

The State of Cardiovascular Health in the European Union



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Preface

Cardiovascular diseases (CVDs) are the leading cause of death and disability across the European Union (EU), accounting for one-third of all deaths, every year, and affecting over 60 million people. The human toll is compounded by significant economic costs, estimated at EUR 282 billion annually across the EU, making CVD not only a health crisis but also a major societal and economic challenge.

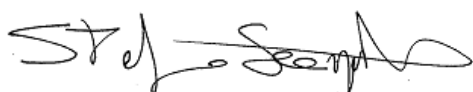
CVDs take a heavy toll on people, impacting their well-being, their social life, their mental and broader physical health. They also increase inequalities between regions and population groups, creating further challenges. While the EU and countries have implemented various policies and cross-sectoral initiatives to address CVDs, an ageing population is expected to further increase their prevalence by 2050, highlighting the need for stronger and co-ordinated action.

As outlined by President von der Leyen in her political guidelines and the mission letter to the Commissioner for Health and Animal Welfare, the European Commission will step up its work on preventive health, in particular on CVDs. The EU's first ever cardiovascular health plan aims to support Member States, through EU co-ordinated action, to reduce the burden of CVDs by enhancing prevention, strengthening early detection and screening, and supporting treatment and care.

This report, *The State of Cardiovascular Health in the European Union*, builds on a longstanding collaboration between the OECD and the European Commission to monitor and improve population health, including through the State of Health in the EU initiative, which includes the *Health at a Glance: Europe* series and the *EU Country Health Profiles*. These efforts have provided critical insights into the performance of health systems and the evolving challenges posed by non-communicable diseases (NCDs), including cardiovascular disease.

The publication reflects the OECD's continued commitment to supporting EU Member States in addressing the growing burden of CVDs and related conditions. It draws on the OECD's extensive analytical work on NCDs and benefits from close co-operation with the European Commission's Directorate-General for Health and Food Safety, and input from a wide range of stakeholders, including healthcare industry, health professional and patient organisations as well as wider civil society.

By providing a comprehensive assessment of cardiovascular health across the EU, this report aims to inform future EU and national policy efforts. Leveraging digital health technologies, promoting people-centred care, and aligning policies and cross-sectoral actions can enhance progress, reduce inequalities, with a specific focus on women, and make cardiovascular care more efficient. By translating evidence into action, the EU can improve cardiovascular health, reduce inequalities, and ensure that all citizens – regardless of where they live, of their gender, or of their socio-economic status – can live longer, healthier lives.



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Foreword

This report, *The State of Cardiovascular Health in the European Union*, provides a comprehensive assessment of cardiovascular disease (CVD) across EU Member States, combining the latest evidence on health outcomes, risk factors, and system performance with policy analysis and actionable recommendations. It examines trends in mortality, morbidity, and quality of life, highlighting persistent inequalities and the growing impact of demographic change and multimorbidity. Beyond describing the burden of CVD, the report explores the current landscape of prevention strategies, care integration, and digital health innovations. By aligning national efforts with EU priorities and promoting people-centred, data-driven approaches, this publication aims to support policymakers in reducing disparities, strengthening resilience, and ensure that cardiovascular health is embedded as a core priority within sustainable health systems.

This report was developed by the cardiovascular health team within the Health Division of the OECD Directorate for Employment, Labour and Social Affairs, who led the analysis and drafting process. It was co-funded by the European Union (EU) under the EU4Health Programme. Ana Sofia Carvalho, Niek Klazinga, Martin O'Flaherty, Luke Slawomirski, Aleksandra Torbica, and Veena Raleigh also contributed to the report as external consultants.

This publication would not have been possible without the efforts of national data correspondents who have provided data to the OECD and the other international data collections cited in the report, as well as the 22 countries that provided valuable data responding to the *2025 OECD Cardiovascular Policy and Data Survey*. We are also grateful to all the national officials who have provided helpful comments on the draft of this report.

Co-operation with the European Commission's Directorate-General for Health and Food Safety (DG SANTE) was instrumental for the production of this report. The project benefited from input from a range of stakeholders, and in particular, the Global Heart Hub, the International Diabetes Federation, the Joint Action on CARdiovascular diseases and DIabetes in Europe (JACARDI), the Joint Action Prevent Non-Communicable Diseases (JA PreventNCD), the European Alliance for Cardiovascular Health, the European Patients Forum, the European Society for Cardiology, European Stroke Organisation, the Stroke Alliance for Europe, and the World Organization of Family Doctors. We are also very grateful to the patient representatives who shared their personal experiences to be featured in the report.

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For more information on the report, or to reach the OECD team members who contributed to the report, please contact HCQO.contact@oecd.org.

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Acronyms

AAA	Abdominal aortic aneurism
ACC	American College of Cardiology
ACE	Angiotensin-converting-enzyme
ACE-I	Angiotensin-converting enzyme inhibitors
ACHD-PRO	Adult Congenital Heart Disease – Patient-Reported Outcome
ACR	Albumin to creatinine ratio
ACS	Acute coronary syndrome
ADR	Adverse drug reactions
AED	Automated external defibrillator
AF	Atrial fibrillation
AF-PROMs	Atrial fibrillation patient-reported outcome measures
AHA	American Heart Association
AI	Artificial intelligence
AIS	Acute ischemic stroke
ALS	Advanced life support
AMI	Acute myocardial infarction
ANGPTL3	Angiopietin-like protein 3
ApoC-III	Apolipoprotein C-III
ARB	Angiotensin receptor blockers
ARNI	Angiotensin receptor-neprilysin inhibitors
ART	Assisted reproductive technologies
ASA	American Stroke Association
ASCVD	Atherosclerotic cardiovascular disease
ASMRs	Age standardised mortality rate
BI	Behavioural insights
BLS	Basic life support
BMI	Body mass index
BP	Blood pressure
CABG	Coronary artery bypass grafting
CAD	Coronary artery disease
CARDS	Cardiology audit and registration data standards
CCBs	Calcium channel blockers
CCM	Chronic care model
CDSS	Clinical decision support systems
CHD	Coronary heart disease
CHF	Congestive heart failure
CIED	Cardiac implantable electronic devices
CKD	Chronic kidney disease
COPD	Chronic obstructive pulmonary diseases
CPI	Consumer price index
CPR	Cardio-pulmonary resuscitation
CR	Cardiac rehabilitation
CRT	Cardiac resynchronisation therapy

CSS	Comprehensive Stroke Centers
CT	Computed tomography
CV	Cardiovascular
CVD	Cardiovascular disease
CWJ	Cluster of Western Jutland
DALYs	Disability-adjusted life years
DAPT	Dual antiplatelet therapy
DDDs	Defined daily doses
DOACs	Direct oral anticoagulants
DRG	Diagnostic-related group
DTN	Door-to-needle
DVT	Deep vein thrombosis
EACTS	European Association for Cardio-Thoracic Surgery
ECG/EKG	Electrocardiogram
ED	Emergency department
eGFR	Estimated glomerular filtration rate
EHDS	European Health Data Space
EHIS	European Health Interview Survey
EHRs	Electronic health records
EMS	Emergency medical service
EMT	Emergency medicine technicians
EPIC	End-gaming tobacco with personalised and integrate care
ESC	European Society of Cardiology
ESO	European Stroke Organisation
EuReCa	European Registry of Cardiac Arrest
FDA	U.S. Food and Drug Administration
FH	Familial hypercholesterolemia
FHF	French Hospitals Federation
FSA	Food Standards Agency
FXR	Farnesoid X receptor
G-BA	Gemeinsamer Bundesausschuss
GDPR	General Data Protection Regulation
GLP-1 RAs	Glucagon-Like Reptide-1 Receptor Antagonists
GP	General practitioner
GPI	German Statutory Pension Insurance
GYTS	Global Youth Tobacco Survey
H@H	Hospital-at-Home
H1N1	Hemagglutinin type 1 / Neuraminidase type 1
H2O	Health Outcomes Observatory
HAS	<i>Haute Autorité de Santé</i>
HbA1c	Hemoglobin A1C
HBPT	Home blood pressure telemonitoring
HCQO	Healthcare quality and outcomes
HDL	High density lipoprotein
HDL-C	High-density lipoprotein cholesterol
HELENA	Healthy Lifestyle in Europe by Nutrition in Adolescence
HEPA	Health-Enhancing Physical Activity
HERA	Health Emergency Preparedness and Response
HF	Heart failure
HF-NET	Heart Failure Network
HFpEF	Heart failure with preserved ejection fraction
HFrEF	Heart failure with reduced ejection fraction
HiAP	Health in All Policies
HMG-CoA	Hydroxy-methylglutaryl-coenzyme A

HR	Hazard ratio
HRPP	High-risk prevention programme
HTA	Health technology assessment
ICD	Implantable cardioverter defibrillators
ICERs	Incremental cost-effectiveness ratios
ICHOM	International Consortium for Health Outcomes Measurement
ICT	Information and communication technologies
IDEFICS	Identification and prevention of dietary- and lifestyle-induced health effects in children and infants
IHD	Ischaemic heart disease
IHME	Institute for Health Metrics and Evaluation
IL-1	Interleukin-1
IMPALA	Improving infrastructure for leisure-time physical activity in the local arena
IVT	Intravenous thrombolysis
JACARDI	Joint Action on Cardiovascular diseases and Diabetes
JA-CHRODIS	Joint Action on Chronic Diseases and Promoting Healthy Ageing
KCCQ	Kansas City Cardiomyopathy Questionnaire
KYN	Know Your Numbers!
LDL	Low density lipoprotein
LDL-C	Low-density lipoprotein cholesterol
LLMs	Large language models
LLT	Lipid lowering therapy
LPA	Low physical activity
LVEF	Left ventricular ejection fraction
LVO	Large vessel occlusion
LYs	Life years
MACE	Major adverse cardiovascular events
MDR	Medical Device Regulation
MECU	Mobile emergency care unit
MET	Metabolic equivalent
MetS	Metabolic syndrome
MI	Myocardial infarction
MICA	Mobile intensive care ambulance
MICU	Mobile intensive care unit
MINOCA	Myocardial infarction with non-obstructive coronary artery disease
MMM	May Measurement Month
MRAs	Mineralocorticoid receptor antagonists
MRI	Magnetic resonance imaging
mRS	Modified ranking score
MSU	Mobile stroke unit
MT	Mechanical thrombectomy
NASH	Non-alcoholic steatohepatitis
NCD	Non-communicable disease
NCDR	The Norwegian Cardiovascular Disease Registry
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NIHSS	National Institute of Health Stroke Severity
NLRP3	Nucleotide-binding domain, leucine-rich-containing family, pyrin domain-containing-3
NP	Natriuretic peptide
NYHA	New York Heart Association
OHCA	Out-of-hospital cardiac arrest
OIM	Operational integration management
OOH	Outside of office hours
PAD	Peripheral arterial disease
PAD	Publicly accessible defibrillators

PaRIS	Patient-Reported Indicator Surveys
PCCs	Primary healthcare centres
PCI	Percutaneous coronary intervention
PCOS	Polycystic ovary syndrome
PCSK9	Proprotein convertase subtilisin/kexin type 9
PE	Pulmonary embolism
PEA	Pulseless electrical activity
PHC	Primary healthcare
PHPT	Public health product tax
PPAR	Peroxisome Proliferator-Activated receptor
PPCI	Primary percutaneous coronary intervention
PPG	Photoplethysmography
PPP	Purchasing power parity
PREMs	Patient-reported experience measures
PROMs	Patient-reported outcome measures
PSC	Primary stroke centres
PSOM	PROMs Standard Operating Model
PTCA	Percutaneous transluminal coronary angioplasty
PYLL	Potential years of life lost
QALYs	Quality-adjusted life years
RAAS	Renin-angiotensin-aldosterone system
RACECAT	Rapid Arterial Occlusion Evaluation Trial
RCTs	Randomised controlled trials
RD	Risk difference
ROSC	Return of spontaneous circulation
RSD	Respiratory diseases
SAFE	Stroke Alliance for Europe
SAMU	<i>Service d'Aide Médicale Urgente</i>
SAP-E	Stroke Action Plan for Europe
SC	Stroke centre
SCAD	Spontaneous coronary artery dissection
SCD	Sudden cardiac death
SDIL	Soft Drinks Industry Levy
SDM	Shared decision making
SGLT2i	Sodium-glucose cotransporter-2 inhibitors
SHI	Statutory Health Insurance
siRNA	Small interfering RNA
SPICES	Scaling up Packages of Interventions for Cardiovascular disease prevention in selected sites in Europe and Sub-Saharan Africa
STEMI	ST-elevation myocardial infarction
SU	Stroke unit
T2DM	Type 2 diabetes mellitus
TAVI	Transcatheter aortic valve implantation
TFG	Tobacco-free generation
THL	Finland's public health institute
TIA	Transient ischaemic attack
TMREL	Theoretical minimum risk exposure level
TPD	Tobacco Products Directive
UPF	Ultra processed foods
VF	Ventricular fibrillation
VKAs	Vitamin K antagonists
VT	Ventricular tachycardia
VTE	Venous thromboembolism
YLLs	Years of life lost

Executive summary

Over the past 50 years, the development and implementation of preventive public health strategies, and medical advances in managing and treating cardiovascular disease (CVD), have resulted in significant declines in CVD morbidity and mortality. However, improvements have slowed in recent years, and in some countries, progress is now reversing. Today, CVD remains one of the most significant health concerns confronting European Union (EU) countries, and beyond. **CVD remains the leading cause of morbidity and mortality in the EU**, accounting for one-in-three of all deaths (1.7 million deaths in 2022) and affecting an estimated 62 million people.

EU countries differ vastly in the magnitude of cardiovascular mortality, with Central and Eastern European countries having higher mortality rates compared to Western and Southern European countries. Regional inequalities in CVD mortality across the EU have been further exacerbated by COVID-19. Countries with high pre-pandemic CVD mortality, such as Bulgaria, Romania, Latvia and Lithuania, saw increases in age-standardised mortality rates between 2019 and 2021, while those with lower mortality experienced smaller rises or continued declines, with Luxembourg and Portugal observing the greatest declines.

In most EU countries, the mortality rate from circulatory diseases is about 26-60% higher in men than in women. Premature mortality (under age 65) is over three times higher in men. Regardless of geography or gender, **people living with CVD report lower quality of life than their peers without CVD, including reduced well-being, poorer physical health, and worse mental health.** These disparities reflect real gaps in access, quality, and system performance.

Aside from the human costs, CVD accounts for a significant share of healthcare expenditures in the EU. As of 2021, **the total economic burden of CVD in the EU has been estimated at EUR 282 billion annually, amounting to approximately 2% of the region's gross domestic product.** This substantial financial commitment is distributed across several key components: direct healthcare costs, social care costs, informal care, and productivity losses. On a per capita basis, CVD-related costs averaged EUR 630 per EU citizen. The combined burden of healthcare expenditures and informal care costs is significantly greater for CVD than for cancer in the EU, sometimes even doubling them, highlighting the considerable burden on people living with CVD, as well as their families and caregivers.

All EU countries are ageing, with the share of people aged 65 and over expected to rise from 22% in 2024 to 29% by 2050. This demographic shift is expected to increase the burden of CVD, with estimates suggesting as much as a 90% rise in CVD prevalence in Europe between 2025 and 2050.

On top of demographics, a mix of factors increase the risk of CVD. More than three-quarters of CVD deaths in the EU are linked to modifiable risks, with metabolic factors – such as hypertension, diabetes and obesity – accounting for 68%, behavioural risks for 37%, and environmental risks contributing 18%. Over the past decade, exposure to metabolic risks has largely risen or stayed high, while behavioural and environmental risks show mixed trends. Of the 15 CVD risk-related metrics presented in this report, eight have worsened, and the remaining seven indicate high levels of population exposure. One-in-five (22%) people living in the EU lives with hypertension, another one-in-seven live with obesity (15%), and one-in-13

(8%) live with diabetes. Depression and severe mental illness – including schizophrenia or bipolar disorder – are associated with increased risk of myocardial infarction, stroke, angina and coronary heart disease. Close to a third (27%) of adults aged 45 and over report at least four depressive symptoms.

Screening is key for managing conditions like hypertension, diabetes and dyslipidaemia, which, if not controlled, can lead to cardiovascular events with more severe complications for patients.

Despite the accessibility of blood pressure screening and given that hypertension is a major CVD risk factor, more than 30% of adults aged 45 to 54 in the EU have not had a measurement in the last year, and about 6% have not had a measurement in the past five years. Cholesterol and blood glucose screening is lacking, with over 10% of adults aged 45 to 54 in the EU not having had a test in the past five years. Screening alone is not sufficient – timely follow-up care, including diagnosis, treatment, and patient support, is essential to translate early detection into improved outcomes.

Health promotion activities can have substantial impacts by targeting people already living with CVD, and there are opportunities to better reach people living with CVD with the advice that can help them improve on modifiable risk factors and effectively manage their conditions.

Confidence in self-management among people aged 45 and older with CVD varies more than three-fold across countries. Strong primary care can also prevent costly and avoidable CVD-related hospital admissions. In 2023, EU countries averaged 232 avoidable hospital admissions per 100 000 people for chronic health failure, with rates varying more than four-fold. Matching the lowest OECD country rate for CVD admissions could save the EU EUR 45 billion – around 16% of total CVD spending in 2021.

Hospitalisation remains common for CVD patients, who are twice as likely to be hospitalised as others.

One in four CVD patients aged 45+ were hospitalised in the last year, despite downward trends in hospitalisation. In 2023, 14% of hospital discharges in Europe were related to CVD, requiring either planned procedures or acute care. However, the effectiveness of hospital care and the likelihood of survival and readmission for CVD patients vary across the EU. Post-discharge care, including medication adherence, is critical but often drops sharply after discharge. Data from 14 EU countries show that 24% of stroke patients and 33% of chronic heart failure patients are readmitted, with mortality rates of 16% and 24%, respectively, after hospital discharge. Effective co-ordination of post-acute care could reduce medium and long-term mortality and morbidity.

Across Europe, national policies to address CVD vary widely, ranging from broad national plans to disease-specific programmes.

These policies mainly address prevention across the life course, early detection, diagnosis and treatment, rehabilitation, care continuity, and improved quality of life. However, tackling inequalities and promoting patient-centred care remain less emphasised within these initiatives.

Preventive care and early risk detection, through health checks and targeted prevention initiatives, are effective and cost-efficient to identify and manage cardiovascular risk factors, particularly for disadvantaged populations.

However, reaching people in vulnerable situations and sustaining engagement with them remains a challenge. Low health literacy further limits timely care and adherence, highlighting the need for targeted education and public training, including automated external defibrillator use, to improve survival after cardiac events.

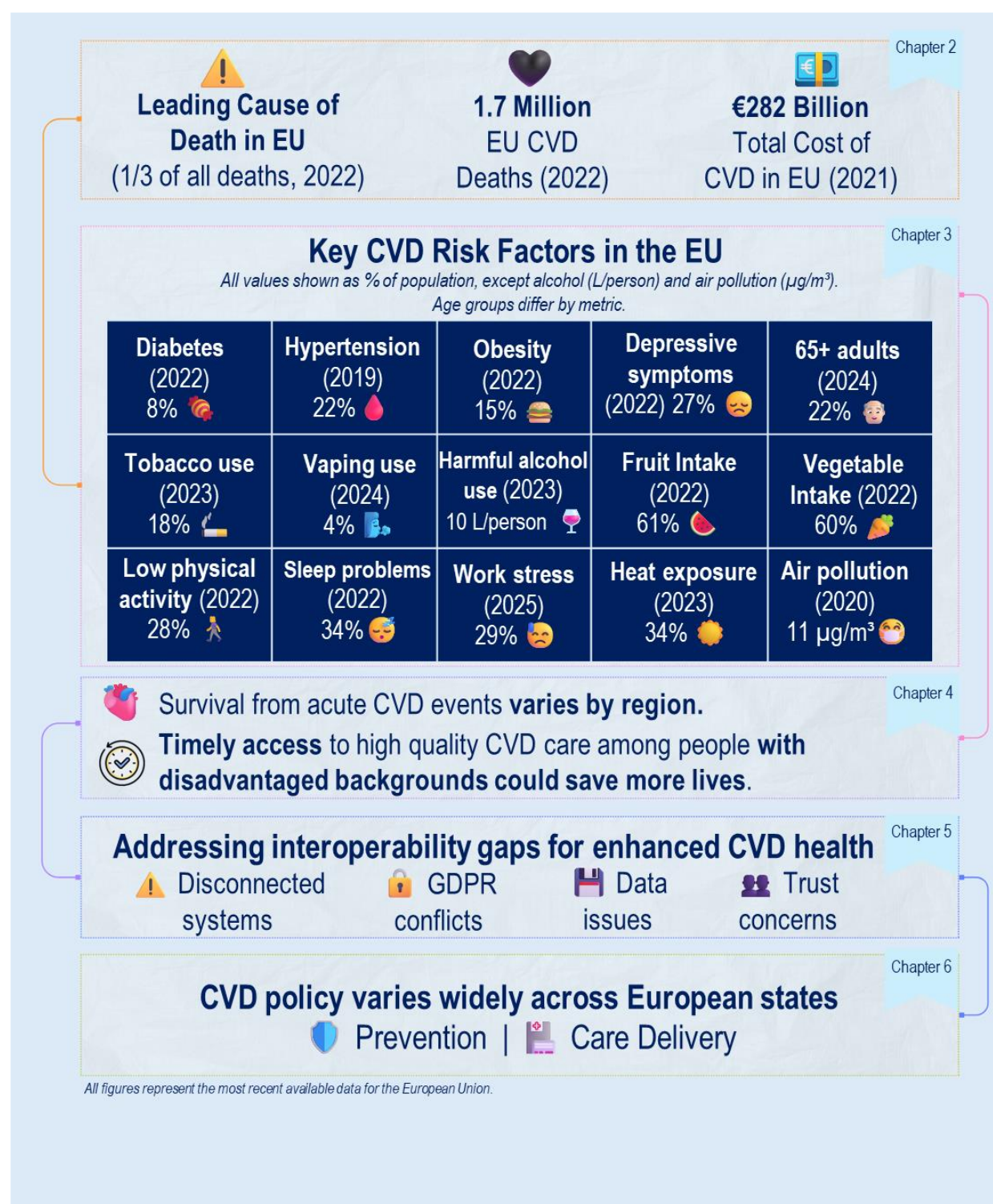
Digital health technologies are increasingly shaping the prevention and management of CVD.

Tools such as electronic health records (EHRs), clinical decision support systems, telemedicine platforms, mobile health applications, and wearable monitoring devices enable the systematic collection of health data and contribute to more effective CVD policies. Despite these advantages, the adoption of such technologies remains limited across the EU. Less than half of surveyed countries reported using EHRs to assess CVD burden and outcomes. Similar challenges apply to wearable technologies: only three EU+2 countries (Czechia, France and Norway) reported having national policies promoting their adoption, and just one country (France) reported having the infrastructure to integrate data from wearables into EHR systems. In parallel, AI and machine learning tools are rapidly expanding, with more than 1 000 AI algorithms approved

for medical use by the US FDA by the end of 2024, with cardiology among the top fields (comparable figures in the EU context are not currently available).

Improving cardiovascular and cerebrovascular health outcomes requires co-ordinated, people-centred approach from prevention and early detection to post-acute support. Multidisciplinary programmes, home/clinic-based follow-up and self-management reduce mortality and hospitalisation. People-centred approaches, shared decision making, and self-management improve patient experiences and health outcomes but are not yet widely adopted in Europe. Investments in health literacy, discharge planning, rehabilitation, and early supported discharge can accelerate recovery and expand home-based care opportunities. Breaking down administrative silos, aligning financial incentives, and enhancing primary care systems improve access, care continuity, and quality in cardiovascular care.

Infographic 1. Cardiovascular health in the EU: Key trends and policy directions



1

Cardiovascular health in the EU: Key trends and policy directions

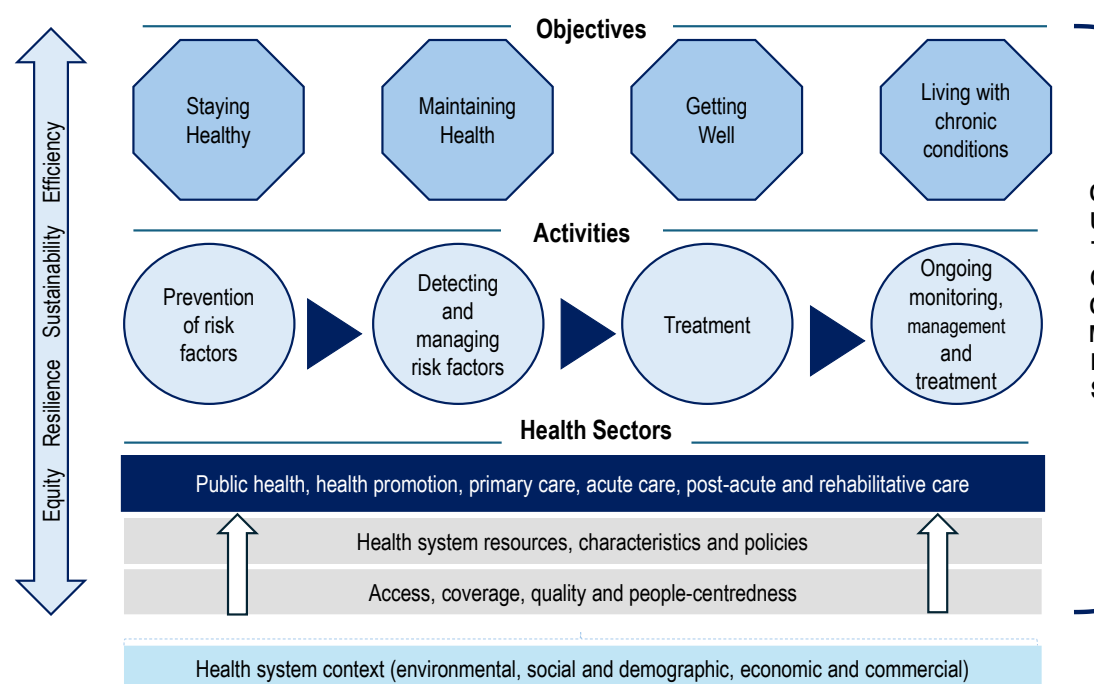
Cardiovascular disease (CVD) remains the leading cause of death and disability in the EU, with significant geographic, gender, and socio-economic disparities in outcomes and care. Despite progress in prevention and treatment, the COVID-19 pandemic reversed some gains, and most countries still face challenges in early detection, access to acute care, and long-term management. The economic and social burden of CVD is immense, driven by premature mortality, lost productivity, and high healthcare costs, especially in Central and Eastern Europe. While digital health tools, artificial intelligence, and remote monitoring offer promising innovations, their integration into national systems remains limited, and sustained investment in prevention, equitable care, and data infrastructure is essential. Cross-sectoral prevention policies – such as nutrition, tobacco, and physical activity interventions – and a growing emphasis on people-centred care and rehabilitation are critical levers to reduce the burden of CVD and improve long-term outcomes in Europe.

1.1. The purpose and scope of this report

Cardiovascular diseases (CVD) are a complex set of diseases involving a wide array of health services. CVD prevention and care is reflected in all aspects of the healthcare system, including public health programmes and preventive services, primary care, emergency and acute care, as well as rehabilitative and long-term care (Figure 1.1). Each aspect of the health system has an important set of functions that can help reduce the extensive health burden of CVD on society.

The role of public health, and particularly health promotion activities, is to promote healthy lifestyles and reduce the prevalence of risk factors such as obesity, the use of tobacco and related products, and harmful alcohol consumption, as well as improve physical activity and nutrition in the population. These risk factors can lead not only to CVD, but also to other health conditions that increase CVD risk. More broadly, public health and health promotion has a role in addressing wider structural and environmental determinants of health. This includes creating supportive environments, implementing regulatory measures, and reducing socio-economic inequalities that shape lifestyle choices. Primary care services have an important role in promoting healthy lifestyles for individual patients and, in addition, are instrumental in the diagnosis and treatment of risk factors, such as high blood pressure and high cholesterol and delaying the onset of CVD. These services also help patients to manage their CVD effectively, as well as other chronic conditions that can lead to worse CVD outcomes.

Figure 1.1. A framework for understanding the state of CVD in the EU



Source: Adapted from OECD (2015^[1]), *Cardiovascular Disease and Diabetes: Policies for Better Health and Quality of Care*, <https://doi.org/10.1787/9789264233010-en> to include additional concepts from the OECD HSPA Framework (2024^[2]), *Rethinking Health System Performance Assessment: A Renewed Framework*, <https://doi.org/10.1787/107182c8-en>.

In the case of an acute episode such as stroke and heart attack, the emergency and hospital sectors are responsible for providing effective and timely treatment to maximise the likelihood of survival and reduce disability. Following acute care, rehabilitative and primary care, play a vital role in managing CVD and associated complications that may have arisen. Such healthcare services are integral to minimising the

morbidity associated with such events. To deliver effective services and programmes along the CVD and diabetes pathway, healthcare systems need to ensure that (1) adequate financial and physical resources are in place, including doctors, nurses, hospital beds and technologies; (2) services and technologies are highly accessible to the people in need of those services – ensuring both financial access, so that cost does not impose unnecessary barriers, and physical access, to ensure that care is timely; (3) the healthcare system delivers high quality care; and (4) equity is embedded across all dimensions of service delivery, ensuring that population groups at greater risk or with disadvantages are not left behind.

Box 1.1. What the OECD State of Cardiovascular Health in the European Union report aims to achieve

The purpose of this report

Building on *Health at a Glance: Europe 2024* and the OECD's portfolio of CVD-related work, this report examines the current status of cardiovascular health in the EU, with the aim of providing evidence which can help to inform potential future initiatives in the EU. The publication will deliver an in-depth situational analysis of CVD trends, including the presence and influence of risk factors, multimorbidity, and health and healthcare pathways and outcomes across the EU. It will also include a mapping of existing policies, as well as the main challenges and opportunities for future action at both Member State and EU levels.

Putting CVD in context

CVD refers to a group of conditions affecting the heart and blood vessels, including coronary heart disease, such as heart attack or acute myocardial infarction (AMI), cardiac arrest, cerebrovascular diseases (including stroke), heart failure, and atherosclerosis (see the glossary section for more information). CVD is closely linked with metabolic conditions (such as hypertension and diabetes), which frequently occur together and increase each other's risks. For this reason, diabetes and hypertension are also examined with a particular emphasis in this report.

Country coverage in this report

This report focusses on the state of cardiovascular health in EU countries, Iceland and Norway. Information on EU candidate countries and additional G20 OECD countries not in the EU (Australia, Canada, Japan, Republic of Korea, Mexico, Türkiye, the United Kingdom and the United States). This report also maps insights and good practices from other OECD Member States, and includes relevant examples from Colombia, Israel, and Singapore, who provided information through the *2025 OCED Cardiovascular Policy and Data Survey*. Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, and the United Kingdom also provided responses to the survey – which is referenced throughout the report.

This report examines how European countries perform in their ability to prevent, manage and treat CVD – and the policies they are undertaking to drive results (Box 1.1). The analysis in this report examines the mechanisms by which countries deliver the programmes and services related to CVD and diabetes, namely health promotion, public health, prevention, primary care and acute care. The following chapters of this report describe the main health sectors and cross-cutting issues involved in CVD prevention and care management. In doing so, the report describes the resources available to prevent disease and deliver care, the accessibility and utilisation of those services, the effectiveness and quality of care delivered, as well as the aptitude of the policy environment to enable positive outcomes.

1.2. CVD remains one of the leading health challenges for the EU, especially in the wake of the COVID-19 pandemic

The decline in mortality from CVD in recent decades has been one of the notable achievements of public health and modern medicine. Over the past 50 years, there have been significant increases in life expectancy in European countries, largely due to advances in preventing and treating CVD and its risk factors (OECD/The King's Fund, 2020^[3]). During this period, the development and implementation of preventive public health strategies, and medical advances in managing and treating CVD, have resulted in significant declines in CVD morbidity and mortality. Between 1980 and 2005, CVD mortality rates fell by as much as half in several European countries – though the gains have been slowing in more recent years (OECD/The King's Fund, 2020^[3]).

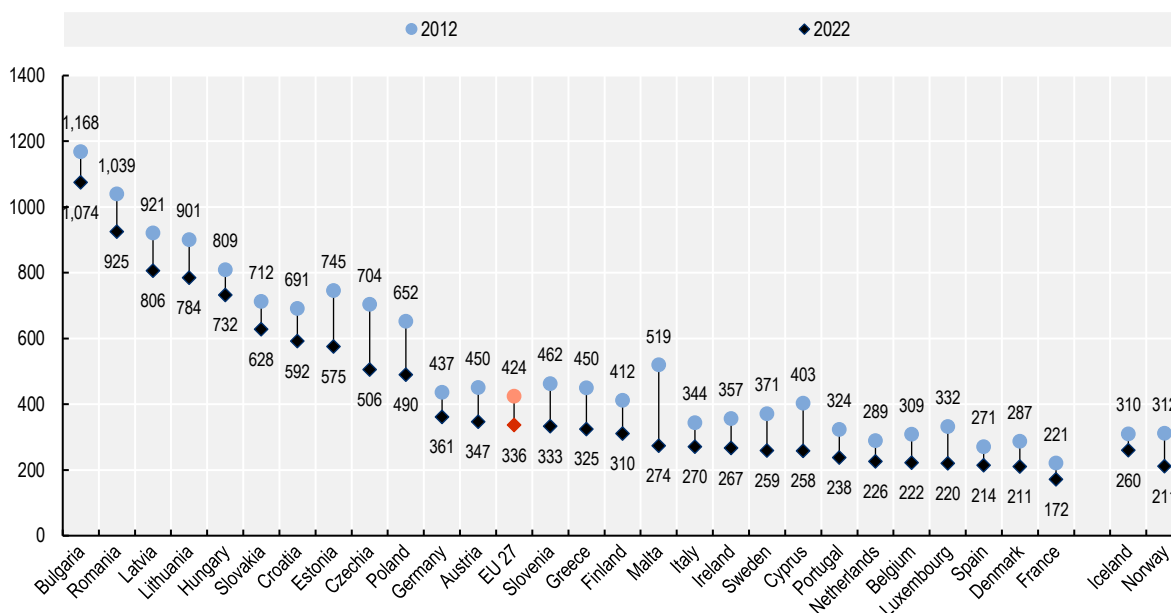
Despite the exceptional advances in preventing and managing CVD, it remains one of the biggest health challenges facing EU countries. It is the leading cause of death in the EU, accounting for one-in-three of all deaths (1.7 million deaths in 2022) and affecting 62 million people (ESC, 2025^[4]). Ischaemic heart disease (IHD) is the largest contributor, responsible for almost one-third (547 000 deaths) of all deaths from circulatory disease. Cerebrovascular disease (stroke) is the second largest contributor, accounting for just over one-fifth of all circulatory disease deaths in the EU (350 000 deaths). Although CVD mortality rates are higher in men than in women across EU countries – reducing life expectancy of men more drastically, more women than men die from CVD overall. (ESC, 2025^[4]). This is because women, on average, live longer and are more likely to reach older age groups where CVD is the leading cause of death. As a result, CVD accounts for a higher share of total deaths among women than among men.

Trends in CVD mortality reversed in several EU countries during the COVID-19 pandemic, with the largest increases occurring in countries with already high CVD mortality

Between 2012 and 2022, mortality from circulatory diseases fell in every EU member state, with an average decline of 20% among men and 22% among women. Nevertheless, large differences persist; while countries like France, Denmark or Spain reported rates below 220 deaths per 100 000 population in 2022, Bulgaria, Romania and Latvia still exceeded 800 deaths per 100 000 population. As shown in Figure 1.2, Central and Eastern EU countries experienced smaller reductions compared to Western and Southern European countries, contributing to a persistent – and in some cases widening – regional mortality gap.

Figure 1.2. CVD mortality fell overall between 2012 and 2022, though gains have been slower than in previous decades

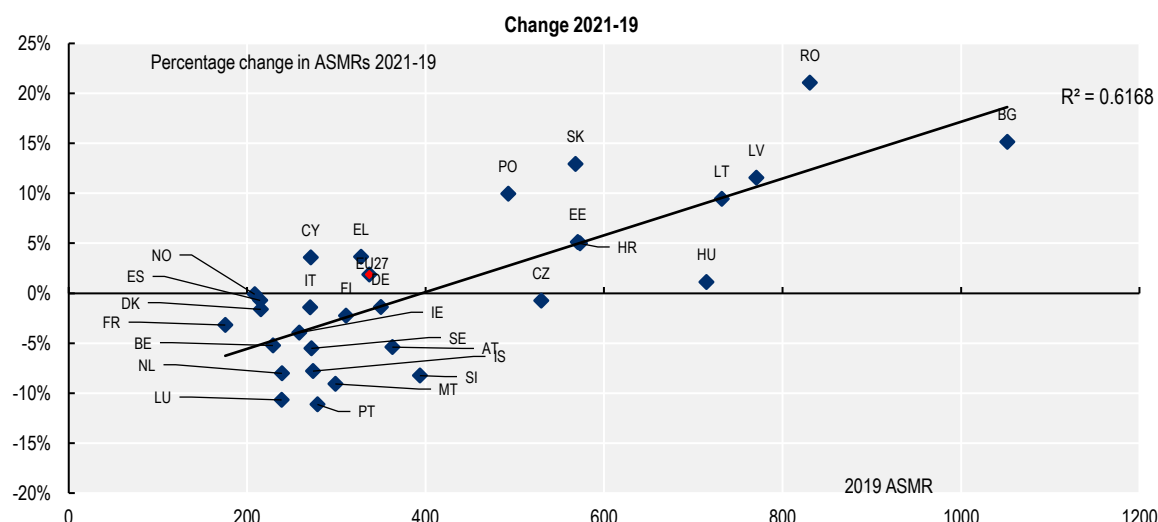
2022-2012 change in CVD age-standardised mortality rates (ASMRs)



Source: Eurostat (hlth_cd_asdr2), 2025.

However, this progress – which was already slowing compared to previous decades – was further disrupted during the COVID-19 pandemic. Countries with higher pre-pandemic CVD mortality in 2019 experienced the largest percentage increases in age-standardised mortality rates (ASMRs) between 2019 and 2021, with rises ranging from 10% to 21% in countries such as Romania, Bulgaria and Latvia. By contrast, countries with already lower pre-pandemic mortality – mostly in Western and Southern Europe – showed smaller increases or even continued declines. This divergence further widened regional inequalities in CVD mortality across the EU. It should be noted that these trends are influenced not only by changes in CVD outcomes, but also by the direct impact of COVID-19 mortality, possible disruptions to health services, and other competing risks. For example, between 2019 and 2021, the mortality gap between Bulgaria and France increased from 6-fold to 7-fold among men, and from 6-fold to 8-fold among women. This pattern, illustrated in Figure 1.3, can be observed by comparing pre-pandemic mortality levels to the percentage change during the pandemic – underscoring persistent inequalities and the disproportionate impact of recent health crises on countries with higher baseline mortality.

Figure 1.3. Some countries saw increases in CVD mortality between 2019-2021, particularly those who had already higher levels of pre-pandemic CVD mortality



Note: EU27 average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

CVD mortality rates vary six-fold for men, and seven-fold for women across EU countries

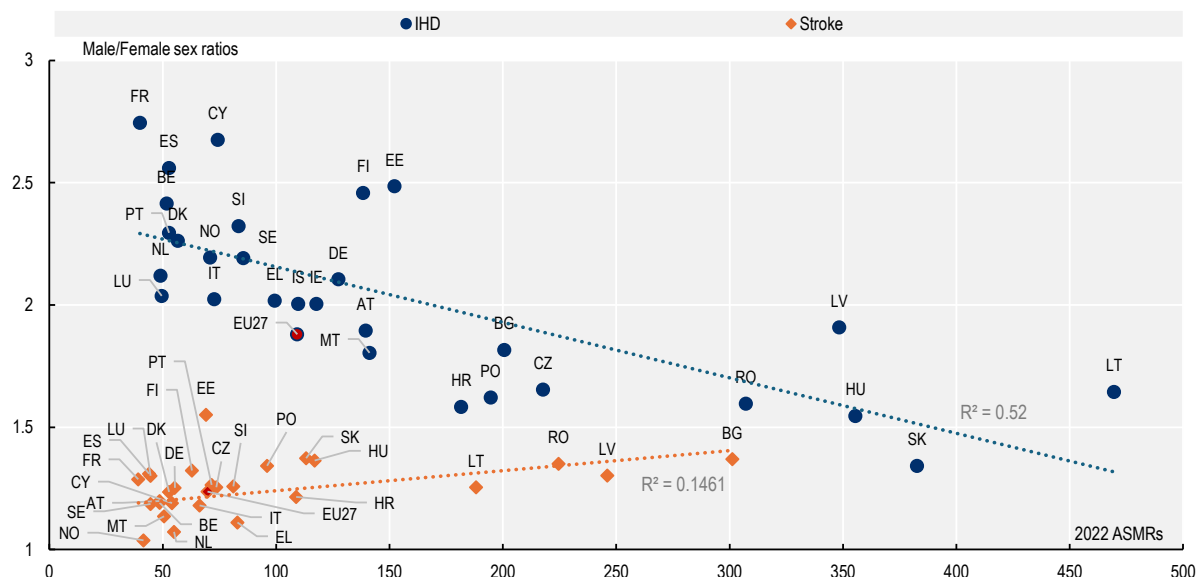
EU countries show substantial variation in cardiovascular mortality; rates are higher and deaths occur younger in Central and Eastern Europe, with the heaviest CVD burden found in the northeast (Bugiardini, 2023^[5]; Cenko et al., 2023^[6]). These countries also have the highest overall burden of CVD (in terms of incidence, mortality, and disability-adjusted life years [DALYs]) among people aged 55 and over (Cenko et al., 2023^[6]).

In 2022, the EU average age-standardised mortality rate (ASMR) for circulatory disease was 404 and 283 per 100 000 population for males and females respectively. The rates ranged from 222 per 100 000 males and 135 per 100 000 population females in France to 1 338 per 100 000 males and 890 per 100 000 females in Bulgaria – a six to seven-fold variation. This large gap is characteristic of a more general geographical pattern across the EU, with higher rates in Central and Eastern European countries. For example, male and female ASMR rates were four times higher in Romania, Latvia and Lithuania than in Norway, Spain and Luxembourg.

In most EU countries, the mortality rate from circulatory diseases is about 26-60% higher in males than in females (the EU average being 43%). Although CVD mortality rates are higher in males than in females in all EU countries, as in most countries globally, CVD claims a larger number and proportion of total deaths in females than in males (ESC, 2025^[4]). Figure 1.4 plots male-to-female mortality ratios against 2022 ASMRs for IHD and stroke. For IHD, there is a clear negative association ($R^2 = 0.52$): where overall IHD mortality is higher, male-to-female ratios are smaller, implying a narrower gender gap. Countries with low IHD mortality (e.g. France, Cyprus, Spain) show higher ratios – greater excess male mortality – whereas countries with high IHD mortality (e.g. Lithuania, Hungary, the Slovak Republic) show lower ratios. By contrast, stroke shows only a weak positive association ($R^2 = 0.15$). Countries with higher stroke mortality tend to have only marginally larger male-to-female differences (e.g. Bulgaria, Romania, Latvia), while countries with low stroke mortality (e.g. Norway, Greece, the Netherlands) have small gaps. Overall, gender differences in IHD narrow as mortality rises, but for stroke, sex gaps are modest (ratios ≤ 1.4 across countries) and show little relationship with overall mortality. Reducing male IHD mortality remains a priority

across the EU – particularly in Central and Eastern Europe – while persistently high female IHD mortality in some Eastern countries also warrants targeted action.

Figure 1.4. Sex differences in mortality are larger for IHD than for stroke and decline as IHD mortality falls



Note: EU average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

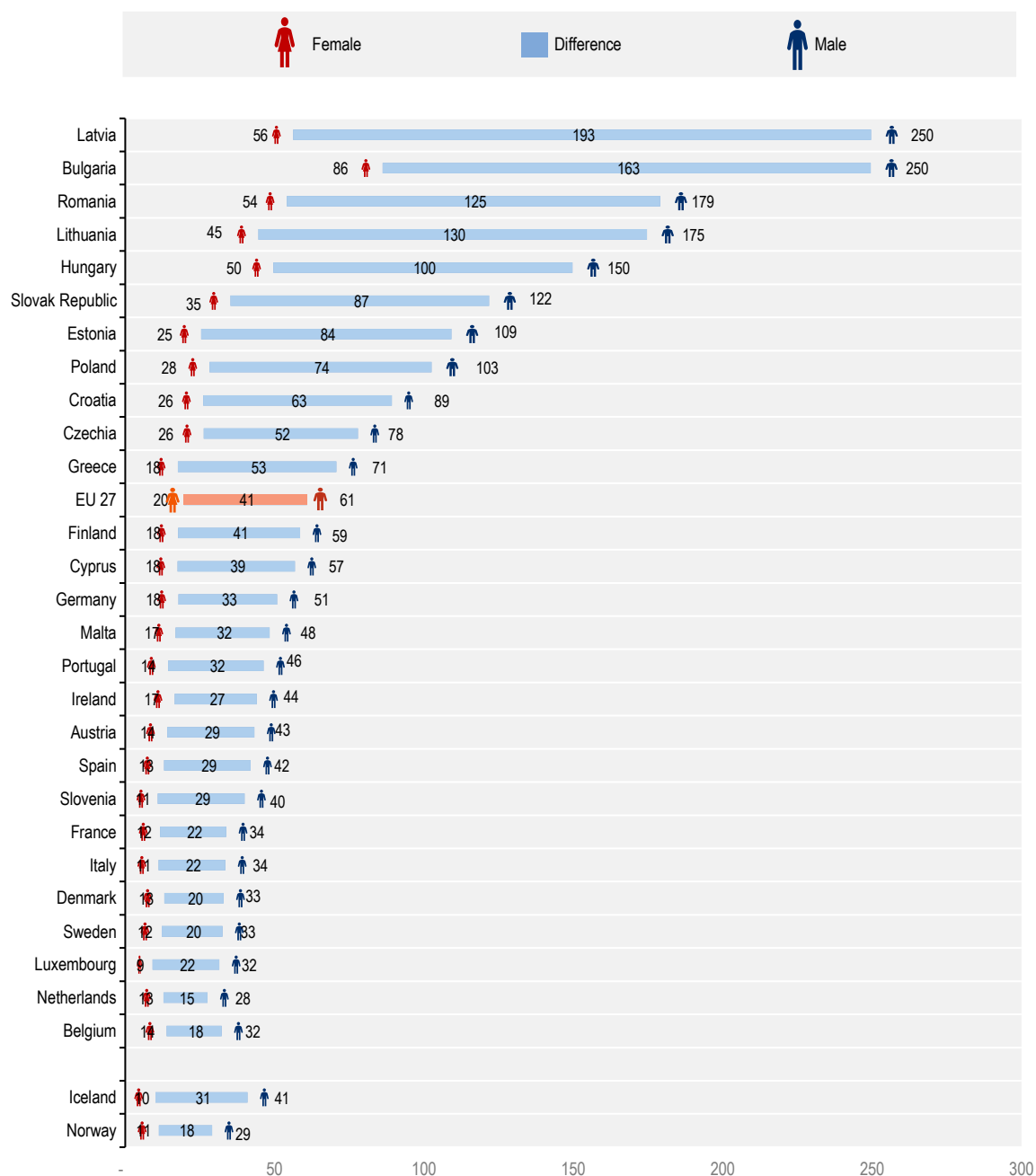
Premature and avoidable mortality from CVD shortens working lives

Premature mortality (deaths below a specified age limit) refers to deaths that occur at a younger age than expected and is often used as a measure of the burden of potentially preventable deaths and for assessing the effectiveness of public health and healthcare systems. It also has consequences for economic costs and the loss of productivity because of working lives cut short. The age limit used differs between data sources; for the Eurostat data discussed here the age limit is 65 years, while some data sources use 70 or 75 years as the upper limit. Because of the small number of premature deaths in countries with smaller populations, the discussion below is limited to EU countries with larger populations. In 2022, the average mortality rate from CVD at ages under 65 for the EU was 61 and 20 per 100 000 population in males and females respectively (Figure 1.5.). There is a 6-9-fold variation in male-mortality between some Central and Eastern European countries (e.g. Bulgaria, Latvia, Romania) and Western European countries (e.g. Norway, the Netherlands, Belgium). The range is more moderate, but still significant, in females (4-8-fold).

The excess of male over female mortality rates for CVD is significantly greater at ages under 65 compared to all ages. Between 2012-2022, premature mortality from CVD fell by an average of 20% in males and 23% in females across the EU, although there were large variations between countries. Premature CVD mortality increased in several EU countries between 2019-2021, reflecting the impact of the pandemic, with the largest increases observed in some Central and Eastern European countries (Lithuania, Latvia, Romania, Bulgaria) (Cherla et al., 2024^[7]).

Figure 1.5. The CVD mortality rate for men under age 65 is more than three times that for women in the same age category

CVD ASMRs under 65, 2022



Note: EU average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

People living with CVD experience worse outcomes across every dimension of self-reported health and well-being than those with other chronic conditions

CVD is a leading cause of disability and premature death, and the results highlight the broader impact it has on people's lives beyond clinical outcomes. Across all measured dimensions – well-being, social functioning, physical health, and mental health – people with CVD report significantly worse outcomes than their peers without CVD (Figure 1.6). These findings are consistent with existing literature showing that CVD affects multiple aspects of patients' lives beyond physical symptoms. Physical limitations caused by CVD – such as fatigue, shortness of breath, and reduced exercise capacity – restrict mobility and hinder participation in social and leisure activities, contributing to feelings of isolation and lower social functioning (Mavaddat et al., 2014^[8]). The psychological burden is also substantial: people living with CVD often face increased anxiety and fear of recurrent cardiac events, as well as challenges in adapting to lifestyle changes and long-term medication regimens, all of which can exacerbate depressive symptoms and reduce overall mental health (Borkowski and Borkowska, 2024^[9]). Furthermore, multimorbidity is highly prevalent among CVD patients and is strongly associated with poorer self-rated health and lower quality of life, sometimes even more than the presence of CVD alone (Dunlay and Chamberlain, 2016^[10]; Skou et al., 2022^[11]). Evidence from OECD also highlights that while improved acute care has reduced mortality, many patients continue to struggle with long-term consequences and ongoing disability (OECD, 2015^[1]). Using data from the OECD Patient-Reported Indicator Surveys (PaRIS), primary care users with CVD report lower overall well-being (4.5 percentage point [p.p.] difference), reduced social functioning (5.8 p.p. difference), worse physical health and poorer mental health (1.3 p.p. difference) as compared those without. Physical health is where the gap between those with and without CVD is most marked (1.8 p.p. difference).

Figure 1.6. CVD negatively affects people's quality of life



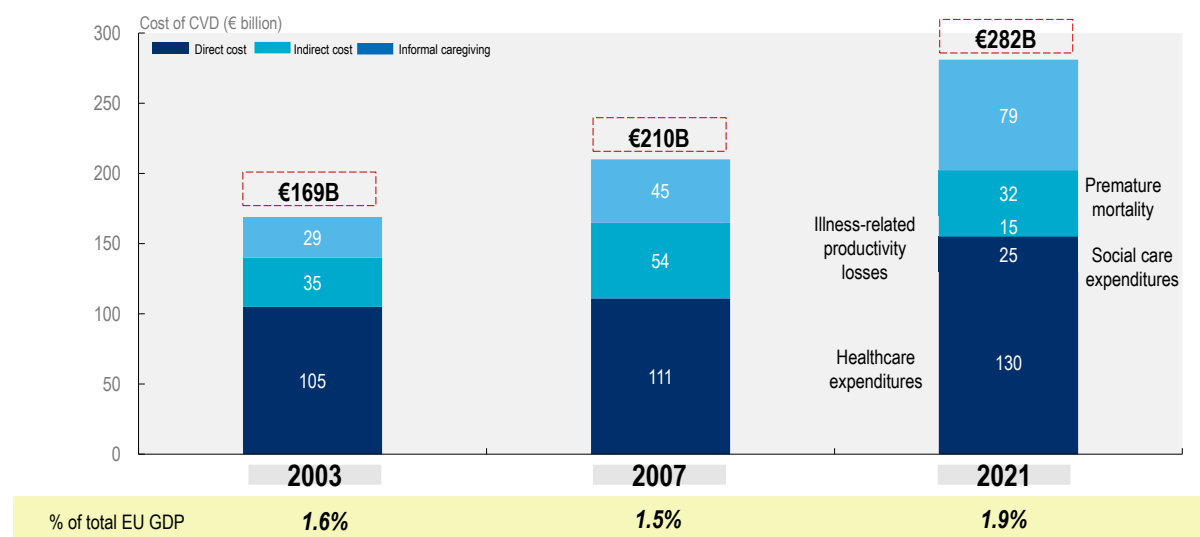
Note: Data from OECD PaRIS Database, 2024. Includes WHO-5 Well-Being Index (0-100 scale) and PROMIS® Global Health measures for social activities, physical health (T-score 16-68, cutoff 42), and mental health (T-score 21-68, cutoff 40). Higher scores indicate better outcomes. Italy data are from outpatient specialist visits in selected regions. US data include only those aged 65+. Data are sorted by CVD status. Differences between people with and without CVD are statistically significant ($p < 0.05$) for most countries, with some exceptions. Source: OECD PaRIS Database, 2024.

The economic burden of CVD in the EU continues to increase

CVD has long been a major contributor to healthcare expenditures and economic losses in the EU. The estimated annual cost of CVD in the EU has surged from EUR 169 billion in 2003 to EUR 282 billion in recent years, reflecting a growing financial strain on healthcare systems (Figure 1.7). This increase is driven not only by direct healthcare expenses but also by rising productivity losses and informal care needs, underscoring the urgency of effective prevention and long-term management strategies. The most recent analysis by Luengo-Fernandez et al., uncover the total economic burden of CVD in the EU at EUR 282 billion annually, amounting to approximately 2% of the region's gross domestic product (GDP). On a per capita basis, CVD-related costs averaged EUR 630 per EU citizen, varying from EUR 381 in

Cyprus to EUR 903 in Germany.¹ Notably, health and social care expenditures for CVD represented 11% of total healthcare spending in the EU, with significant variation among member states – from 6% in Denmark to 19% in Hungary (Luengo-Fernandez et al., 2023^[12]).

Figure 1.7. Economic assessments over time show a growing financial burden of CVD in the EU



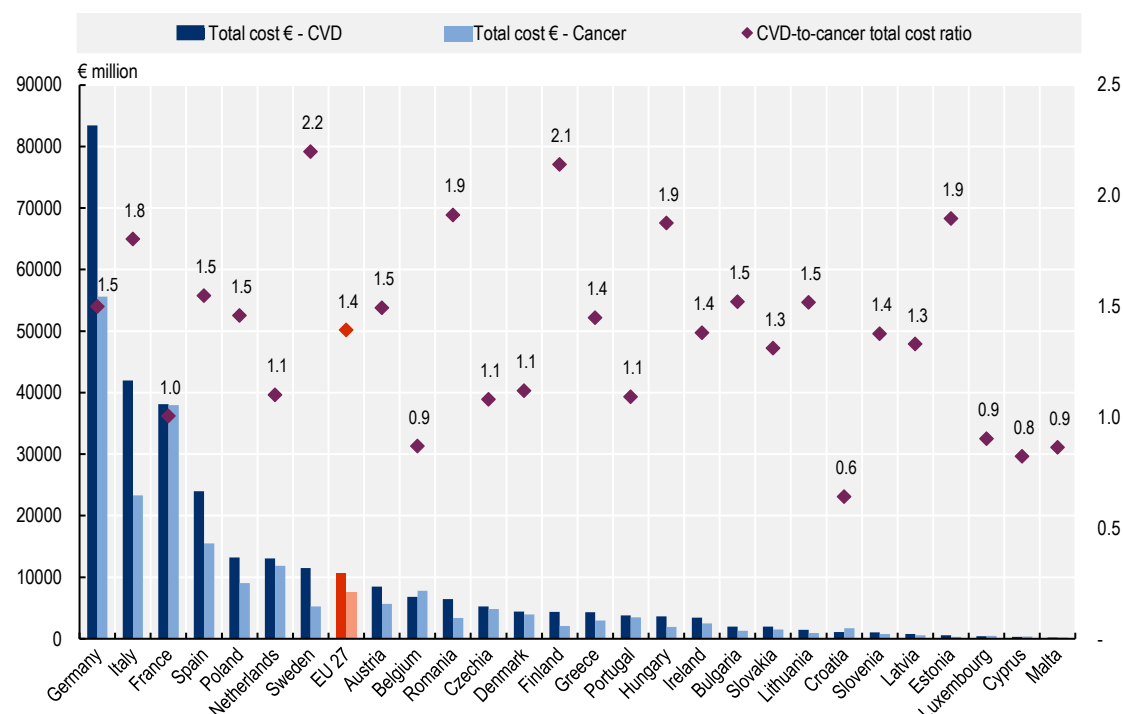
Note: The graph presents and consolidates findings from three separate studies that estimated the financial burden of CVD. percentage of total EU GDP was calculated using Eurostat data and the GDP of EU member states at the time of each study. Figures are presented in nominal terms and are not adjusted for inflation and calculation methods vary between studies. Source: Eurostat (Leal et al., 2006^[13]; Wilkins et al., 2017^[14]; Luengo-Fernandez et al., 2023^[12]).

Total societal economic burden of CVD exceeds cancer

Comparative analyses indicate that CVD impose a substantial economic burden across the EU, often exceeding the costs associated with other costly diseases such as cancer. In 2021, the total economic burden of cancer in Europe not including informal care costs was estimated at EUR 203 billion (Manzano et al., 2025^[15]), which included EUR 134 billion in healthcare expenditures, compared to EUR 155 billion for CVD and EUR 70.4 billion in productivity losses, compared to EUR 48 billion for CVD. The 2021 estimates for cancer exclude the costs of informal care – that is, unpaid support provided by family members or friends. The most recent available data from 2018 indicate that cancer-related informal care costs, adjusted to 2021 euros, amounted to EUR 27 billion, compared to EUR 79 billion for CVD (Manzano et al., 2025^[15]; Hofmarcher et al., 2020^[16]).

In 2021, the total societal cost of CVD – inclusive of direct healthcare costs and losses related to informal caregiving and productivity – was higher than cancer-related costs in most EU countries. In Sweden and Finland, the societal costs of CVD are double that of cancer. Austria reported a total CVD cost of EUR 8.47 billion per year, compared to EUR 5.67 billion for cancer (Figure 1.8). Similarly, Germany spent EUR 83.4 billion on CVD versus EUR 55.6 billion on cancer,¹ while France allocated EUR 38.1 billion to CVD compared to EUR 37.9 billion for cancer.

Figure 1.8. CVD pose higher societal costs than cancer in most EU countries, in some cases exceeding them more than two-fold



Note: All costs expressed in 2021 euros. For cancer, health & social care, costs are estimated with 2023 data, and informal care and productivity losses with 2018 data.

Source: Hofmarcher et al. (2020^[16]), "The cost of cancer in Europe 2018", <https://doi.org/10.1016/j.ejca.2020.01.011>; Luengo-Fernandez et al. (2023^[12]), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", <https://doi.org/10.1093/eurheartj/ehad583>; Manzano et al. (2025^[15]), "Comparator Report on Cancer in Europe 2025 - Disease Burden, Costs and Access to Medicines and Molecular Diagnostics", IHE report.

This cost differential is largely driven by higher costs of health and social healthcare and informal care associated with CVD. For example, in Nordic countries, higher CVD costs are driven by more intensive formal care and higher productivity losses, while in Eastern Europe, the burden is shaped by higher disease prevalence, earlier onset, and reliance on informal care. In 15 out of the 27 countries, the direct healthcare costs for CVD in 2021 are larger than those of Cancer in 2023 (in 2021 euros), with an average difference of 52%. The differences in informal care costs are even more pronounced: in all EU countries, the economic burden associated with informal care for CVD is nearly 400% higher compared to cancer. This stark contrast reflects not only the differing nature of the two diseases and their impact on morbidity and long-term care needs but also points to a critical challenge in care provision and coverage. The high reliance on informal care in CVD highlights potential gaps in formal support systems and places a considerable burden on families and caregivers.

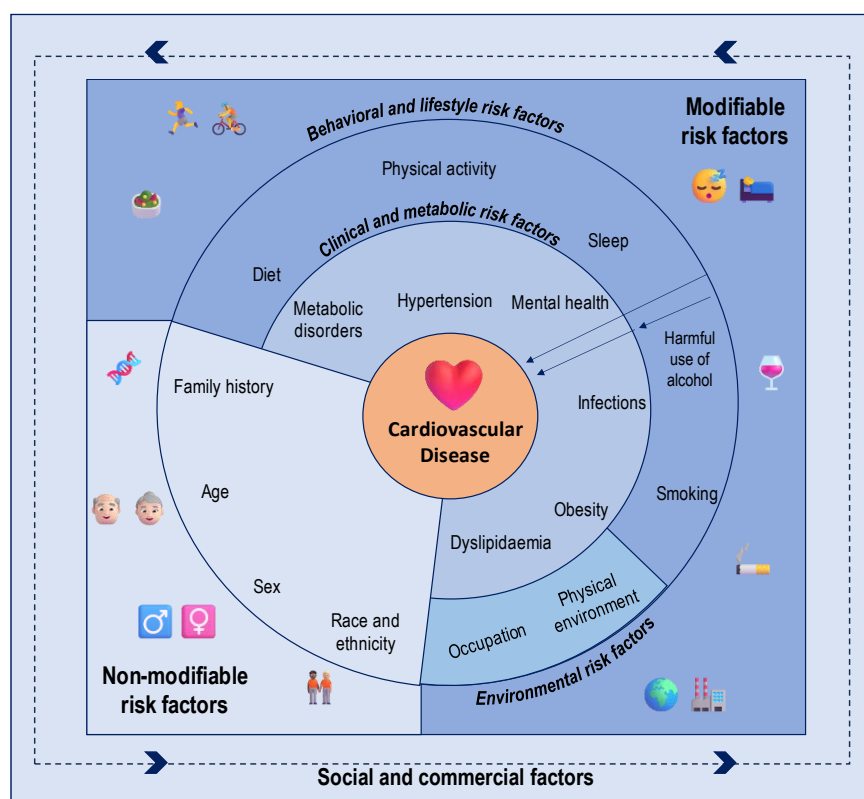
1.3. A number of key risk factors are driving the CVD burden

Cardiovascular conditions are impacted by a range of non-modifiable and modifiable risk factors. Non-modifiable risk factors – such as sex, age, family history, and ethnicity and race – are those inherent individual characteristics that may increase the risk of developing a cardiovascular condition. Modifiable risk factors include clinical and metabolic risks, lifestyle and behavioural risks, and environmental risks, as seen in Figure 1.9. The main causal risk factors are metabolic risks which include high low-density

lipoprotein (LDL) cholesterol, high blood pressure, diabetes mellitus, obesity, and mental health problems. Smoking is one of the main behavioural and lifestyle-related risk factors for CVD, alongside unhealthy diet, sedentary lifestyle, harmful use of alcohol and poor sleep quality. Environmental risks include air pollution, extreme heat exposure and occupation, all of which can be modified. These risk factors are shaped by broader social and commercial factors – including education, income, housing conditions, migration status and labour market conditions – which further compound CVD risks among people living in vulnerable situations.

Figure 1.9. Cardiovascular conditions are impacted by a range of clinical, lifestyle, environmental, and individual factors

A number of intermediate clinical risk factors are influenced by the same risk factors that also influence cardiovascular disease more directly



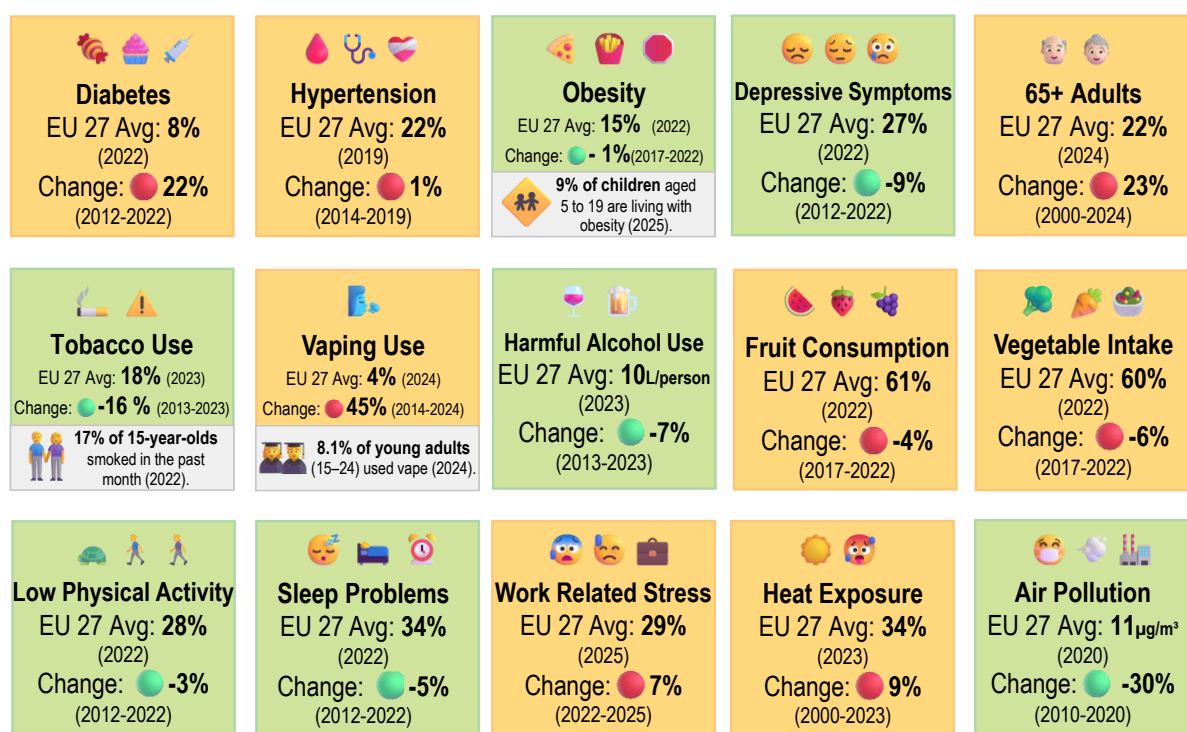
Globally, 83% of all deaths due to CVD in 2021 were attributable to modifiable risk factors, while in the EU this figure falls to 76%. Metabolic risk factors are the predominant group, accounting for 70% of CVD deaths globally and 68% in the EU. Behavioural risks are the second largest group, accounting for 42% of the CVD deaths globally and 37% in the EU. Environmental risk factors account 33% of CVD death globally, and 18% in the EU (IHME, 2021^[17]). Note that risk factors are not mutually exclusive, a person can be exposed to multiple risk factors at once, therefore the percentages are not summative.

Recent trends in cardiovascular risk factors across Europe reveal several growing public health challenges. Concerningly, many metabolic and clinical risks have been increasing or remain at high levels. Between 2012 and 2022, diabetes prevalence rose by 22% in the EU, reaching 7.8% (WHO Global Health Observatory, 2024^[18]), and hypertension increased by 1%, impacting 22% of people living in Europe (EuroStat, 2025^[19]). Obesity rates have shown little change between 2017 and 2022 but remain high,

affecting around one-in-seven adults aged 18 and over (15%) (EuroStat, 2025^[20]). Depressive symptoms have declined by 9% in older adults, but still impact almost a third (27%) of the EU population aged 45 and over (SHARE-ERIC, 2024^[21]). The high exposure to metabolic and clinical risks is, at least in part, driven by population ageing; the proportion of adults aged 65 and over surged by 23% between 2000 and 2024, reaching 22% of the population (EuroStat, 2025^[22]).

Lifestyle and behavioural risk factors show mixed progress. Tobacco use has dropped by 16% over the past decade, reaching 18% in 2023 (OECD, 2025^[23]), and harmful alcohol consumption declined slightly by 7%, reaching 10 litres per person in 2024 (OECD, 2025^[24]). However, vaping surged by 45%, reaching 4% in 2024, raising concerns about emerging nicotine habits (OECD, 2025^[25]). In Europe, between 2017 and 2022, vegetable consumption has decreased slightly by 6% and fruit consumption fell by 4% (EuroStat, 2025^[26]). In 2022, fruit and vegetable intake stood at 61% and 60% respectively (EuroStat, 2025^[26]). Insufficient physical activity decreased by 3%, yet still affects more than one-quarter of the population (28%) (WHO Global Health Observatory, 2024^[27]). Sleep problems among older adults have also declined slightly (by 5%) but remain prevalent at 34% (SHARE-ERIC, 2024^[21]). Work-related stress, anxiety, or depression rose by 7%, now impacting 29% of the population, reflecting growing mental health pressures in the workplace (OSH Pulse, 2025^[28]). Finally, indicators on exposure to environmental factors also show varied outcomes: exposure to extreme heat has increased by 9% with nearly one-in-three people (34%) experiencing at least one hot day (>35°C) in Europe (OECD, 2025^[29]), while exposure to air pollution dropped significantly by 30%, now at 11 µg/m³ (OECD, 2025^[30]).

Figure 1.10. EU average prevalence and changes in cardiovascular risk factors over the past decade



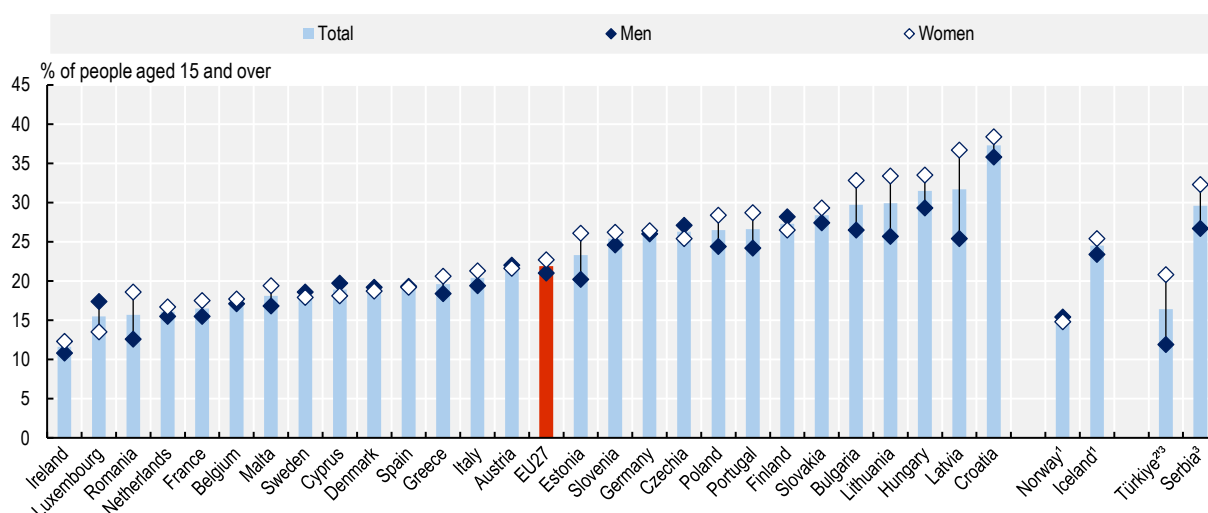
Note: Data represent EU27 averages for the indicated metrics. Metrics sourced from Eurostat and OSH Pulse are weighted averages, while all other metrics are unweighted. Where the most recent data were unavailable, the closest available year was used as noted. Units of measurement – Diabetes: percentage of adults (≥ 18) with fasting glucose ≥ 126 mg/dl or HbA1c $\geq 6.5\%$; Hypertension: percentage of adults (≥ 15) with high blood pressure; Obesity: percentage of adults (≥ 18) with BMI ≥ 30 kg/m²; Depressive symptoms: percentage of adults (≥ 45) reporting ≥ 4 symptoms on EURO-D scale; Age: percentage of population aged ≥ 65 ; Tobacco: percentage of daily smokers (≥ 15); Vaping: percentage of regular users (≥ 15); Alcohol: litres per person (≥ 15); Fruit & vegetables: percentage of population consuming daily; Physical inactivity: percentage of adults (≥ 18) below WHO activity threshold (< 150 min/week moderate or < 75 min/week vigorous); Sleep problems: percentage of adults (≥ 45) reporting trouble sleeping; Work-related stress: percentage of employed (≥ 16) reporting work-related stress, depression, or anxiety; Extreme heat: percentage of people exposed to ≥ 1 day > 35 °C; Air pollution: mean exposure to PM2.5 ($\mu\text{g}/\text{m}^3$). Detailed tables are available in Chapter 3, Table 3.1.

Source: EU averages for Diabetes (WHO Global Health Observatory, 2024), Hypertension (Eurostat hlth_ehis_cd1e, 2021), Obesity & Fruit & Vegetable Consumption (Eurostat ilc_hch10 & ilc_hch11, 2024), Work-related Stress (OSH Pulse, 2025), Depression & Sleep Problems (SHARE-ERIC, 2024; The Irish Longitudinal Study on Ageing (TILDA) 2025; Healthy Ireland Survey 2024), Tobacco, Vaping, Alcohol, Heat Exposure & Air Pollution (OECD, 2025), Physical Activity (WHO, 2024).

Hypertension has stabilised in most countries – but still impacts a significant proportion of the population

Across the EU, an average of 22% of people 15 years and older report having high blood pressure (Figure 1.11). Over 30% of people report having high blood pressure in Hungary, Latvia and Croatia, while less than 15% report having high blood pressure in Ireland. Differences in gender prevalence tend to become more pronounced among countries with higher levels of high blood pressure overall. In Bulgaria, Lithuania and Latvia, there is an over a 6 p.p. difference between levels of high blood pressure in men and women, with higher levels observed in women.

Figure 1.11. 22% of people 15 years and older in the EU have high blood pressure

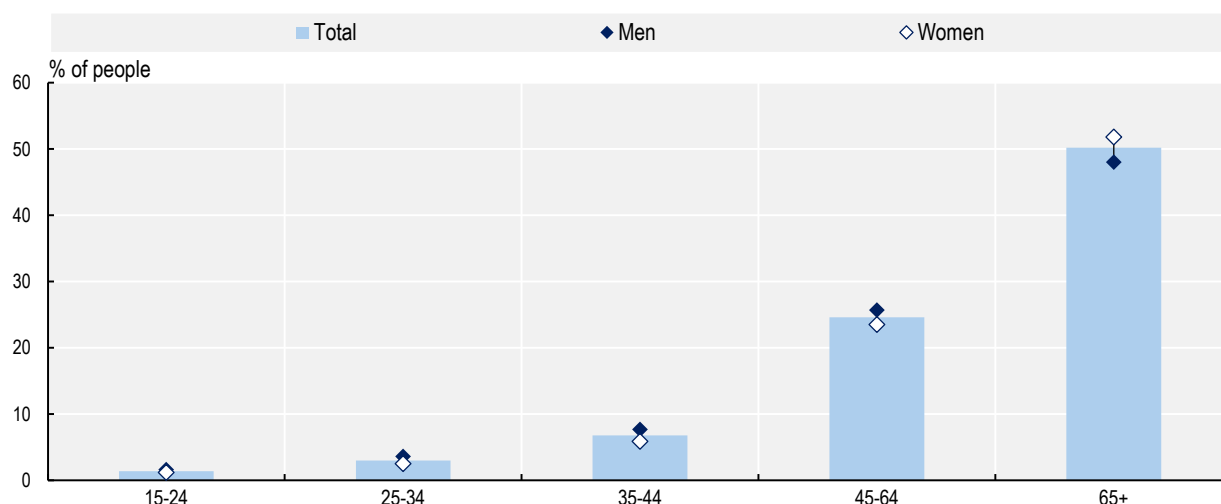


Note: EU27 average is weighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. Source: Eurostat (2021), Persons reporting a chronic disease, by disease, sex, age and educational attainment level (hlth_ehis_cd1e), https://ec.europa.eu/eurostat/web/products-datasets/-/hlth_ehis_cd1e (accessed 8, July 2025).

The prevalence of high blood pressure is age dependent. In the EU, on average, half of the people aged 65 or older have high blood pressure compared to less than 10% in those aged 44 or younger. In younger age groups women tend to have slightly lower prevalences than men, but in the age group 65 and over, this pattern reverse, with higher rates in women than men (Figure 1.12).

Figure 1.12. High blood pressure predominates in people aged 65+ in the EU, with the female-to-male ratio reversing in this group

EU27 average of people with high blood pressure by age group



Note: EU is the weighted average of the 27 EU countries.

Source: Eurostat (2021), Persons reporting a chronic disease, by disease, sex, age and educational attainment level (hlth_ehis_cd1e), Persons reporting a chronic disease, by disease, sex, age and educational attainment level, https://ec.europa.eu/eurostat/web/products-datasets/-/hlth_ehis_cd1e (accessed 8, July 2025).

Hypertension is the primary risk factor for ischaemic and haemorrhagic stroke – and has been attributed to approximately 60% of cases (Silva et al., 2024^[31]). Antihypertensive pharmacologic treatment within the first 24 hours of onset of acute CVD events has been found to reduce mortality in as little as 10 days (Perez, Musini and Wright, 2009^[32]; Galea et al., 2025^[33]). Meta-analyses show that blood pressure reduction reduces the risk of stroke by approximately 40%, with even modest reductions of 5 mmHg (Law, Morris and Wald, 2009^[34]). Moreover, poorly controlled blood pressure after an initial cerebrovascular event is strongly associated with recurrence and mortality (Lindley, 2018^[35]). Hypertension is also a major cause of heart failure and it precedes its onset in up to 91% of patients, particularly in older adults (Vasan et al., 2001^[36]). In the EU, countries with the highest prevalence of high blood pressure among people aged 65 and over tend to have higher age-adjusted mortality rates due to ischaemic heart disease in this age group.

Globally, elevated blood pressure is the leading risk factor for DALYs attributable to non-communicable diseases. In 2019, it was responsible for an estimated 10.8 million deaths and 235 (IHME, 2024^[37]). In the EU, ischaemic heart disease and stroke – the two primary outcomes of uncontrolled hypertension – rank among the top causes of DALYs and premature mortality. Over the last two decades, the impact of high systolic blood pressure has led to diverging trends. While the contribution of high blood pressure has reduced in terms of cumulative loss of DALYs, it is leading to a cumulative increase of years lived with disability – demonstrating its contribution to the CVD epidemiological shift from mortality to morbidity.

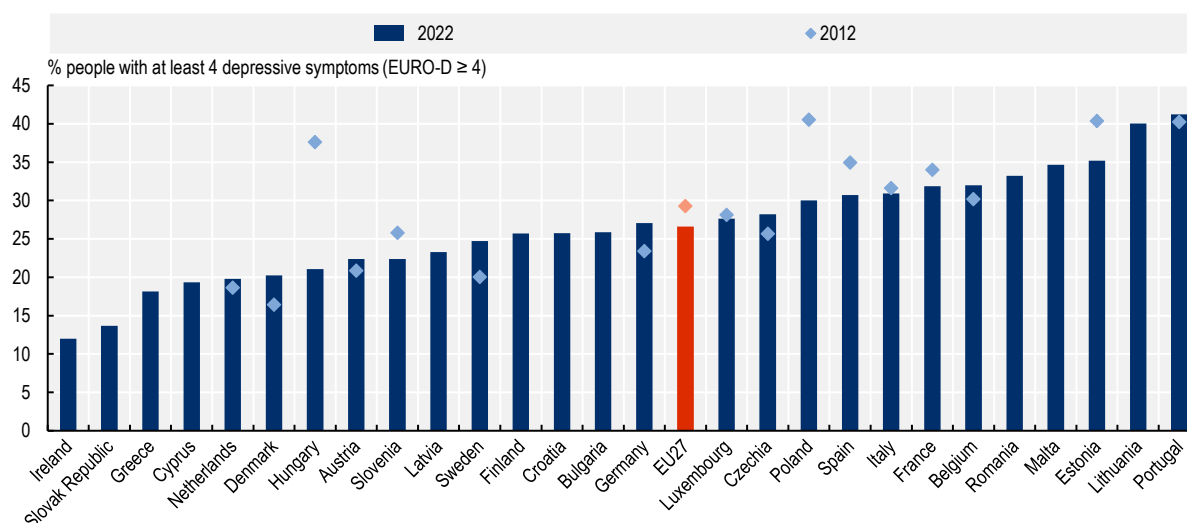
Depressive symptoms are prevalent, and highly associated with CVD

Mental illness is a leading cause of ill health and disability in Europe, and a key risk factor for CVD. Depression and severe mental illness – including schizophrenia or bipolar disorder – are associated with increased risk of myocardial infarction, stroke, angina and coronary heart disease (Honigberg et al., 2022^[38]; Kwapong et al., 2023^[39]; Emerging Risk Factors Collaboration, 2020^[40]; Nielsen, Banner and Jensen, 2020^[41]). This link is partly explained by the physiological changes associated with depression –

including elevated cortisol and adrenaline levels that raise the blood pressure, glucose and heart – as well as the higher level of socio-economic disadvantage and the higher prevalence of unhealthy behaviours among people with mental illness – such as smoking, diets high in calories, salt and saturated fats, lack of exercise, and lower medication compliance (Nielsen, Banner and Jensen, 2020^[41]; Chaddha et al., 2016^[42]; Kwapong et al., 2023^[39]; Henking, Reeves and Chrisinger, 2023^[43]). Some mental health medicines, especially older antipsychotics or very high doses, can affect the heart. They may cause weight gain and changes in heart rhythm that, in rare cases, can lead to dangerous arrhythmias (Nielsen, Banner and Jensen, 2020^[41]).

Depression is widespread in Europe. In 2022, 27% of adults aged 45 and over reported at least four depressive symptoms on the EURO-D scale (Figure 1.13). Mental health problems are common among people with cardiovascular conditions. In 2022, 31% of people with CVD and related clinical risk factors (including high blood pressure, hypertension, high blood cholesterol, diabetes and high blood sugar) reported depressive symptoms, compared to 20% of those without. Previous OECD analysis found that stroke survivors faced a 23% higher risk of depression (Everard et al., 2025^[44]). This elevated risk may reflect both the physical and psychological burden of living with CVD. Symptoms such as pain, fatigue and sleep disturbance can limit daily functioning and reduce social participation, contributing to isolation and poorer quality of life. At the same time, fear of disease progression, disability or death can have a direct impact on anxiety and depression (Karami et al., 2023^[45]).

Figure 1.13. Nearly one-in-three Europeans report depressive symptoms, with rates rising in several EU countries, 2012 and 2022 (or nearest year)



Note: Respondents aged 45 and older. The EURO-D depression scale is a composite index of 12 items (depressed mood, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness). The scale ranges from 0 “not depressed” to 12 “very depressed”. 2011 data (instead of 2012 data) was used for Austria, Belgium, Czechia, Denmark, Estonia, France, Hungary, Italy, the Netherlands, Portugal, Slovenia, Spain and Sweden; and 2013 data (instead of 2012 data) was used for Luxembourg. Data for Ireland is based on The Irish Longitudinal Study on Ageing (TILDA) 2025.

Source: SHARE-ERIC (2024).

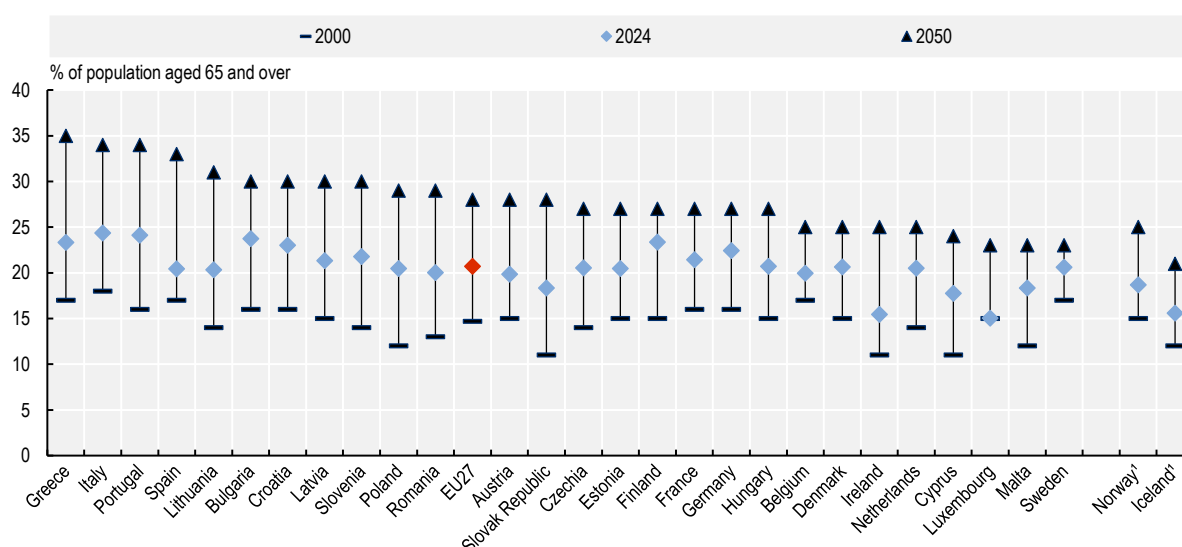
Europe’s ageing population puts people at risk

Older adults are especially vulnerable to CVD. As individuals age, the cardiovascular system undergoes structural and functional changes that increase the likelihood of CVD (Jensen, 2024^[46]). These include increased arterial stiffness, reduced elasticity, and reduced capacity of the heart to pump blood efficiently.

At the same time, exposure to age-related risk factors, such as diabetes, obesity, hypertension and hyperlipidaemia, reduced physical activity, cognitive decline and depression, further contribute to the growing burden of CVD in older adults.

The share of older adults is growing, contributing to the rising burden of CVD. Between 2000 and 2024, the percentage of adults aged 65 and over grew from 18% to 22% of the population and are projected to reach 29% by 2050 (Figure 1.14) (EuroStat, 2025^[47]; EuroStat, 2025^[22]). While all EU countries are ageing, the pace and extent differ. In 2024, Italy, Portugal and Bulgaria had the highest shares of older adults (24%), while Ireland and Luxembourg had the lowest (15%). By 2050, the highest shares of older adults are expected in Greece, Italy, Portugal, Spain, Lithuania, Bulgaria, Croatia, Latvia and Slovenia (over 30%), while the lowest shares are projected in Luxembourg, Malta, Sweden and Iceland (below 23%). This demographic shift is expected to increase the burden of CVD, with estimates suggesting a 90% rise in CVD prevalence in Europe between 2025 and 2050 (Chong et al., 2024^[48]).

Figure 1.14. Nearly three in ten people in the EU will be over age 65 in 2050, up from two in ten in 2024



Note: EU27 average is weighted. 1. non-EU European Economic Area countries.

Source: Eurostat (2023), Population on 1 January by age, sex and type of projection (proj_23np), https://ec.europa.eu/eurostat/web/products-datasets/product?code=proj_23np (accessed 8, July 2025); Eurostat (2025), Population on 1 January by age group and sex (demo_pjangroup), https://ec.europa.eu/eurostat/en/web/products-datasets/-/DEMO_PJANGROUP (accessed 8, July 2025).

While middle-aged and older adults are more likely to experience cardiovascular events, the incidence of CVD is increasing among younger age groups (15-39 years) (Sun et al., 2023^[49]). A key contributor is the high and rising rate of childhood obesity and overweight: in 2022, the average prevalence among children in EU countries was 9% for obesity and 25% for overweight (WHO Global Health Observatory, 2024^[50]). Increased exposure to other CVD risk factors in younger people – such as diabetes, hypertension, poor diet and physical inactivity – also contribute to the growing burden in CVD in young people, especially heart failure (Andersson and Vasan, 2017^[51]). These developments underscore the urgency for primary prevention strategies that address cardiovascular risk factors throughout the life course.

Early detection through primary care or screening programmes improves outcomes

Screening for metabolic risk factors and other vascular risk factors (i.e. family history of premature CVD, familial hypercholesterolemia) is key to control underlying conditions such as hypertension, diabetes and dyslipidaemia, which, if not managed, can lead to cardiovascular events with greater complications for patients. Screening through CVD risk assessment also helps primary care identify higher risk patients to provide support on self-management and information on signs of alarm to identify CVD events.

Despite the accessibility of blood pressure screenings, more than 30% of EU adults between the ages of 45 and 54 have not had a measurement in the past year, and about 6% have not had a measurement in the past five years, even though hypertension is a major CVD risk factor. Cholesterol and blood glucose screenings are lacking, with over 10% of adults between the ages of 45 and 54 in the EU not having had a test in the past five years (Eurostat, 2022^[52]) (see Chapter 3).

Screening for CVD risk factors in adults over age 40 for men and over age 50 for women – as evidence-based clinical practice guidelines recommend doing at least every five years if CVD risk is low – is a cost-effective strategy to prevent CVD complications. As Figure 1.15 shows, older age groups – 55 to 64 years and those 65 years and over – report higher screening rates, yet there is room for improvement among adults aged 45 to 54. Among those 45 to 54, men report lower rates (87%) than women (89%) for having had a blood cholesterol measurement in the past five years. Similar results are seen for having had a blood sugar measurement in this age group; men consistently report lower rates (86%) than women (88%). Improving blood cholesterol and blood glucose measurements, particularly among men aged 40 and over, would strengthen CVD risk assessment. These screenings are essential for identifying and managing metabolic risk factors – hypertension, diabetes and dyslipidaemia – thereby enabling timely interventions and supporting self-management in primary care settings. However, screening alone is not sufficient – timely follow-up care, including diagnosis, treatment, and patient support, is essential to translate early detection into improved outcomes.

Figure 1.15. Blood cholesterol and blood sugar screening by age group in the EU, 2019

Percentage of population, by age group, reporting having had a blood cholesterol or blood sugar measured by a health professional in less than 5 years from the time of the survey, 2019



Note: EU27 is the weighted average.

Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

1.4. The analysis of the current landscape of CVD prevention and management reveals opportunities for improvement

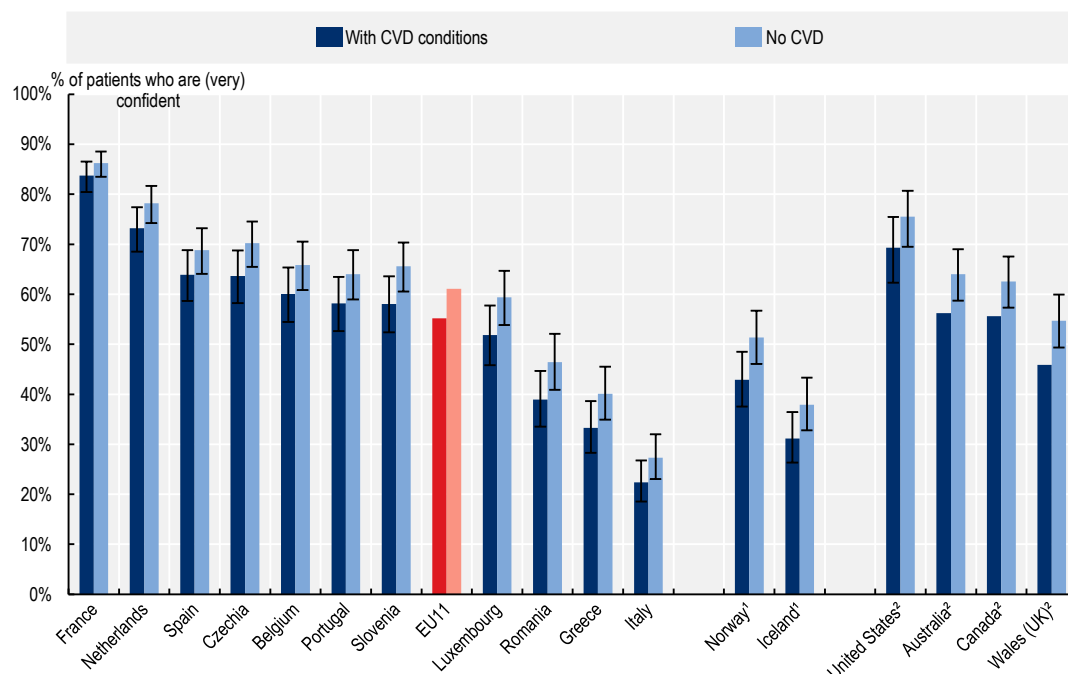
People living with CVD interact with a wide range of settings and levels of the healthcare system, including primary care, emergency responders, hospitals, and rehabilitative care after acute events such as heart attacks or stroke. To decrease the significant burden of CVD in EU, it is essential to provide high quality of care to all people across these different settings.

High quality primary care and support for self-management is the first step for CVD control and management

Health promotion activities can have substantial impacts by reducing risks of CVD occurrence among people without CVD (i.e. primary prevention), particularly those in low socio-economic groups, and targeting people already living with CVD. However, there are opportunities to better reach people living with CVD with the advice that can help them improve on modifiable risk factors and effectively manage their conditions. Self-management support, in particular, is key to increase the confidence of patients to manage their own health to control clinical and behavioural risk factors and to be able to manage their conditions. Confidence in self-management among people aged 45 and older with CVD varies more than three-fold across countries – from 23% in Italy, to 73% in the Netherlands, and up to 84% in France (Figure 1.16). CVD patients who are confident to manage their own health report higher levels of well-being and are more likely to assess their general health as good or very good, compared to those who lack such confidence.

Figure 1.16. Fewer CVD patients are confident to manage their health compared to other primary care patients, with inter-country differences of up to double the confidence rates

Percentage of patients that are confident or very confident (compared to somewhat confident or not confident at all) to manage their own health



Note: 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. CVD status is self-reported using the question: “Have you ever been told by a doctor that you have any of the following health conditions?” and answer: “Cardiovascular or heart condition”. Confidence to self-manage; Response to question: “How confident are you that you can manage your own health and well-being?”, response options range from not confident at all (0) to very confident (3). Percentage of patients that are confident or very confident (compared to somewhat confident or not confident at all). Error bars correspond to comparative intervals (84%CI).

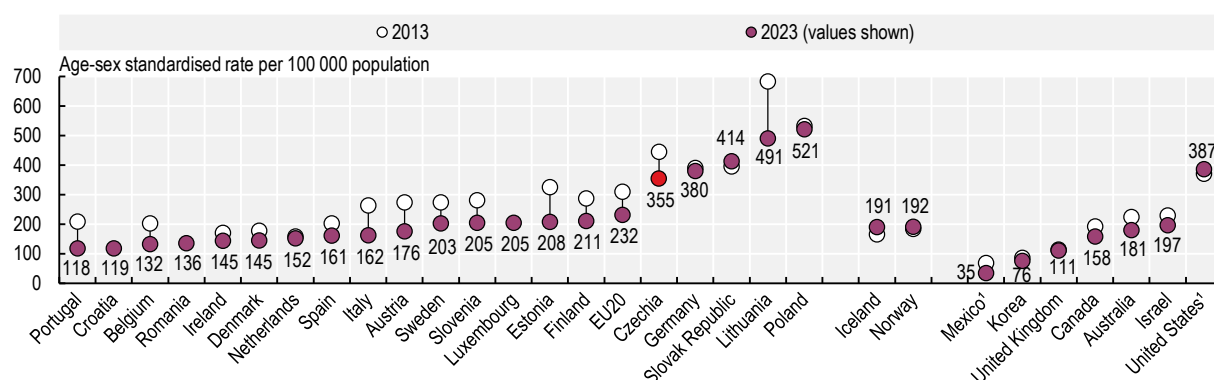
Source: OECD PaRIS 2024 Database.

Hospital avoidable admissions can be reduced through better access to high-quality primary care

Congestive heart failure (CHF) and diabetes are common chronic health conditions with potential for severe complications and rapid deterioration. However, these conditions can also be effectively controlled in primary care using evidence-based management practices. A well-performing primary care system can reduce acute deterioration of people living with chronic conditions related to CVD such as CHF or diabetes, thereby preventing unwanted and costly avoidable hospital admissions (OECD, 2020^[53]).

However, the effectiveness of primary care to reduce avoidable admissions related to CVD varies considerably. Hospital admission rates for CHF varied almost over four-fold across EU countries in 2023, averaging 232 per 100 000 population (Figure 1.17). Portugal and Croatia had the lowest rates, while Poland and Lithuania reported rates over twice the EU average. The average admission rate across EU countries fell by 25% between 2013 and 2023 – and over 30% in Austria, Belgium, Estonia, Iceland, Italy and Portugal. Admissions for CHF increased in several countries over this period, including Iceland, Norway and the Slovak Republic. Steep reductions in hospital admissions between 2019 and 2021 were mainly associated with disruptions in hospital services and reduced care-seeking during the COVID-19 pandemic, rather than changes in primary care quality. This highlights the importance of strengthening the accessibility and resilience of primary care.

Figure 1.17. Congestive heart failure hospital admission in adults, 2013 and 2023 (or nearest year)



Note: The EU average is unweighted. 1. Latest data from 2021-2022.

Source: OECD Health Statistics 2025.

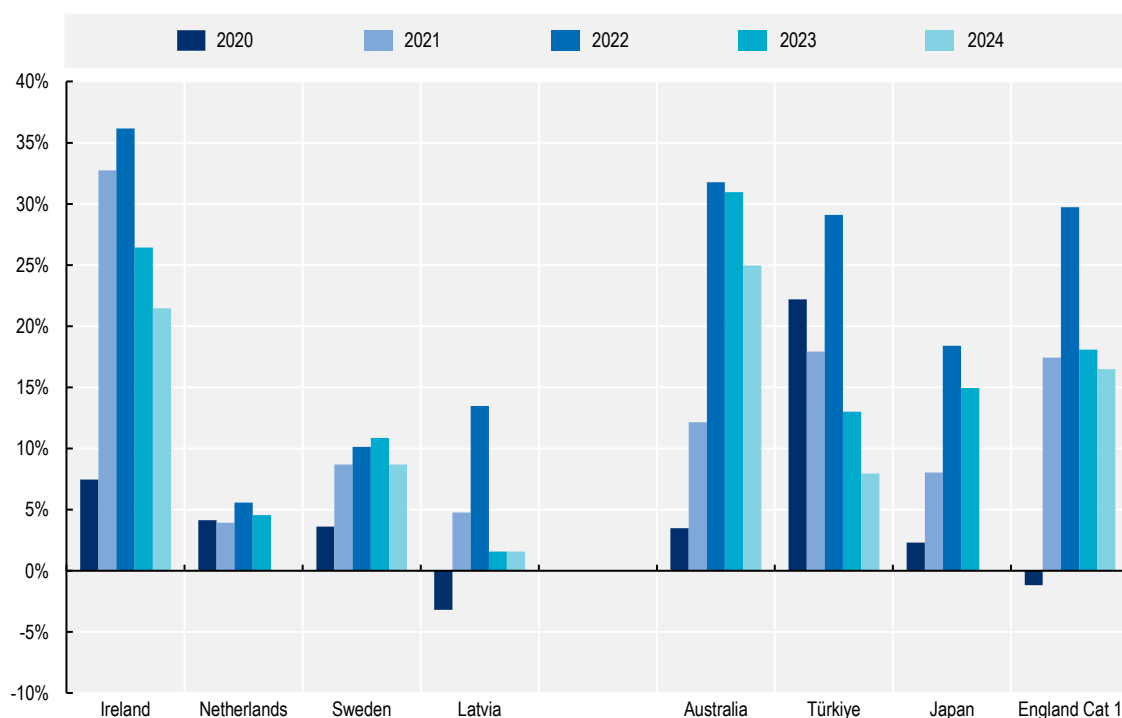
Reducing avoidable admissions through improvements in primary care and effective delivery can result in significant potential health system savings and improve patient outcomes. According to OECD estimates, EU countries as a whole would have reduced hospital spending by EUR 45 billion, if all countries could to reduce hospital admissions for CVD to the lowest level in the OECD (see Annex 4.B). Besides cross-country differences, multiple studies also point to disproportionately high avoidable admissions among disadvantaged populations with CVD, so focussing on reducing inequalities in access to effective primary care is crucial to further improve health outcomes and in turn increase cost-saving.

Pre-hospital emergency care is critical for timely response to acute CVD events, but ambulance response times have yet to recover following COVID-19

Timely access to acute CVD care starts with help-seeking behaviours of the patient and those around them, who play a critical role recognising the symptoms of potential acute CVD and being confident to call for help from emergency medical service (EMS). Data from countries suggest that on average only three of four stroke patients (76%) arrive to a dedicated stroke centre by EMS; the other quarter of stroke patients continue to arrive by their own means. Evidence from multiple countries shows that women wait longer than men to call for emergency services following the onset of stroke symptoms. The pandemic, however, has negatively impacted ambulance response times in several countries, and average response times have not yet returned to pre-pandemic levels (Figure 1.18).

Figure 1.18. Ambulance response times have been significantly impacted since the pandemic in several countries

Response times presented as percentage change in average response time. Reference year 2019



Note: Ireland, the Netherlands, Sweden, Latvia and Türkiye report median response times, Japan reports the mean. Australian data represents the weighted averages of the medians for each jurisdiction (state or territory). England reports the mean.

Source: 2025 OECD Cardiovascular Policy and Data Survey; Australian Government Productivity Commission (2025^[54]), <https://www.pc.gov.au/ongoing/report-on-government-services/2025/health/ambulance-services>; Nuffield Trust (2024^[55]), Ambulance response times, <https://www.nuffieldtrust.org.uk/resource/ambulance-response-times>.

European countries have been making advancements in expanding access to time-sensitive treatments for stroke, reflecting improvements in system capacity and co-ordination. Time to diagnosis and assessment can be improved at every stage in the process – from the call for help through to the decision to treat – and varies widely between countries. Data from 22 EU countries showed that less than 60% of reporting countries provided intravenous thrombolysis (IVT) to more than 15% of their admitted ischaemic stroke patients in 2023. Delivering sophisticated, high-quality acute care equitably across the entire population – following the onset of a disease process that manifests without warning – requires a high degree of integration between the general community, emergency responders, emergency departments (EDs) and the inpatient teams within hospitals.

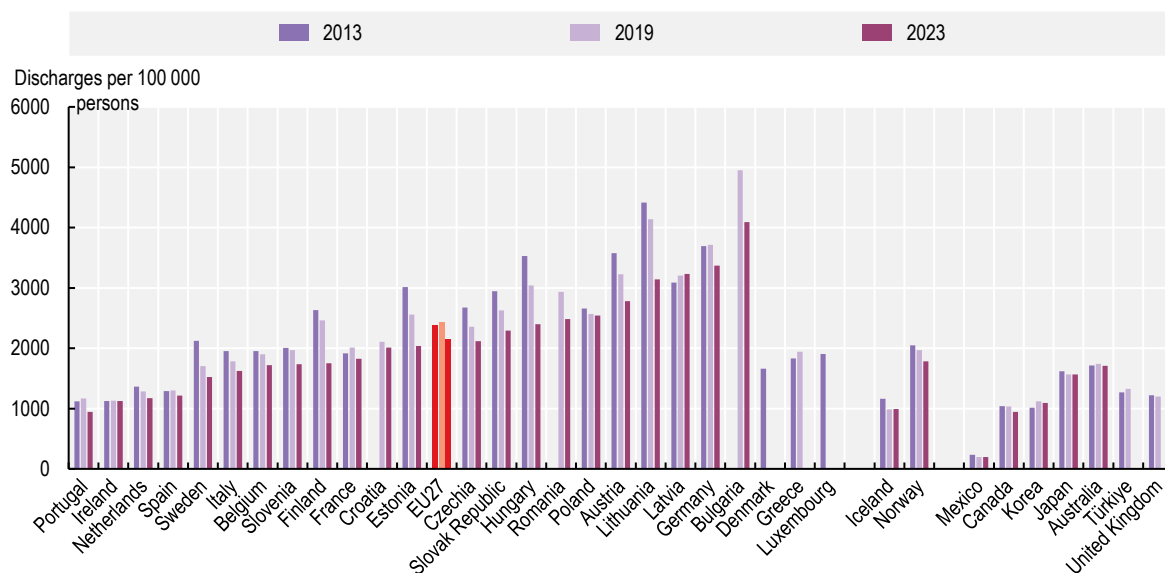
CVD account for up to 6% of hospital ED visits. Approximately two in five primary care users over the age of 45 living with CVD has used the emergency room in the last year – and they are twice as likely to have gone to an ED as those without CVD. Modern care delivery systems generate large quantities of data that may be used to measure the quality of this care against evidence-based and widely accepted guidelines and targets.

Access to – and outcomes of – hospital and post-acute care varies across countries, and often depend on geography

Hospital avoidable admissions due to congestive heart failure and diabetes are trending down across countries – as are hospital discharges for circulatory diseases – but variation in rates between countries indicate these can be reduced through better access to high quality primary care. Despite downward trends, hospitalisation remains a common occurrence for people living with CVD, reflecting difficulties in managing CVD-related conditions. Among people aged 45 and over attending primary care, one-in-four people with cardiovascular conditions have been hospitalised in the last year, and those with cardiovascular conditions are twice as likely to be hospitalised than those without CVD-related conditions.

Despite playing a central role in all health systems as a care setting for CVD, hospital access, capacities, and outcomes vary and are not always sufficiently matched to disease burden and demand. In almost all countries in OECD, circulatory diseases are the most common cause for inpatient care, and in 2023, 14% of hospital discharges across Europe were associated with cardiovascular diagnosis requiring planned surgical procedures or acute care after acute CVD events. The share varies two-fold, ranging between 9% in Ireland to 18% in Latvia and Lithuania. Hospital discharges for circulatory diseases vary over four-fold in the EU. There are less than 1 000 hospital discharges per 100 000 population in Portugal and Iceland, but exceed 3 000 in Lithuania, Latvia and Germany, and are more than 4 000 in Bulgaria (Figure 1.19).

Figure 1.19. Hospital discharges for circulatory diseases, 2012, 2019 and 2023 (or nearest year)

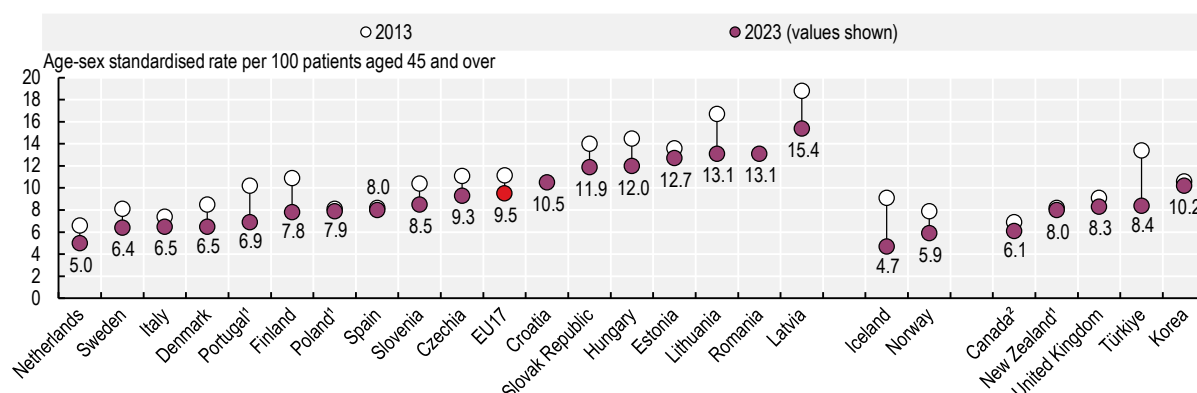


Source: OECD Health Statistics 2025.

The effectiveness of hospital care varies – and the likelihood of surviving an admission for an acute CVD event varies depending on geography. The 30-day AMI mortality rate in 2023 ranges over three-fold between the best and worst performing EU country, and 30-day mortality following ischaemic stroke varies by a factor of 2.5 (Figure 1.20). In recent years, Europe has seen a growing trend in the use of intravenous thrombolysis (IVT) as a frontline treatment for acute ischaemic stroke. The rate of IVT varies by a magnitude of 20 between European countries – from over 75 per 100 000 population in Latvia and Estonia to below 10 in Ireland and Greece. Furthermore, some countries with high mortality rates due to cerebrovascular disease have notably low rates of use of IVT, including Bulgaria and Romania. Latvia

stands out as a country where there is high use of IVT and high cerebrovascular mortality, while Estonia, has lower than average cerebrovascular mortality and high rate of use of IVT.

Figure 1.20. Thirty-day mortality after admission to hospital for acute myocardial infarction based on linked data, 2013 and 2023 (or nearest years)



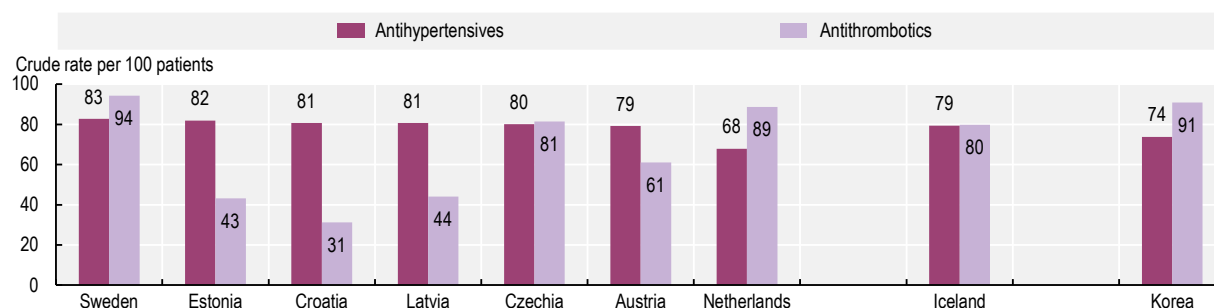
Note: The EU average is unweighted. 1. Latest data from 2020-2022. 2. Data do not include deaths outside acute care hospitals.
Source: OECD Health Statistics 2025.

Hospital care for CVD is highly dependent on technology, including imaging and invasive procedures. For example, countries with fewer hospitals implanting implantable cardioverter defibrillators (ICDs) tend to have lower implantation rates. There remain persistent delays in elective, but time sensitive, cardiovascular services. Data from seven OECD countries shows that a significant share of patients face delays exceeding three months for procedures such as coronary angioplasty and coronary artery bypass grafting (CABG) for chronic coronary disease, highlighting potential challenges insuring access and equality of service provision.

The use of implantable devices – such as pacemakers and implantable defibrillators – have generally plateaued, but the international variation remains great. The exception is the use of transcatheter aortic valve implantations (TAVI), which have increased in all EU countries and seen expanding populations. Many countries have clinical standards in place in their country for device implantation and follow-up or maintain national or regional registries for post-market surveillance and safety monitoring – such as for tracking device use, complications and reoperation rates. Fewer countries have adopted systems for quality audits, such as professional peer review, compliance checks or have implemented systematic measurement of patient-reported outcomes or experiences related to cardiac implant procedures.

Hospital discharge following an acute cardiovascular event is an important point to ensure the continuation of treatment with medications that prevent recurrence and address underlying conditions. Data on prescribing practices shows that care generally conforms to standards. Almost all (97%) stroke patients receive anticoagulating drugs at discharge in countries that report data, while fewer receive statins (92%) and antihypertensive drugs (82%). Additionally, across countries, most patients were discharged on dual anti-platelet therapy and statins following AMI. However, these prescribing practices need to be sustained – and in most cases there is a steep drop between discharge and prescribing practices more than a year after the event, with 68% to 83% patients in reporting EU countries receiving antihypertensive and 31% to 94% patients receiving antithrombotic prescriptions within 18 months (Figure 1.21).

Figure 1.21. Patients receiving at least one antihypertensive and antithrombotic prescription in the 18 months following discharge after ischaemic stroke, 2023 (or nearest year)



Source: Data Collection on Integrated Care 2022-2023, and OECD Health Statistics Database 2025.

Post-acute care is an opportunity to reduce medium to long term mortality and morbidity, but effectively co-ordinating and implementing such care remains a challenge for many countries. Goals include optimising secondary prevention (medication, risk factor change), tertiary prevention, rehabilitation after the acute event, and reintegrating with primary care or with ongoing monitoring and self-management programmes. Data from 14 EU countries shows that, on average, 60% of stroke patients survived without readmission within a year, while 24% were readmitted (5% for stroke-related causes), and 16% died. For CHF patients, 43% survived without readmission, 33% were readmitted (11% for CHF-related causes), and 24% died within the year.

1.5. Data infrastructure and digital technologies show potential

Digital health technologies are increasingly reshaping the way CVD is prevented, diagnosed, and managed. Tools such as electronic health records (EHRs), clinical decision support systems (CDSS), telemedicine platforms, mobile health apps, and wearable monitoring devices are enabling more proactive, co-ordinated, and patient-centred care. These technologies can help identify individuals at high risk, monitor chronic conditions in real time, and deliver tailored interventions – where supported by robust data, interoperable infrastructure and appropriate governance frameworks such as those being introduced in the European Health Data Space (EHDS) – potentially reducing avoidable morbidity and mortality. However, while process improvements are well documented, evidence of sustained improvements in long-term cardiovascular outcomes remains variable and context-dependent. A risk is that consumer-facing digital technologies may do little to address health inequalities and may, in fact, exacerbate them.

Electronic health records and data systems enable prevention, early detection and management

EHRs are now the cornerstone of health information infrastructure in most high-income countries, providing a digital platform to store and exchange patient information. While gaps remain, modern EHR systems not only serve as repositories of clinical notes and test results but also integrate a suite of functions – from computerised physician order entry and e-prescribing to clinical dashboards and data analytics (Slawomirski et al., 2023^[56]; Kao, 2022^[57]). These can aid good cardiovascular prevention and care. The past decade has seen near-universal EHR adoption in some high-income countries. Countries including Denmark and Estonia have implemented comprehensive, national EHR systems enabling data flow across care settings. The widespread use of EHRs means that most patients with CVD have their histories, medications, and investigations recorded electronically, which in principle could support co-ordinated prevention and management of CVD. In the EU, the European Health Data Space (EHDS) Regulation

establishes common rules for interoperable EHR systems, priority data categories, and patients' digital access rights, aiming to address some of these gaps over the coming decade.

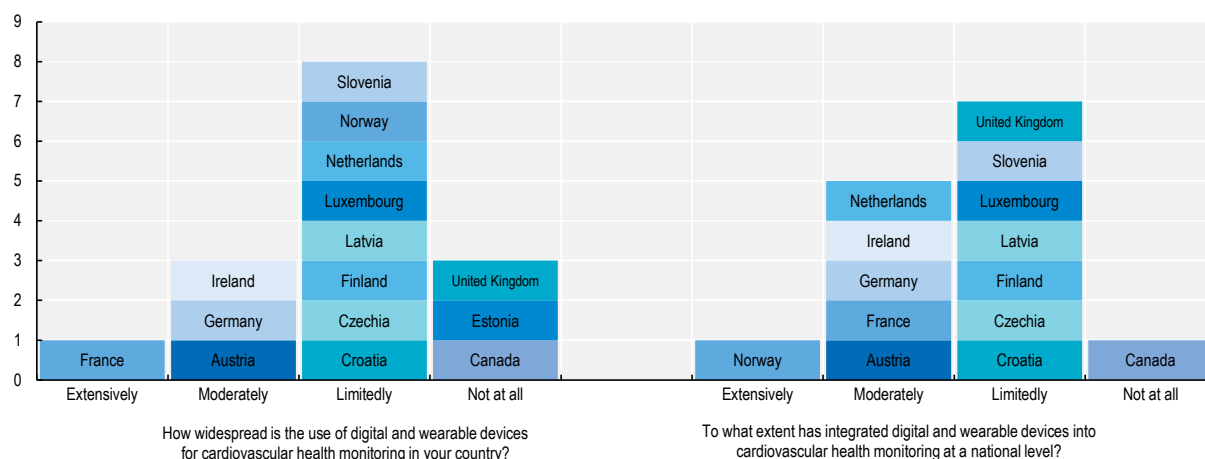
However, challenges around EHR usability, interoperability, and trust in data governance continue to limit their full potential. Similarly, clinical decision support tools have been shown to improve the delivery of recommended services and treatments, but their effectiveness depends heavily on thoughtful integration into clinical workflows and regular updating of underlying guidelines. Results from the *2025 OECD Cardiovascular Policy and Data Survey* suggest that countries may not be positioned to leverage EHR data for prevention, early detection and management of CVD.

Wearable devices and smartwatches show promise but countries report limited use and integration into national health systems

Wearables have seen rapid adoption across high-income countries. Recent market data show that as of 2023, roughly one in three adults in the United States uses some form of wearable health tracker (smartwatch or fitness band) (Dhingra et al., 2023^[58]). Global estimates indicate over 400 million people worldwide use smartwatches, with the user base expected to approach half a billion in 2025, and Poland, Germany, France being among the top ten adopters (Kumar, 2025^[59]). This popularity stems from the appeal of these devices as consumer electronics for fitness and communication, as well as increasing health awareness. A subset of devices with medical functionalities (e.g. ECG-enabled devices) are classified and regulated as medical devices in the EU, with associated safety and performance requirements. Cardiologists are seeing patients armed with data from their wearable device and health systems have begun pilots to integrate patient-generated wearable data into electronic records for monitoring of conditions like atrial fibrillation or post-operative recovery. The benefits in practice remain unclear. However, these initiatives remain limited in scale, and there is not yet consistent evidence that routine integration of consumer wearable data into clinical workflows improves cardiovascular outcomes.

As consumer wearables become ubiquitous, their influence on CVD care is rising. Even so, countries report limited use and integration of wearables into national CVD health monitoring (Figure 1.22). Only four countries (Czechia, France, Norway and Singapore) report having policies in place to promote the adoption of medical devices such as wearable fitness trackers, home ECG-enabled/ arrhythmia detection devices for CVD prevention and monitoring. Only one of these (France) reports having the data infrastructure to support the transmission of data from wearables to a patient's EHR. Ensuring that these devices do not exacerbate the "inverse care law" (the observation that more affluent members of society receive more care at the expense of the less affluent and less well) due to inequalities in digital literacy and ability to pay is a central priority, including through the development of data governance frameworks, to prevent further widening digital health divides.

Figure 1.22. Countries report limited use and integration of wearables into national CVD health monitoring



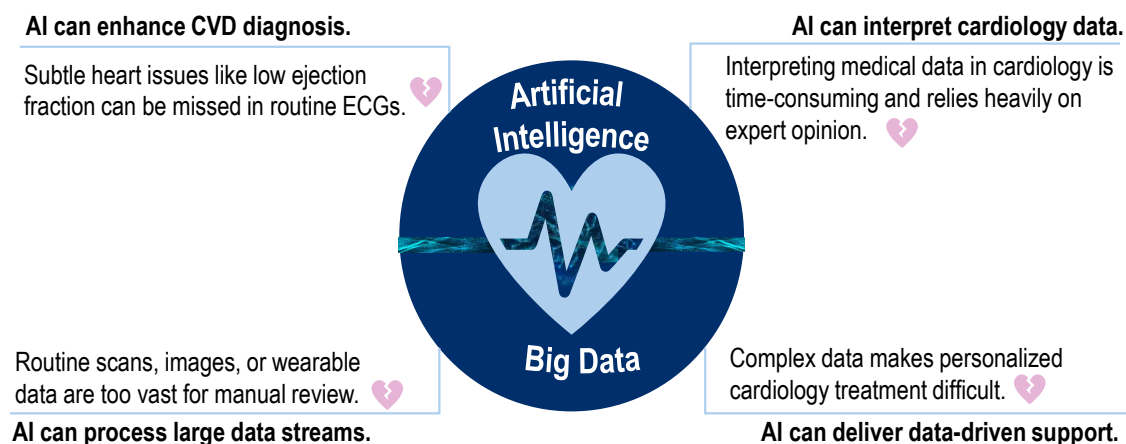
N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom). Ireland also indicated “Limitedly” in the question on widespread use of digital and wearable devices.

Source: 2025 OCED Cardiovascular Policy and Data Survey.

Artificial intelligence can support the interpretation of large volumes of data if appropriately deployed

Artificial intelligence (AI) and machine learning offer enhanced capabilities in diagnostics, risk prediction, and personalised treatment. Meanwhile, big data analytics and interoperability efforts are enabling new insights by aggregating vast amounts of cardiovascular health information across populations (Figure 1.23). AI algorithms have shown impressive performance in interpreting medical data relevant to cardiology. While proof-of-concept studies and early deployments show promising performance, robust evidence of sustained, real-world impact on cardiovascular morbidity and mortality at scale remains limited. In medical imaging, for instance, deep learning models can analyse echocardiograms with accuracy approaching that of experienced sonographers. In addition to supporting diagnosis, AI is being used to optimise treatment decisions. For example, machine learning models can predict which heart failure patients are at highest risk of hospitalisation in the next 30 days, helping clinicians prioritise interventions (this is already used in some hospital readmission reduction programmes) (Yu and Son, 2024^[60]). AI-based clinical decision support, as an evolution of the rule-based CDSS discussed earlier, can integrate far more data (genetics, labs, imaging, sensor data) to provide nuanced recommendations – essentially an advanced form of CDSS. Regulators have been approving AI-enabled software in cardiology. As of December 2024, over 1 000 AI or machine learning medical algorithms have been approved by the US FDA, and CVD is among the top specialties for these AI tools (Grant et al., 2024^[61]; Singh et al., 2025^[62]).²

Figure 1.23. Emerging technologies like AI and Big Data will play a key role in advancing cardiovascular health



Source: Authors based on information from Poterucha et al. (2025^[63]), “Detecting structural heart disease from electrocardiograms using AI”, <https://doi.org/10.1038/s41586-025-09227-0>; Singh et al. (2024^[64]), “Artificial intelligence for cardiovascular disease risk assessment in personalised framework: a scoping review”, <https://doi.org/10.1016/j.eclinm.2024.102660>; Chowdhury et al. (2025^[65]), “The Heart of Transformation: Exploring Artificial Intelligence in Cardiovascular Disease”, <https://doi.org/10.3390/biomedicines13020427>.

Despite the promise, AI and big data introduce challenges including data bias, algorithm transparency, data privacy, and the risk of over-reliance. Ensuring equitable access and building clinician trust are essential for responsible adoption. Ultimately, these technologies can support a more proactive, personalised model of cardiovascular care – but only if implemented with careful attention to evidence, ethics, and inclusivity. The EU Artificial Intelligence Act, which entered into force in 2024 and will apply progressively over the following years, aims to boost innovation and protect individuals against potential harms, will have important implications for the healthcare sector (EU AI Act, 2024^[66]).

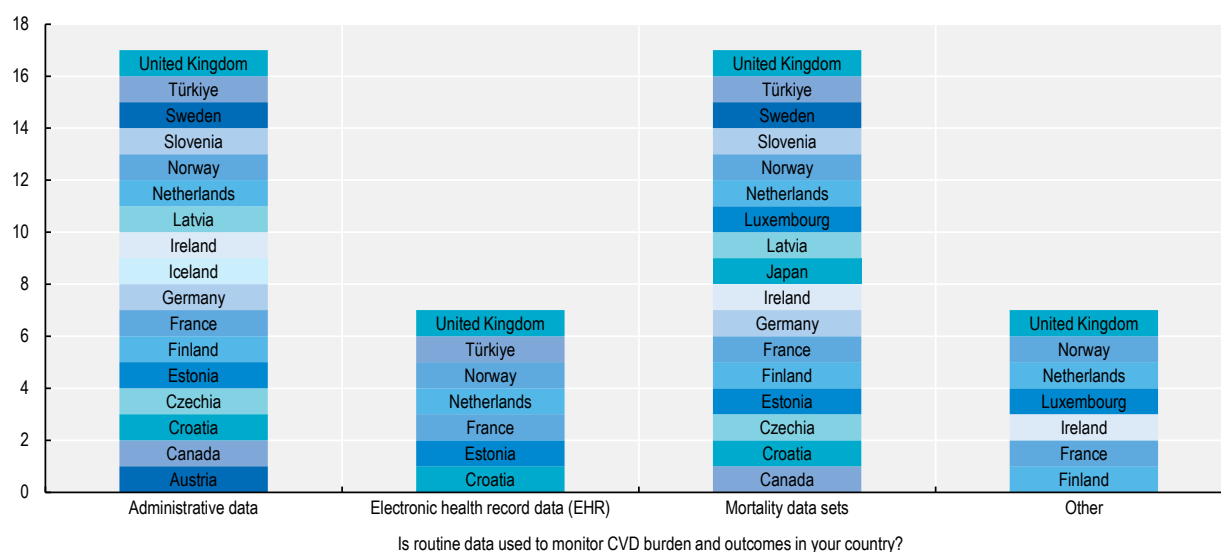
Leveraging health data is key to maximising the benefits of existing and new technologies that aim to manage and prevent CVD

A range of routinely collected health data can be leveraged to improve CVD prevention and management both directly, and by underpinning the digital technologies outlined above. Each data source – including EHRs, registries, administrative datasets, mortality data and (increasingly) alternative sources like patient-generated information – provides unique value for guiding interventions as well as research and policy. However, it is by linking these data, and making them interoperable across jurisdictions and sectors, that their value can be substantially increased, and be harnessed to develop and refine potentially game-changing technologies to prevent and manage CVD.

EHR systems were discussed above mainly in terms of directly improving patient care and outcomes, such as identifying high-risk patients and improving care co-ordination. But because EHRs contain longitudinal patient data from routine clinical encounters, offering a comprehensive view of individual health histories, their data can be put to work in several productive ways. They provide a rich source of information for research on CVD prevention, treatments and outcomes that can enable large-scale analysis of real-world evidence – although caveats do apply (Davidson et al., 2020^[67]). Seven of the 19 participating countries in the 2025 OECD Cardiovascular Policy and Data Survey reported using EHRs to CVD burden and outcomes (Croatia, Estonia, France, the Netherlands, Norway, Türkiye and the United Kingdom). For comparison, 17 countries report using administrative datasets and mortality data for this purpose (Figure 1.24). This suggests that countries may not be positioned to leverage EHR data for CVD

management and research. The recently adopted EHDS Regulation aims to address some of these barriers by defining common standards, governance structures and rights for primary and secondary use of electronic health data across the EU.

Figure 1.24. Only seven of the 19 EU and OECD G20 report using EHRs to monitor CVD burden and outcomes



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

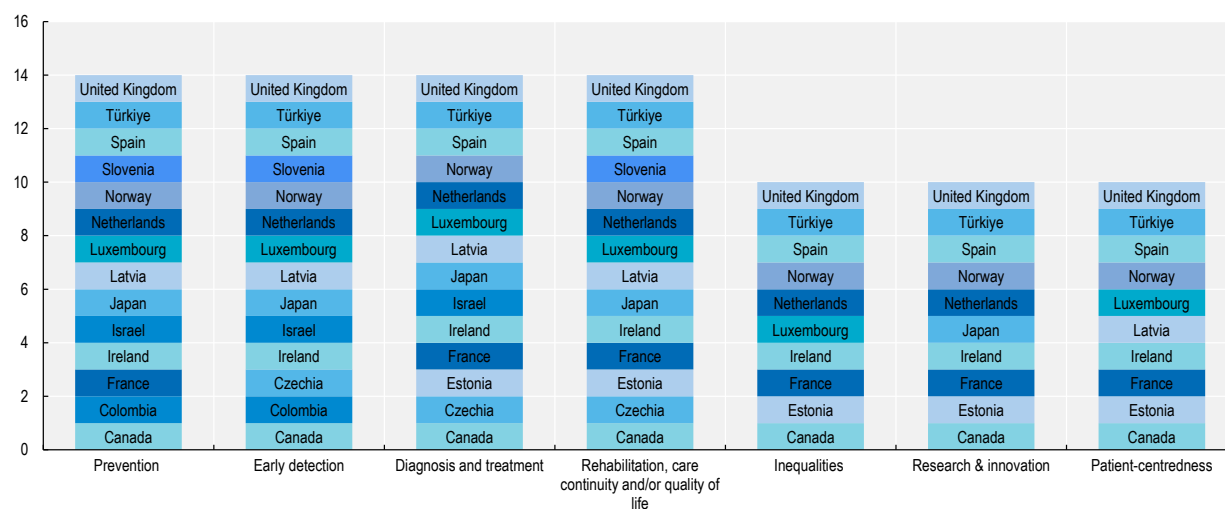
Improving interoperability would allow for richer analytics – such as calculating survival rates or identifying high-risk patients before adverse events occur. Cross-border data integration in Europe is also key, as it enables pooled analyses, enhances statistical power, and facilitates benchmarking. Initiatives like the European Society of Cardiology's (ESC) EuroHeart aim to standardise cardiovascular data across countries to improve policy and practice. The Joint Action on CARdiovascular diseases and Diabetes (JACARDI) is also developing a conceptual framework that defines the key information needed to assess CVDs and diabetes across the EU (risk factors, disease-related conditions, and medical, social, or structural modifiers), structured by settings, dimensions, and domains. However, data silos, incompatible standards, lack of unique patient identifiers, and varying privacy regulations still remain substantial barriers. Achieving health data interoperability requires co-ordinated action on several fronts. Technical barriers include differing data formats and the absence of a shared patient identifier across the EU. Legal and ethical hurdles stem from varying interpretations of General Data Protection Regulation (GDPR), inconsistent consent rules, and public trust concerns. In the EU, the newly adopted European Health Data Space (EHDS) Regulation establishes common rules for primary and secondary use of electronic health data. It creates Health Data Access Bodies, defines common standards and safeguards (including secure processing environments and permitted and prohibited secondary uses), and provides greater legal clarity while complementing the GDPR.

1.6. Targeted policy action can reduce risk factors and improve health system performance in CVD

National policies and international actions are evolving to address multimorbidity and the challenges of an ageing population

Across Europe, countries are implementing a wide range of strategies to address the growing burden of chronic diseases, notably CVD (Table 1.1.). In some countries, these efforts are embedded within broader national frameworks, including National Health Plans, National CVD control plans and non-communicable diseases (NCDs) prevention and/or management programmes. Hybrid models combining prevention and disease-specific strategies within acute care services are in place in some countries. Other countries implemented disease-specific national control plans, such as for diabetes and stroke or disease management programmes. Disease management programmes are the process of care co-ordination of patients suffering from specific chronic conditions during their care transitions. It has been proposed as a model to optimise care for patients with complex health needs (Sochalski et al., 2009^[68]). Figure 1.25 illustrates how comprehensively national CVD policies address various components of the cardiovascular care pathway. While most countries include elements such as prevention, early detection, and diagnosis and treatment in their national plans, critical areas such as tackling inequalities and promoting patient-centredness are the least frequently covered.

Figure 1.25. Several European and OECD G20 countries cover the entire CVD care pathway in national plans, yet inequalities and patient-centredness remain less-emphasised



Note: Response to question “If your country has national CVD policies, does it address the following aspects?” N=20 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Table 1.1. There is a diversity of national policies to tackle CVD

	NCDs Policies Are Part of National Health Plans	National NCDs Prevention Programmes	National NCDs Management Programmes	National CVD Control Plan	National Diabetes Control Plan	National Stroke Plan	Disease Management Programmes for CVD
Austria					✓	✓	
Belgium							
Bulgaria		✓				✓	
Croatia		✓	✓	✓	✓		
Cyprus							
Czechia				✓		✓	
Denmark						✓	
Estonia	✓			✓		✓	
Finland	✓	✓	✓	✓	✓	✓	
France	✓	✓	✓	✓			
Germany	✓						✓
Greece					✓		
Hungary						✓	
Ireland	✓	✓	✓			✓	✓
Italy	✓	✓	✓		✓		
Latvia	✓			✓			
Lithuania						✓	
Luxembourg				✓			
Malta					✓		
Netherlands				✓	✓		
Poland				✓			
Portugal				✓	✓		
Romania				✓	✓		
Slovak Republic					✓		
Slovenia	✓	✓			✓		
Spain		✓		✓	✓	✓	
Sweden				✓			
Iceland							
Norway				✓		✓	
Canada					✓		
Japan				✓			
Türkiye				✓	✓	✓	
United Kingdom				✓		✓	

Note: Disease management programmes are the process of care co-ordination of patients suffering from specific chronic conditions during their care transitions, which has been proposed as a model to optimise care for patients with complex health needs (Sochalski et al., 2009^[68]).

Source: 2025 OECD Cardiovascular Policy and Data Survey, (ESO, 2023^[69]; IDF Europe^[70]; Amgen, 2025^[71]; Romanian Ministry of Health, 2025^[72]; PWC, 2025^[73]; Italian Ministry of Health, 2025^[74]; Spanish Ministry of Health, 2022^[75]; Bulgarian Ministry of Health, 2021^[76]; French Ministry of Solidarity and Health, 2018^[77]).

The EU has a key role in supporting Member States action on cardiovascular health. EU-level actions to reduce circulatory disease mortality have focussed on regulatory measures and health initiatives, including stricter tobacco control, clear food labeling, limits on trans fats, and joint actions on chronic disease prevention and healthy ageing. The Healthier Together NCD initiative, for example, supports EU countries in tackling non-communicable diseases through shared best practices, funding opportunities, and collaborative actions to improve prevention, care, and health outcomes. The *2024 EU Council Conclusions on Improving Cardiovascular Health* calls on Member States to strengthen prevention, early detection, and equitable access to high-quality cardiovascular care, while promoting research, innovation, and cross-sector collaboration (see Chapter 6). These actions and political commitments – among others – are working to address key drivers of CVD through prevention and management, reflecting strong recognition and leadership in tackling CVD and the broader NCD burden as major societal challenges.

The 2030 Agenda for Sustainable Development identifies NCDs as a major obstacle to sustainable development. World leaders committed to cutting premature NCD mortality by one-third by 2030 through prevention and treatment (SDG target 3.4). The WHO leads global efforts to co-ordinate and promote actions towards this goal. In 2019, the World Health Assembly extended the WHO Global Action Plan for the Prevention and Control of NCDs (2013-2020) to 2030 and requested an Implementation Roadmap (2023-2030) to speed up progress. The Roadmap guides actions to meet nine global targets for NCD prevention and management.

Cross-sectoral prevention policies amplify their impact beyond cardiovascular health

The substantial burden of CVD on European societies and healthcare systems calls for the prioritisation of prevention policies across the life course, supported and sustained by empowering citizens to make healthy choices. The environments in which people live, work, and age play a critical role in shaping health outcomes, requiring prevention efforts and co-ordinated cross-sectoral actions. CVD prevention is increasingly framed as a cross-sectoral priority, with growing recognition of the health co-benefits of policies on diet, tobacco, air pollution, and physical activity. However, there is variation in the implementation of the key policy actions that can reduce the unequal burden of CVD.

In recent years, several international and regional policy frameworks have been developed to help governments translate evidence into effective, scalable interventions, namely the NOURISHING and MOVING frameworks (World Cancer Research Fund) and MPOWER (World Health Organization). They offer practical tools to navigate complex policy environments, enhance accountability, and foster multisectoral collaboration. Crucially, they shift attention from individual choices to structural factors, supporting healthier environments and advancing health equity.

Diet and nutrition policy continues to evolve, with increasing uptake of structural measures such as, reducing trans fats in food sugar-sweetened beverage taxes, and healthy food procurement policies in public institutions like schools. These approaches have shown encouraging results, helping to reduce sugar intake, support product reformulation, and improve dietary quality, particularly for children and groups at higher risk of poor nutrition. The NOURISHING framework provides governments with a useful structure for designing, implementing, and monitoring evidence-informed actions across the food environment, food system, and behaviour-change communication. Voluntary industry agreements – such as those setting targets for salt or sugar reduction – can be effective, but only when targets are ambitious, progress is independently monitored, and actions are rigorously evaluated. In addition, comprehensive marketing restrictions aimed at reducing children’s exposure to unhealthy food advertising are not yet extensively applied across Europe, even though available evidence suggests they can contribute positively to improving children’s diets.

Tobacco control is among the most developed policy areas, with widespread adoption of effective measures contributing to declining smoking rates and reductions in CVD. Many countries have implemented legislation on smoke- and aerosol-free environments, cessation support, and youth-focussed

restrictions, with growing interest in flavour bans and tobacco-free generation laws. The Tobacco Products Directive 2014/40/EU and the Tobacco Advertising Directive 2003/33/EC regulate key aspects of the manufacture, presentation, sale, advertising and sponsorship of tobacco and related products. The implementation of these measures has contributed to reductions in smoking prevalence and, consequently, declines in cardiovascular disease. While individual policies – such as taxation, smoking restrictions, and health warnings – are effective on their own, the most impactful approach is implementing them simultaneously (Akter et al., 2024^[78]). Other measures, such as flavour bans and free or discounted nicotine replacement therapy, also show positive impacts on quit rates, with flavour bans reducing e-cigarette consumption. Progress at national level, however, varies. In more than a third of countries, cigarette affordability has increased, while the uptake of advertising bans and mass media campaigns differs across the region, and enforcement of newer measures remains uneven. Rising youth vaping and dual use present emerging challenges, with regulatory approaches to e-cigarettes showing considerable diversity. The MPOWER framework provides countries with a structured, evidence-based set of measures to support the implementation of comprehensive tobacco control policies and reduce tobacco-related harm.

Physical activity is widely recognised in national policies, with many countries implementing campaigns, school-based programmes, and infrastructure investments. Promising practices include active travel schemes, physical education in schools and workplace initiatives; however, their implementation is inconsistent. People living in vulnerable situations – such as children, older adults, and disadvantaged populations – remain under-targeted, and cross-sector co-ordination with areas like transport and urban planning is often limited. The MOVING framework is a policy tool to support physical activity promotion and support governments in the development and assessment of strategies (Oldridge-Turner et al., 2022^[79]). It focusses on six key areas: mass media campaigns, opportunities for physical activity in schools, volunteer and community programmes, infrastructure and urban design, national guidelines, and governance. In addition, the Health4EUKids Joint Action fosters collaboration among EU Member States to promote healthy lifestyles and physical activity in children through integrated, evidence-based approaches across both the health and education sectors (Health4EUKids, 2025^[80]).

Countries across Europe have overall advanced policies to tackle harmful alcohol consumption based on key European and International frameworks, though there are differences among countries. Specifically, the European Framework for Action on Alcohol 2022-2025 sets out six key priority areas: pricing policies, marketing restrictions, availability controls, health information and labelling, health services' response, and community action (WHO, 2022^[81]). The WHO's SAFER initiative highlights a set of cost-effective actions that can support countries in further reducing alcohol-related harm. At the same time, environmental factors including air pollution, extreme weather events and climate-related stressors are being more and more recognised as important contributors to cardiovascular risk. Measures such as low-emission zones and policies that promote active transport present promising co-benefits for health and the environment. However, only a limited number of countries currently incorporate environmental risks in a systematic way into their national cardiovascular plans.

Improvements in health literacy and preventative care could prevent and reduce treatment delays

Preventive care and risk detection play an important role in cardiovascular health, with programmes like health checks and high-risk prevention initiatives demonstrating effectiveness in identifying and managing cardiovascular risk factors, particularly in underserved populations. These approaches are generally cost-effective and scalable, but challenges remain in reaching the people living in vulnerable situations and sustaining long-term engagement. Behavioural insights offer valuable tools to enhance adherence and design more effective interventions, but their application remains fragmented and limited across Europe.

Low health literacy hinders behavioural change and timely care-seeking – while it can be improved through context-specific education, few countries target people living in vulnerable situations. High health literacy

has potential to improve outcomes for acute cardiac events, and survival after out-of-hospital cardiac arrest depends on public training and automated external defibrillator (AED) availability, which vary across Europe. National cardiopulmonary resuscitation policies and AED registries have improved outcomes in some countries. Addressing equity is essential in CV care, as women, some ethnic groups, smokers, and people with diabetes face delays and treatment gaps (Anand et al., 2025^[82]; Cabrera and Johnson, 2025^[83]). A full-pathway approach and regional networks can help reduce these disparities. JACARDI (11/2023-2010/27) applies the “4Cs” framework as a structured approach to integrate the principle of equity and diversity into the implementation of 142 national-level pilot projects, which entails “Critical reflection”, “Context and data”, “Co-design”, “inclusive and accessible Communications”. Enhancing health systems ability to meet the needs of individuals from varied backgrounds requires ongoing self-reflection, recognising power imbalances, and ensuring commitment to respectful partnerships with diverse communities, to ensure that services are inclusive and equitable.

Health systems interventions – particularly related to co-ordination and people-centredness – are essential for improving outcomes both in acute instances and over the long-term

Improving outcomes in cardiovascular and cerebrovascular care requires a co-ordinated approach across the care continuum – from early detection to post-acute support. Early heart failure detection and referral require public and professional awareness, primary care diagnostic tools, and clear referral pathways. Multidisciplinary programmes with and home- or clinic-based follow-up and self-management are key to reducing mortality and hospitalisations. Dedicated stroke teams and networks help standardise care and reduce regional disparities in stroke treatment. Mobile Stroke Units improve outcomes and are cost-effective, especially in densely populated areas; they are already in use in countries like France, Germany and Norway. Post-acute stroke care remains limited and needs expansion, being crucial to improve outcomes.

People-centred care integrates medical treatment with individual preferences, promotes co-production, shared decision making, and prioritises overall well-being. People-centred cardiovascular care improves patient experiences and outcomes yet lacks widespread adoption. In the 2025 OECD Cardiovascular Policy and Data Survey, eight of the EU27+2 countries reported that citizen or patient representatives were involved in developing policies related to access and quality of CV care. However, only four European countries reported citizen or patient representatives participating as co-designers. A few countries are investing in health literacy programmes to support self-care and shared decision making. Enhancing patients’ quality of life requires strong investments in discharge planning, self-management and rehabilitation. Early supported discharge accelerates the hospital discharge from hospital by offering specialised multidisciplinary care at home. Few countries have fully implemented early discharge protocols after stroke, acute coronary syndrome and heart procedures. Home-based care has significant potential for development across the region and could support the implementation of these innovations across the region.

Strengthening governance structures by breaking down silos across administrative systems in health and social care is one key aspect. Financial incentives to healthcare providers have been associated with measures of enhanced access and increased quality of care (Flodgren et al., 2011^[84]; Heider and Mang, 2020^[85]). Furthermore, primary care-oriented health systems, with General Practitioners (GPs) as gatekeepers, stronger financial incentives directed to GPs and better care continuity, have been associated with lower avoidable hospitalisations in a previous OECD analysis (OECD/The Health Foundation, 2025^[86]). Various European countries are strengthening governance models, changing legal frameworks and piloting the systematic collection of integrated cardiovascular care indicators to enhance cardiovascular care integration (Table 1.2).

Table 1.2. European countries are developing policies to enhance cardiovascular care integration

Country	Strengthening governance models	Changes in legal framework	Systematic collection of integrated CV care indicators
Austria	In development 	In development 	In development 
Croatia	N/A	N/A	N/A
Czechia	N/A	N/A	N/A
Estonia	In development 	In development 	In development 
Finland	N/A	N/A	N/A
France	In development 	In development 	Fully implemented 
Germany	N/A	N/A	Fully implemented 
Ireland	In development 	N/A	In development 
Latvia	In development 	In development 	In development 
Luxembourg	In development 	In development 	In development 
Netherlands	In development 	In development 	In development 
Slovenia	N/A	N/A	N/A
Sweden	In development 	Fully implemented 	N/A
Iceland	N/A	N/A	N/A
Norway	In development 	In development 	In development 
Canada	N/A	N/A	N/A
Japan	Not implemented 	Not implemented 	Not implemented 
Türkiye	N/A	N/A	N/A
United Kingdom	In development 	Fully implemented 	In development 

Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom). N/A: information not available.
Source: 2025 OECD Cardiovascular Policy and Data Survey.

1.7. Conclusion

CVD is the leading cause of death and disability in the EU, with persistent and widening inequalities across regions, genders, and socio-economic groups. While decades of progress in prevention and treatment have contributed to declining mortality, these gains have slowed – and in some countries reversed – particularly following the COVID-19 pandemic. Central and Eastern European EU countries continue to bear a disproportionate burden, with higher premature mortality, lower treatment coverage, and greater reliance on informal care. The growing prevalence of metabolic and behavioural risk factors, compounded by population ageing and rising multimorbidity, underscore the urgency of co-ordinated, system-wide responses.

To address these challenges, scaling up proven, cost-effective interventions across the full continuum of care – from prevention and early detection to acute treatment, rehabilitation, and long-term management – will be crucial for EU countries. Strengthening primary care, improving medication adherence, expanding access to rehabilitation, and investing in digital health infrastructure are critical levers for improving outcomes. Equally important is the need to address disparities, integrate patient-centred approaches, and leverage data for real-time monitoring and international benchmarking. A renewed commitment to equity, resilience, and cross-sector collaboration will be essential to reduce the burden of CVD and improve cardiovascular health for all people living in Europe.

References

- Akter, S. et al. (2024), “A systematic review and network meta-analysis of population-level interventions to tackle smoking behaviour”, *Nature Human Behaviour*, Vol. 8/12, pp. 2367-2391, <https://doi.org/10.1038/s41562-024-02002-7>. [78]
- Amgen (2025), *CVD Dashboard*, https://public.tableau.com/app/profile/gabriel.lopez3427/viz/CVDDashboard_17277167502310/0_Cover (accessed on 18 July 2025). [71]
- Anand, S. et al. (2025), “Reducing inequalities in cardiovascular disease: focus on marginalized populations considering ethnicity and race”, *The Lancet Regional Health - Europe*, Vol. 56, p. 101371, <https://doi.org/10.1016/j.lanepe.2025.101371>. [82]
- Andersson, C. and R. Vasan (2017), “Epidemiology of cardiovascular disease in young individuals”, *Nature Reviews Cardiology*, Vol. 15/4, pp. 230-240, <https://doi.org/10.1038/nrcardio.2017.154>. [51]
- Borkowski, P. and N. Borkowska (2024), “Understanding Mental Health Challenges in Cardiovascular Care”, *Cureus*, <https://doi.org/10.7759/cureus.54402>. [9]
- Bugiardini, R. (2023), “Tackling cardiovascular health inequalities in European countries”, *The Lancet Regional Health–Europe*, Vol. 33. [5]
- Bulgarian Ministry of Health (2021), *National Programme for the Prevention of Chronic Non-communicable Diseases 2021-2025*, <https://ncpha.government.bg/index/3189-nacionalna-programa-za-prevenция-na-hronichnite-nezarazni-bolesti-2021-2025-g.html>. [76]
- Cabrera, K. and N. Johnson (2025), “Addressing cardiovascular health disparities: global perspectives from the patient community”, *The Lancet Regional Health - Europe*, Vol. 56, p. 101404, <https://doi.org/10.1016/j.lanepe.2025.101404>. [83]

- Cenko, E. et al. (2023), “Clinical determinants of ischemic heart disease in Eastern Europe”, *The Lancet Regional Health - Europe*, Vol. 33, p. 100698, <https://doi.org/10.1016/j.lanepe.2023.100698>. [6]
- Chaddha, A. et al. (2016), “Mental Health and Cardiovascular Disease”, *The American Journal of Medicine*, Vol. 129/11, pp. 1145-1148, <https://doi.org/10.1016/j.amjmed.2016.05.018>. [42]
- Cherla, A. et al. (2024), “Trends in avoidable mortality from cardiovascular diseases in the European Union, 1995–2020: a retrospective secondary data analysis”, *The Lancet Regional Health - Europe*, Vol. 47, p. 101079, <https://doi.org/10.1016/j.lanepe.2024.101079>. [7]
- Chong, B. et al. (2024), “Global burden of cardiovascular diseases: projections from 2025 to 2050”, *European Journal of Preventive Cardiology*, <https://doi.org/10.1093/eurjpc/zwae281>. [48]
- Chowdhury, M. et al. (2025), “The Heart of Transformation: Exploring Artificial Intelligence in Cardiovascular Disease”, *Biomedicines*, Vol. 13/2, p. 427, <https://doi.org/10.3390/biomedicines13020427>. [65]
- Davidson, J. et al. (2020), “<p>Validity of Acute Cardiovascular Outcome Diagnoses Recorded in European Electronic Health Records: A Systematic Review<p>”, *Clinical Epidemiology*, Vol. Volume 12, pp. 1095-1111, <https://doi.org/10.2147/clep.s265619>. [67]
- Dhingra, L. et al. (2023), “Use of Wearable Devices in Individuals With or at Risk for Cardiovascular Disease in the US, 2019 to 2020”, *JAMA Network Open*, Vol. 6/6, p. e2316634, <https://doi.org/10.1001/jamanetworkopen.2023.16634>. [58]
- Dunlay, S. and A. Chamberlain (2016), “Multimorbidity in Older Patients with Cardiovascular Disease”, *Current Cardiovascular Risk Reports*, Vol. 10/1, <https://doi.org/10.1007/s12170-016-0491-8>. [10]
- Emerging Risk Factors Collaboration (2020), “Association Between Depressive Symptoms and Incident Cardiovascular Diseases”, *JAMA*, Vol. 324/23, p. 2396, <https://doi.org/10.1001/jama.2020.23068>. [40]
- ESC (2025), *EU 27 Cardiovascular Realities 2025*, <https://www.flipsnack.com/escardio/eu-27-cardiovascular-realities-2025/full-view.html>. [4]
- ESO (2023), *KPI 1 – European Stroke Organisation (ESO)*, <https://actionplan.eso-stroke.org/kpi/kpi-1> (accessed on 13 July 2025). [69]
- EU AI Act (2024), *The AI Act: Responsibilities of the EU Member States*, <https://artificialintelligenceact.eu/responsibilities-of-member-states/>. [66]
- EuroStat (2025), *Person distribution by body mass index, educational attainment level, sex and age*, https://ec.europa.eu/eurostat/databrowser/view/ilc_hch10/default/table?lang=en (accessed on 8 July 2025). [20]
- EuroStat (2025), *Persons eating fruit, vegetables or salad by educational attainment level, risk of poverty threshold, most frequent activity status and sex*, https://ec.europa.eu/eurostat/web/products-datasets/-/ilc_hch11 (accessed on 8 July 2025). [26]
- EuroStat (2025), *Persons reporting a chronic disease, by disease, sex, age and educational attainment level*, https://ec.europa.eu/eurostat/web/products-datasets/-/hlth_ehis_cd1e (accessed on 8 July 2025). [19]

- EuroStat (2025), *Population on 1 January by age group and sex*, [22]
https://ec.europa.eu/eurostat/en/web/products-datasets/-/DEMO_PJANGROUP (accessed on 8 July 2025).
- EuroStat (2025), *Population on 1st January by age, sex and type of projection*, [47]
https://ec.europa.eu/eurostat/web/products-datasets/product?code=proj_23np (accessed on 8 July 2025).
- Eurostat (2022), *Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e)*, [52]
https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed on 17 October 2025).
- Everard, C. et al. (2025), “Exploring the relationship between non-communicable diseases and depression”, *OECD Health Working Papers*, No. 178, OECD Publishing, Paris, [44]
<https://doi.org/10.1787/02a1cfc5-en>.
- Flodgren, G. et al. (2011), “An overview of reviews evaluating the effectiveness of financial incentives in changing healthcare professional behaviours and patient outcomes”, *Cochrane Database of Systematic Reviews*, Vol. 2011/7, [84]
<https://doi.org/10.1002/14651858.cd009255>.
- French Ministry of Solidarity and Health (2018), *National Health Strategy 2018-2022*, [77]
https://sante.gouv.fr/IMG/pdf/dossier_sns_2017_synthesev6-10p_anglaisv2.pdf.
- Galea, G. et al. (2025), “Quick buys for prevention and control of noncommunicable diseases”, [33]
The Lancet Regional Health - Europe, Vol. 52, p. 101281,
<https://doi.org/10.1016/j.lanepe.2025.101281>.
- Grant, J. et al. (2024), “Digital health innovation and artificial intelligence in cardiovascular care: a case-based review”, *npj Cardiovascular Health*, Vol. 1/1, [61]
<https://doi.org/10.1038/s44325-024-00020-y>.
- Health4EUkids (2025), *Health4EUkids - the european Joint Action for the implementation of Best Practice for health promotion and obesity prevention*, [80]
<https://www.epicentro.iss.it/en/obesity/joint-action-health4EUkids> (accessed on 1 December 2025).
- Heider, A. and H. Mang (2020), “Effects of Monetary Incentives in Physician Groups: A Systematic Review of Reviews”, *Applied Health Economics and Health Policy*, Vol. 18/5, [85]
pp. 655-667, <https://doi.org/10.1007/s40258-020-00572-x>.
- Henking, C., A. Reeves and B. Chrisinger (2023), “Global inequalities in mental health problems: understanding the predictors of lifetime prevalence, treatment utilisation and perceived helpfulness across 111 countries”, *Preventive Medicine*, Vol. 177, p. 107769, [43]
<https://doi.org/10.1016/j.ypmed.2023.107769>.
- Hofmarcher, T. et al. (2020), “The cost of cancer in Europe 2018”, *European Journal of Cancer*, [16]
Vol. 129, pp. 41-49, <https://doi.org/10.1016/j.ejca.2020.01.011>.
- Honigberg, M. et al. (2022), “Low depression frequency is associated with decreased risk of cardiometabolic disease”, *Nature Cardiovascular Research*, Vol. 1/2, pp. 125-131, [38]
<https://doi.org/10.1038/s44161-021-00011-7>.
- IDF Europe (n.d.), *Country Profiles – Insulin at 100 – IDF Europe*, [70]
<https://www.insulin100.eu/country-profiles/> (accessed on 13 July 2025).

- IHME (2024), *GBD 2021 Cause and Risk Summary*, <https://www.thelancet.com/gbd/summaries> [37]
(accessed on 27 March 2025).
- IHME (2021), *GDB Compare Database*, <https://vizhub.healthdata.org/gbd-compare/>. [17]
- Italian Ministry of Health (2025), *National prevention plan*, [74]
<https://www.salute.gov.it/new/it/tema/il-piano-nazionale-della-prevenzione/> (accessed on September 2025).
- Jensen, C. (2024), “Cardiovascular Disease in the Aging Population: Addressing Challenges and Management Approaches”, *J Cardiovasc Disc Diagn*, Vol. 12, p. 629, [46]
<https://doi.org/10.37421/2329-9517.2024.12.629>.
- Kao, D. (2022), “Electronic Health Records and Heart Failure”, *Heart Failure Clinics*, Vol. 18/2, [57]
pp. 201-211, <https://doi.org/10.1016/j.hfc.2021.12.004>.
- Karami, N. et al. (2023), “Global prevalence of depression, anxiety, and stress in cardiac patients: A systematic review and meta-analysis”, *Journal of Affective Disorders*, Vol. 324, [45]
pp. 175-189, <https://doi.org/10.1016/j.jad.2022.12.055>.
- Kiechl, S. (ed.) (2014), “Relationship of Self-Rated Health with Fatal and Non-Fatal Outcomes in Cardiovascular Disease: A Systematic Review and Meta-Analysis”, *PLoS ONE*, Vol. 9/7, [8]
p. e103509, <https://doi.org/10.1371/journal.pone.0103509>.
- Kumar, N. (2025), *Smartwatch Statistics (2025) – Users & Market Share*, [59]
<https://www.demandsage.com/smartwatch-statistics/>.
- Kwapong, Y. et al. (2023), “Association of Depression and Poor Mental Health With Cardiovascular Disease and Suboptimal Cardiovascular Health Among Young Adults in the United States”, *Journal of the American Heart Association*, Vol. 12/3, [39]
<https://doi.org/10.1161/jaha.122.028332>.
- Law, M., J. Morris and N. Wald (2009), “Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies”, *BMJ*, Vol. 338/may19 1, pp. b1665-b1665, [34]
<https://doi.org/10.1136/bmj.b1665>.
- Leal, J. et al. (2006), “Economic burden of cardiovascular diseases in the enlarged European Union”, *European Heart Journal*, Vol. 27/13, pp. 1610-1619, [13]
<https://doi.org/10.1093/eurheartj/ehi733>.
- Lindley, R. (2018), “Stroke Prevention in the Very Elderly”, *Stroke*, Vol. 49/3, pp. 796-802, [35]
<https://doi.org/10.1161/strokeaha.117.017952>.
- Luengo-Fernandez, R. et al. (2023), “Economic burden of cardiovascular diseases in the European Union: a population-based cost study”, *European Heart Journal*, Vol. 44/45, [12]
pp. 4752-4767, <https://doi.org/10.1093/eurheartj/ehad583>.
- Manzano, A. et al. (2025), *Comparator Report on Cancer in Europe 2025 - Disease Burden, Costs and Access to Medicines and Molecular Diagnostics*, IHE Report. [15]
- Nielsen, R., J. Banner and S. Jensen (2020), “Cardiovascular disease in patients with severe mental illness”, *Nature Reviews Cardiology*, Vol. 18/2, pp. 136-145, [41]
<https://doi.org/10.1038/s41569-020-00463-7>.

- Nuffield Trust (2024), *Ambulance response times*, [55]
<https://www.nuffieldtrust.org.uk/resource/ambulance-response-times> (accessed on 18 February 2025).
- OECD (2025), *Alcohol consumption*, [24]
[https://data-explorer.oecd.org/vis?fs\[0\]=Topic%2C1%7CHealth%23HEA%23%7CRisk%20factors%20for%20health%23HEA_RIS%23&pg=0&fc=Topic&bp=true&snb=7&df\[ds\]=dsDisseminateFinalDMZ&df\[id\]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_AC&df\[ag\]=OECD.ELS.HD&df\[vs\]=1.0&dq=.A.....&](https://data-explorer.oecd.org/vis?fs[0]=Topic%2C1%7CHealth%23HEA%23%7CRisk%20factors%20for%20health%23HEA_RIS%23&pg=0&fc=Topic&bp=true&snb=7&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_AC&df[ag]=OECD.ELS.HD&df[vs]=1.0&dq=.A.....&) (accessed on 8 July 2025).
- OECD (2025), *Exposure to air pollution*, [30]
[https://data-explorer.oecd.org/vis?tm=air%20pollution&pg=0&snb=33&df\[ds\]=dsDisseminateFinalDMZ&df\[id\]=DSD_AIR_POL%40DF_AIR_POLL&df\[ag\]=OECD.ENV.EPI&df\[vs\]=1.0&dq=AUT%2BAUS%2BBEL%2BCAN%2BCHL%2BCOL%2BCRI%2BCZE%2BDNK%2BBEST%2BFIN%2BFRA%2BDEU%2BGRC%2BHUN%2BISL](https://data-explorer.oecd.org/vis?tm=air%20pollution&pg=0&snb=33&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_AIR_POL%40DF_AIR_POLL&df[ag]=OECD.ENV.EPI&df[vs]=1.0&dq=AUT%2BAUS%2BBEL%2BCAN%2BCHL%2BCOL%2BCRI%2BCZE%2BDNK%2BBEST%2BFIN%2BFRA%2BDEU%2BGRC%2BHUN%2BISL) (accessed on 8 July 2025).
- OECD (2025), *Exposure to extreme temperature*, [29]
[https://data-explorer.oecd.org/vis?tm=extreme%20heat&pg=0&hc\[Heat%20stress%20thresholds\]=&snb=18&df\[ds\]=dsDisseminateFinalDMZ&df\[id\]=DSD_ECH%40EXT_TEMP&df\[ag\]=OECD.ENV.EPI&df\[vs\]=1.1&dq=AFG%2BBFA%2BBDI%2BCAF%2BTCD%2BSWZ%2BETH%2BGUF%2BATF%2BGLP%2BHMD%2BVAT](https://data-explorer.oecd.org/vis?tm=extreme%20heat&pg=0&hc[Heat%20stress%20thresholds]=&snb=18&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_ECH%40EXT_TEMP&df[ag]=OECD.ENV.EPI&df[vs]=1.1&dq=AFG%2BBFA%2BBDI%2BCAF%2BTCD%2BSWZ%2BETH%2BGUF%2BATF%2BGLP%2BHMD%2BVAT) (accessed on 8 July 2025).
- OECD (2025), *Tobacco consumption*, [23]
[https://data-explorer.oecd.org/vis?fs\[0\]=Topic%2C1%7CHealth%23HEA%23%7CRisk%20factors%20for%20health%23HEA_RIS%23&pg=0&fc=Topic&bp=true&snb=7&vw=tb&df\[ds\]=dsDisseminateFinalDMZ&df\[id\]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_TC&df\[ag\]=OECD.ELS.HD&df\[vs\]=1.0&dq=.A](https://data-explorer.oecd.org/vis?fs[0]=Topic%2C1%7CHealth%23HEA%23%7CRisk%20factors%20for%20health%23HEA_RIS%23&pg=0&fc=Topic&bp=true&snb=7&vw=tb&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_TC&df[ag]=OECD.ELS.HD&df[vs]=1.0&dq=.A) (accessed on 8 July 2025).
- OECD (2025), *Use of vaping products*, [25]
[https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=3&vw=tb&df\[ds\]=dsDisseminateFinalDMZ&df\[id\]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_VP&df\[ag\]=OECD.ELS.HD&df\[vs\]=1.0&dq=.A.....&pd=2012%2C&to\[TIME_PERIOD\]=false&isAvailabilityDisabled=false&tm=vape](https://data-explorer.oecd.org/vis?pg=0&bp=true&snb=3&vw=tb&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_HEALTH_LVNG%40DF_HEALTH_LVNG_VP&df[ag]=OECD.ELS.HD&df[vs]=1.0&dq=.A.....&pd=2012%2C&to[TIME_PERIOD]=false&isAvailabilityDisabled=false&tm=vape) (accessed on 8 July 2025).
- OECD (2024), *Rethinking Health System Performance Assessment: A Renewed Framework*, [2]
 OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/107182c8-en>.
- OECD (2020), *Realising the Potential of Primary Health Care*, OECD Health Policy Studies, [53]
 OECD Publishing, Paris, <https://doi.org/10.1787/a92adee4-en>.
- OECD (2015), *Cardiovascular Disease and Diabetes: Policies for Better Health and Quality of Care*, OECD Health Policy Studies, OECD Publishing, Paris, [1]
<https://doi.org/10.1787/9789264233010-en>.
- OECD/The Health Foundation (2025), *How Do Health System Features Influence Health System Performance?*, OECD Publishing, Paris, [86]
<https://doi.org/10.1787/7b877762-en>.
- OECD/The King's Fund (2020), *Is Cardiovascular Disease Slowing Improvements in Life Expectancy?: OECD and The King's Fund Workshop Proceedings*, OECD Publishing, Paris, [3]
<https://doi.org/10.1787/47a04a11-en>.

- Oldridge-Turner, K. et al. (2022), "Promoting Physical Activity Policy: The Development of the MOVING Framework", *Journal of Physical Activity and Health*, Vol. 19/4, pp. 292-315, <https://doi.org/10.1123/JPAH.2021-0732>. [79]
- OSH Pulse (2025), *OSH Pulse 2025: Occupational safety and health in the era of climate and digital change*, <https://osha.europa.eu/en/publications/osh-pulse-2025-occupational-safety-and-health-era-climate-and-digital-change>. [28]
- Perez, M., V. Musini and J. Wright (2009), "Effect of early treatment with anti-hypertensive drugs on short and long-term mortality in patients with an acute cardiovascular event", *Cochrane Database of Systematic Reviews*, <https://doi.org/10.1002/14651858.cd006743.pub2>. [32]
- Poterucha, T. et al. (2025), "Detecting structural heart disease from electrocardiograms using AI", *Nature*, Vol. 644/8075, pp. 221-230, <https://doi.org/10.1038/s41586-025-09227-0>. [63]
- Productivity Commission (2025), *11 Ambulance services - Report on Government Services 2025*, Australian Government, <https://www.pc.gov.au/ongoing/report-on-government-services/2025/health/ambulance-services> (accessed on 18 February 2025). [54]
- PWC (2025), "Towards better cardiovascular health in Poland", https://www.pwc.ch/en/publications/2025/PwC_better-cardiovascular-health-in-Poland_EN_web.pdf (accessed on 18 July 2025). [73]
- Romanian Ministry of Health (2025), *Romania launches first national strategy to combat cardiovascular and cerebrovascular diseases 2025-2030*, <https://www.ms.ro/ro/centrul-de-presa/rom%C3%A2nia-are-%C3%AEn-premier%C4%83-o-strategie>. [72]
- SHARE-ERIC (2024), , <https://share-eric.eu/>. [21]
- Silva, G. et al. (2024), "Blood pressure management to prevent recurrent stroke: current evidence and perspectives", *npj Cardiovascular Health*, Vol. 1/1, <https://doi.org/10.1038/s44325-024-00021-x>. [31]
- Singh, M. et al. (2024), "Artificial intelligence for cardiovascular disease risk assessment in personalised framework: a scoping review", *eClinicalMedicine*, Vol. 73, p. 102660, <https://doi.org/10.1016/j.eclinm.2024.102660>. [64]
- Singh, R. et al. (2025), "How AI is used in FDA-authorized medical devices: a taxonomy across 1,016 authorizations", *npj Digital Medicine*, Vol. 8/1, <https://doi.org/10.1038/s41746-025-01800-1>. [62]
- Skou, S. et al. (2022), "Multimorbidity", *Nature Reviews Disease Primers*, Vol. 8/1, <https://doi.org/10.1038/s41572-022-00376-4>. [11]
- Slawomirski, L. et al. (2023), "Progress on implementing and using electronic health record systems: Developments in OECD countries as of 2021", *OECD Health Working Papers*, No. 160, OECD Publishing, Paris, <https://doi.org/10.1787/4f4ce846-en>. [56]
- Sochalski, J. et al. (2009), "What Works In Chronic Care Management: The Case Of Heart Failure", *Health Affairs*, Vol. 28/1, pp. 179-189, <https://doi.org/10.1377/hlthaff.28.1.179>. [68]

- Spanish Ministry of Health (2022), *Joint Action to Prevent Non Communicable Diseases and Cancer*,
https://www.sanidad.gob.es/en/areas/promocionPrevencion/jornadas_OtrasActuaciones/otrasActuaciones/JA_preventNCD.htm. [75]
- Sun, J. et al. (2023), “Global, regional, and national burden of cardiovascular diseases in youths and young adults aged 15–39 years in 204 countries/territories, 1990–2019: a systematic analysis of Global Burden of Disease Study 2019”, *BMC Medicine*, Vol. 21/1,
<https://doi.org/10.1186/s12916-023-02925-4>. [49]
- Vasan, R. et al. (2001), “Impact of High-Normal Blood Pressure on the Risk of Cardiovascular Disease”, *New England Journal of Medicine*, Vol. 345/18, pp. 1291-1297,
<https://doi.org/10.1056/nejmoa003417>. [36]
- WHO (2022), *European framework for action on alcohol, 2022–2025*,
https://cdn.who.int/media/docs/librariesprovider2/regional-committee-meeting-reports/rc72/european-framework-for-action-on-alcohol-2022-2025-cheat-sheet-en.pdf?sfvrsn=8e63aef4_6&download=true. [81]
- WHO Global Health Observatory (2024), *Body mass index among children*,
<https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/bmi-among-children>. [50]
- WHO Global Health Observatory (2024), *Diabetes, prevalence (%)*,
<https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-diabetes-age-standardized>. [18]
- WHO Global Health Observatory (2024), *Physical activity, insufficient, among adults aged 18+ years (crude estimate), prevalence (%)*,
[https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-\(crude-estimate\)-\(-\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-(crude-estimate)-(-)). [27]
- Wilkins, E. et al. (2017), *European Cardiovascular Disease Statistics 2017*, European Heart Network. [14]
- Yu, M. and Y. Son (2024), “Machine learning–based 30-day readmission prediction models for patients with heart failure: a systematic review”, *European Journal of Cardiovascular Nursing*, Vol. 23/7, pp. 711-719, <https://doi.org/10.1093/eurjcn/zvae031>. [60]

Notes

¹ Germany’s national CVD cost estimates may differ due to methodological variations, as they account only for ongoing healthcare expenditures.

² Comparable data on the number of approved AI-enabled medical devices in the EU context not currently available.

2 The burden of cardiovascular disease

Cardiovascular disease (CVD) remains the leading cause of death and disability in the European Union, despite major declines in mortality since the 1970s. In 2022, CVD accounted for one in three deaths (1.7 million) and affected 62 million people, with significant gender, socio-economic, and geographic disparities. The COVID-19 pandemic disrupted progress, causing mortality increases in countries with already high CVD burden and widening East – West inequalities. Beyond its health impact, CVD imposes a heavy economic cost – over EUR 282 billion annually – driven by healthcare expenditures, productivity losses, and informal care. Premature mortality shortens working lives, while survivors experience poorer physical, mental, and social well-being compared to those without CVD.

In Brief

- There have been remarkable declines in mortality from cardiovascular disease (CVD) in the European Union (EU) since the 1970s, however, **CVD remains the leading cause of morbidity and mortality** in the EU, accounting for one-in-three of all deaths (1.7 million deaths in 2022) and affecting an estimated 62 million people. The circumstances brought about by the COVID-19 pandemic appear to have led to a **deterioration of CVD outcomes in several EU countries**, which had been improving in a pre-pandemic period across all EU. European countries with the highest pre-pandemic CVD mortality in 2019 showed **absolute increases** in CVD mortality rates in the years following, whereas those with low pre-pandemic CVD mortality showed falls or no increase in CVD mortality. The wide geographical inequalities in CVD mortality within the EU show the significant potential there is for reducing the human, social and economic impacts of CVD in the EU. **Reducing the rates of CVD, and disparities in them, would increase overall survival and life expectancy in Europe.**
- Across EU countries, **men consistently experience higher mortality due to CVD than women**. In 2022, the average age-adjusted mortality ratio for CVD was 43% higher among men than women on average. Although men exhibit higher rates of CVD mortality and morbidity overall, in some Eastern and Central EU countries, such as Hungary, Romania and Bulgaria, up to two-thirds of all female deaths are due to CVD. While both Ischaemic heart disease (IHD) and stroke contribute significantly to CVD mortality, IHD is not only more prevalent but also far more lethal in men, including those at younger ages. Stroke, on the other hand, primarily affects older individuals and displays far less gender disparity.
- **The excess of male over female mortality rates for CVD is significantly greater at ages under 65 compared to all ages.** During the 2012-2022-decade, premature mortality from CVD fell by an average for the EU of 20% in males and 23% in females, although there were large variations between countries. Premature CVD mortality increased in several EU countries during 2019-2021, reflecting the impact of the pandemic, the increases being largest in some Central and Eastern European countries (Lithuania, Latvia, Romania and Bulgaria).
- CVD's **shortens human longevity**; it also adds to the economic costs associated **with curtailing working lives prematurely**. EU countries are impacted on average by 1 301.9 potential years of life lost per 100 000 due to premature deaths as a result of CVD among people younger than 75. Approximately **256 million working days were lost** in 2021 due to illness and disability, while **1.3 million working years were lost** due to premature deaths. The total workforce impact is **47 billion Euro including lost productivity due to premature mortality and illness.**
- **CVD negatively effects people's quality of life**, and people living with CVD score lower on a breadth of dimensions of self-reported health and well-being compared to those with other chronic conditions. Using data from the OECD PaRIS survey, primary care users with CVD report lower overall well-being (4.5 percentage point (p.p.) difference), reduced social functioning (5.8 p.p. difference), worse physical health (1.8 p.p. difference), and poorer mental health (1.3 p.p. difference) as compared those without.
- Inequalities in CVD risk factors, prevalence, treatment, morbidity and mortality, between and within EU countries, are wide and an obstacle to improvements in population health and life expectancy. CVD burden is closely linked to socio-economic status, with rates in **people in lower income and education brackets experiencing higher prevalence, mortality, and**

worse health outcomes. Disparities are particularly pronounced for conditions like stroke and diabetes, where the prevalence among the lower-educated population is more than double that of their higher-educated counterparts. Data from the PaRIS survey show that **individuals with lower income or educational attainment report poorer physical and mental well-being, more difficulty in managing their health conditions, and lower use of preventive care.** Moreover, CVD, hypertension and diabetes impose a disproportionately heavy burden of ill health and mortality on disadvantaged socio-economic groups, some ethnic minority groups, and people with serious mental illness and disabilities.

- CVD imposes **a heavy economic burden** on EU health systems and societies, **estimated at over EUR 282 billion in 2021.** This includes direct healthcare costs, productivity losses due to premature mortality and morbidity, and long-term disability care. Countries with high CVD prevalence and mortality – especially in Central and Eastern Europe – also bear disproportionately high costs relative to GDP. In 2021, the total societal cost of CVD in the EU was assessed to be higher than that of cancer, largely driven by the greater burden of informal care and higher health and social care costs associated with CVD.

Infographic 2.1. The burden of cardiovascular disease

! CVD is leading cause of death in EU (1/3 of all deaths, 2022)
♥ CVD caused 1.7 million deaths and affected 62 million people in 2022.

Men consistently experience higher mortality due to CVD than women in 2022.



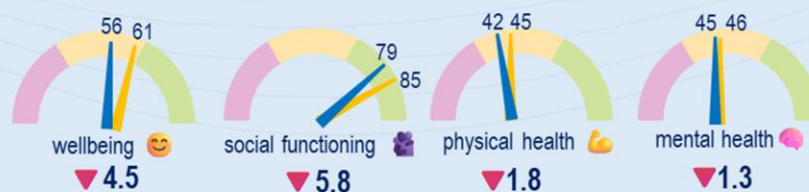
CVD ASMRs* per 100 000 population
 *Age-Standardized Mortality Ratio

€47 billion loss including lost productivity due to premature mortality and illness.

- **1,301 potential years of life lost** per 100,000.
- **256 million working days lost.**
- **1.3 million working years lost.**

CVD negatively affects people's quality of life.

— with CVD
 — without CVD



Note: Well-being measured with WHO-5 (0–100, higher = better). Physical and mental health measured with PROMIS® Global Health T-scores (mean = 50, SD = 10; higher = better). Social functioning assessed via PROMIS® Global Health question on usual social activities (good/very good/excellent vs. fair/poor).

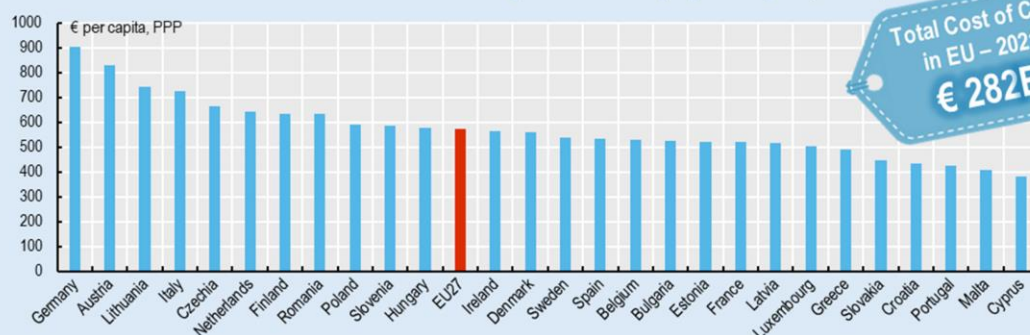


CVD burden is higher among people with lower income, education, and social status.



Disadvantaged groups report worse health, less preventive care, and higher disease rates.

Cross-National Costs of CVD in the European Union (€ per capita, PPP)



Total Cost of CVD in EU – 2021: € 282B

2.1. Despite remarkable declines in CVD related mortality since the 1970s, it remains the leading cause of mortality and morbidity in the EU

The decline in mortality from CVD in recent decades has been one of the most remarkable successes of public health and modern medicine. Over the past 50 years, there have been significant increases in life expectancy in European countries, largely due to advances in preventing and treating CVD and its risk factors (OECD/The King's Fund, 2020^[1]). During this period, the development and implementation of preventive public health strategies, and medical advances in managing and treating CVD, have resulted in significant declines in CVD morbidity and mortality. Between 1980 and 2005, CVD mortality rates as much as halved in several European countries (OECD/The King's Fund, 2020^[1]). The Global Burden of Disease study shows that years of life lost to CVD in high-income countries have declined more rapidly than those for other major causes of death (ESC Cardiovascular Realities, 2024^[2]) (Chong et al., 2024^[3]).

Despite exceptional advances in preventing and managing CVD, it remains the biggest health challenge facing European Union (EU) countries (Table 2.1). It is the leading cause of death in the EU, accounting for one-in-three of all deaths (1.7 million deaths in 2022) and affecting 62 million people (ESC EU 27 Cardiovascular Realities, 2025^[4]). Ischaemic heart disease (IHD) is the largest contributor, responsible for almost one-third (547 000 deaths) of all deaths from CVD. Cerebrovascular disease (stroke) is the second largest contributor, accounting for just over one-fifth of all CVD deaths in the EU (350 000 deaths). Although CVD mortality rates are higher in men than in women across EU countries, more women than men die from CVD overall. This is because women live longer, and more of them reach the very old age groups where CVD is the leading cause of death. As a result, CVD accounts for a higher share of total deaths among women than among men.

The slowdown in the rate of decline in CVD mortality in Europe since 2011 has been a key driver of the reductions in life expectancy improvements that followed (OECD/The King's Fund, 2020^[1]; Steel et al., 2025^[5]). CVD affects all age groups, not just older people. Nearly a quarter (22%) of all premature deaths (before the age of 70) in the EU are caused by CVD (ESC Atlas of Cardiovascular Disease Statistics, 2024^[6]). CVD also has a disproportionately heavy impact on some populations. It is a major cause of health inequalities between EU countries, and within EU countries among different geographical, socio-economic and demographic sub-groups. In addition to the loss of, and impact on, human lives, the economic burden of CVD in EU countries exceeded EUR 282 billion in 2021 and is expected to increase further in the coming decades (ESC Atlas of Cardiovascular Disease Statistics, 2024^[6]).

Table 2.1. CVD remains the leading cause of death in the EU over the past two decades

Cause of Death in the EU	Rank – 1990	Rank – 2021	Change
Cardiovascular diseases	1	1	—
Neoplasms	2	2	—
Respiratory infections & tuberculosis	8	3	↑ -5
Neurological disorders	4	4	—
Diabetes & chronic kidney diseases	6	5	↑ -1
Chronic respiratory	5	6	↓ 1
Digestive diseases	3	7	↓ 4
Unintentional injuries	7	8	↓ 1
Other non-communicable	11	9	↑ -2
Other COVID-19 outcomes		10	
Self-harm & Violence	10	11	↓ 1
Transport Injuries	9	12	↓ 3
Substance Use	12	13	↓ 1
Enteric infections	19	14	↑ -5
Maternal & neonatal	13	19	↓ 6
HIV / AIDS & sexually transmitted infections	14	20	↓ 6

Source: IHME GBD Compare.

The high burden of CVD in European countries, and its health and economic impacts, have been the topic of previous work by international organisations and research institutes (Health Systems Innovation Lab at Harvard University, 2022^[7]; OECD/The King's Fund, 2020^[1]; OECD, 2025^[8]; OECD/European Commission, 2024^[9]). However, better understanding the burden and causes of trends in CVD prevalence and mortality needs to take account of the linkages between CVD and other conditions – e.g. influenza and pneumonia, COVID-19, diabetes, serious mental illness and drug overdoses – that increase the risk of dying from a CVD (OECD/The King's Fund, 2020^[1]). On 3 December 2024, the EU Council of Ministers adopted Council Conclusions on the Improvement of Cardiovascular Health in the EU, mandating the European Commission to take decisive action on cardiovascular health (Council of the European Union, 2024^[10]).

This chapter examines the burden and impact of CVD on European health systems and people's lives. It begins by providing an overview of how CVD affects population health and health service use across Europe. The chapter then turns to mortality patterns, presenting comparative data at the European level, with a focus on gender and geographic disparities. The analysis covers not only overall CVD mortality but also delves into two key components: ischaemic heart disease (IHD) and stroke (cerebrovascular disease) (see Box 2.1). Subsequent sections explore the social and economic inequalities associated with CVD, with disaggregated data by gender, education, income, and ethnicity wherever available. The chapter concludes with an assessment of the economic impact of CVD on European countries, highlighting the costs to health systems and society overall.

Box 2.1. Definitions of Cardiovascular Disease, Ischaemic Heart Disease and Stroke

Among CVD, the main causes of mortality relate to ischaemic heart diseases (i.e. diseases that involve reduced blood flow to the heart, including acute myocardial infarctions also commonly called heart attacks) and cerebrovascular diseases (strokes), which together accounted for over half of all deaths from circulatory diseases.

Cardiovascular Disease (CVD)

CVD refers to a class of diseases that affect the heart and blood vessels. It includes conditions such as coronary artery disease, cerebrovascular disease, rheumatic heart disease, peripheral arterial disease, and other disorders of the cardiovascular system. CVD is the leading cause of death globally and is largely preventable through lifestyle changes and effective management of risk factors such as hypertension, smoking, diabetes, and high cholesterol. Some data in this report refers to circulatory diseases. Circulatory diseases refer any condition affecting the circulatory system, which comprises the heart, arteries, veins, and capillaries – so it includes all CVDs and blood disorders.

Ischaemic Heart Disease (IHD)

Ischaemic heart disease, also known as coronary artery disease, is a type of CVD caused by narrowed heart arteries, which leads to reduced blood flow to the heart muscle. This can result in chest pain (angina), heart attacks (myocardial infarction), or heart failure. It is one of the most common types of CVD.

Acute myocardial infarction (AMI), generally known as a heart attack, is a serious medical condition that occurs when a plaque suddenly blocks the blood supply in a major branch of the coronary artery.

Stroke/Cerebrovascular Disease

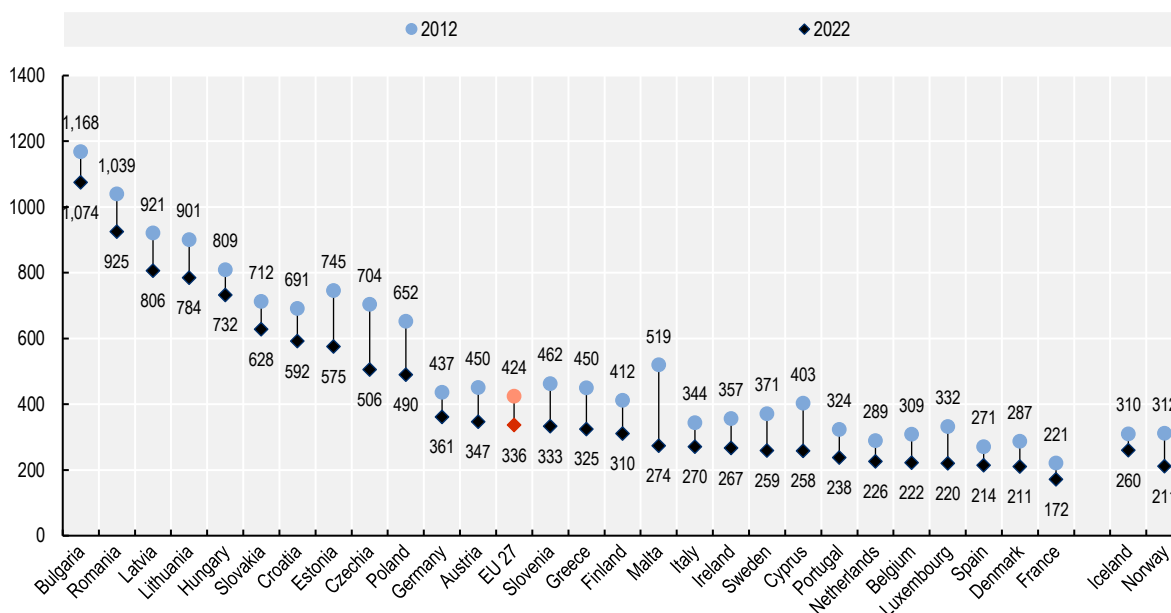
A stroke occurs when the blood supply to part of the brain is interrupted or reduced, preventing brain tissue from getting oxygen and nutrients. It can be ischaemic (due to a blocked artery) or haemorrhagic (due to a ruptured blood vessel). Stroke is a major cause of death and disability worldwide.

2.2. CVD related mortality increased in many EU countries during the COVID-19 pandemic, most significantly in countries with high CVD mortality before pandemic

Between 2012 and 2022, mortality from circulatory diseases fell in every EU member state, with an average decline of 20% among men and 22% among women. Nevertheless, large differences persist while countries like France, Denmark or Spain reported rates below 220 deaths per 100 000 population in 2022, Bulgaria, Romania, Latvia still exceeded 800 deaths per 100 000. As shown in Figure 2.1, countries in Central and Eastern Europe experienced smaller reductions compared to Western and Southern European countries, contributing to a persistent – and in some cases widening – Central/East-West European mortality gap.

Figure 2.1. CVD mortality fell overall between 2012 and 2022, though gains have been slower than in previous decades

2022-2012 change in CVD age-standardised mortality rates (ASMRs)



Note: EU27 average is weighted.

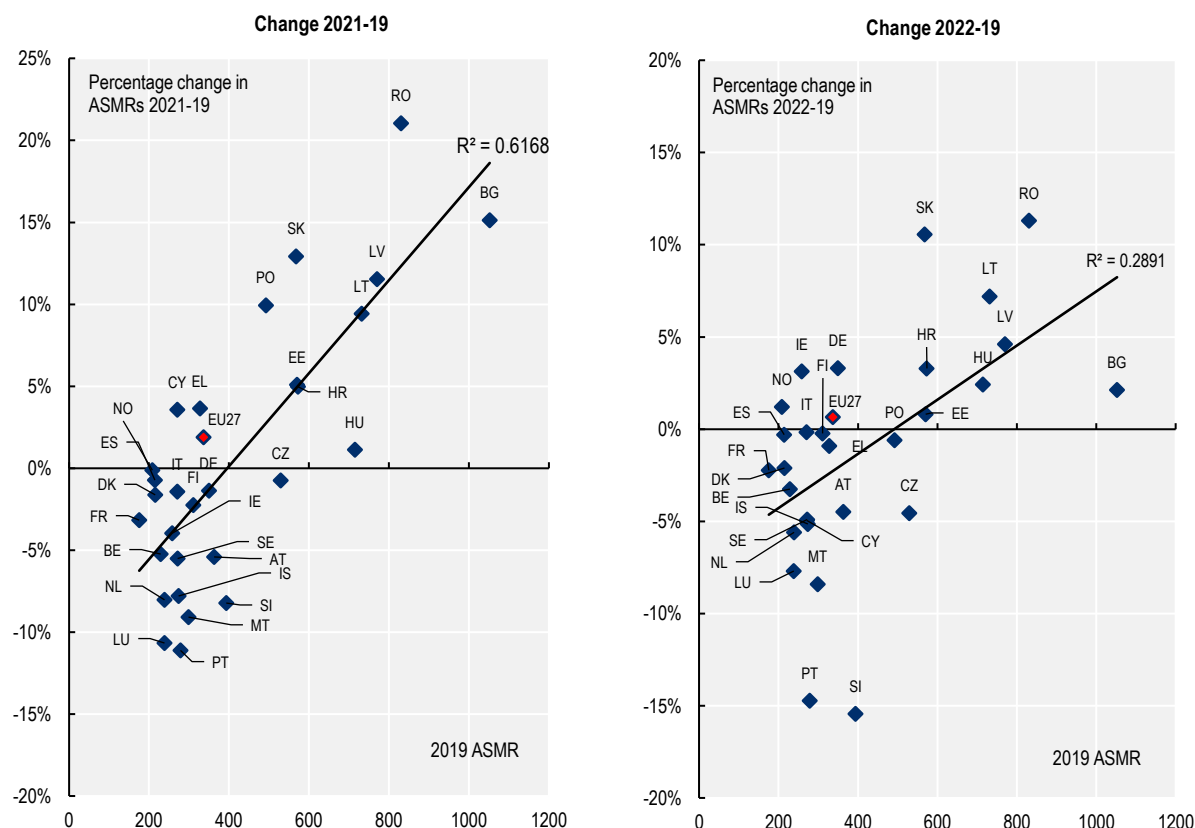
Source: Eurostat (hlth_cd_asdr2), 2025.

However, this progress was disrupted during the COVID-19 pandemic. Countries with higher pre-pandemic CVD mortality in 2019 experienced the largest percentage increases in age-standardised mortality rates (ASMRs) between 2019 and 2021, with rises ranging from 10% to 21% in countries such as Romania, Bulgaria, and Latvia. By contrast, countries with already lower pre-pandemic mortality – mostly in Western and Southern Europe – showed smaller increases or even continued declines. This divergence further widened regional inequalities in CVD mortality across the EU. It should be noted that these trends are influenced not only by changes in CVD outcomes, but also by the direct impact of COVID-19 mortality, possible disruptions to health services, and other competing risks.¹ For example, between 2019 and 2021, the mortality gap between Bulgaria and France increased from 6-fold to 7-fold among men, and from 6-fold to 8-fold among women. This pattern, clearly shown in the left panel of Figure 2.2, a scatter plot comparing pre-pandemic mortality levels to the percentage change during the pandemic, underscores both persistent inequalities and the disproportionate impact of recent health crises on countries with higher baseline.

The right panel of Figure 2.2 extends this analysis to 2022. While some Central and Eastern European countries, such as Romania and Latvia, still exhibit elevated CVD mortality, the overall increases in 2022 are generally lower than those seen in 2021. Moreover, several Western and Southern European countries – including Portugal, Malta and Luxembourg – now show reductions in CVD mortality relative to 2019. This suggests that, despite the severe disruption experienced in the first two years of the pandemic, health systems across the EU have begun to recover, with improved continuity of care and the resumption of preventive services contributing to better cardiovascular outcomes. The contrast between 2021 and 2022 highlights not only the immediate strain imposed on health systems but also their capacity for adaptation and recovery. Nonetheless, these trends reinforce the need for sustained investment in resilient health systems that can protect vulnerable populations and mitigate the long-term impacts of future health crises.

Figure 2.2. CVD mortality increased between 2019-2021, particularly in countries with higher levels of pre-pandemic CVD mortality

2022/21-2019 change in CVD age-standardised mortality rates (ASMRs) in relation to 2019 rates



Note: EU27 average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

The significant burden and existing inequalities associated with CVD were exacerbated by the COVID-19 pandemic, as CVD is a major risk factor for severe COVID-19 infection, hospitalisation and death (Bae et al., 2020^[11]; Health Systems Innovation Lab at Harvard University, 2022^[7]; Regional Health– Europe, 2021^[12]). Furthermore, the pandemic disrupted the delivery of healthcare services for people with non-COVID-19 conditions, and delays in people seeking care as a result of the pandemic, impacted adversely on health outcomes for people living with CVD (Regional Health– Europe, 2021^[12]; OECD, 2021^[13]; Khan et al., 2023^[14]). For example, during the early months of the pandemic hospital admissions for cardiovascular events, including acute myocardial infarction and stroke, fell by 40% or more in many countries, including Austria, France, Germany, Greece, Spain, the United Kingdom and the United States; there was also evidence of an increase in case fatality and complication rates for myocardial infarction (OECD, 2021^[13]). In the United Kingdom almost half a million fewer people initiated antihypertensive treatment from March 2020 to May 2021 compared to 2019 (CVD-COVID-UK Consortium, 2023^[15]).

Excess mortality overall during the pandemic was highest in some Central and Eastern European countries (Pizzato et al., 2024^[16]), caused largely by COVID-19, but the concurrent rise in CVD mortality in these countries will have contributed to this. The interactions between COVID-19 and the cardiovascular system are multiple, with direct and indirect effects on the cardiovascular system leading to numerous and life-threatening cardiovascular complications e.g. myocardial infarction, heart failure, Takotsubo

cardiomyopathy, myocarditis and arrhythmias (Krishna et al., 2024^[17]; Regional Health– Europe, 2021^[12]). Since 2019, life expectancy in most EU countries has reverted to or is higher than pre-pandemic levels as of 2023, healthcare systems need to be vigilant and have good surveillance and monitoring systems. COVID-19 is still claiming lives and the CVD impacts of Long COVID will continue to be felt in the coming years. The interactions between CVD and COVID-19 and other respiratory diseases including influenza remain an ongoing concern for healthcare systems in the EU, as the severity and spread of these respiratory viruses can vary from year to year, highlighting the need for continued surveillance and monitoring, stronger integration of public health and cardiovascular care strategies, and investment in resilient health systems capable of protecting vulnerable populations during future crises.

2.2.1. CVD mortality rates differ significantly across EU: By seven-fold for men, and eight-fold for women

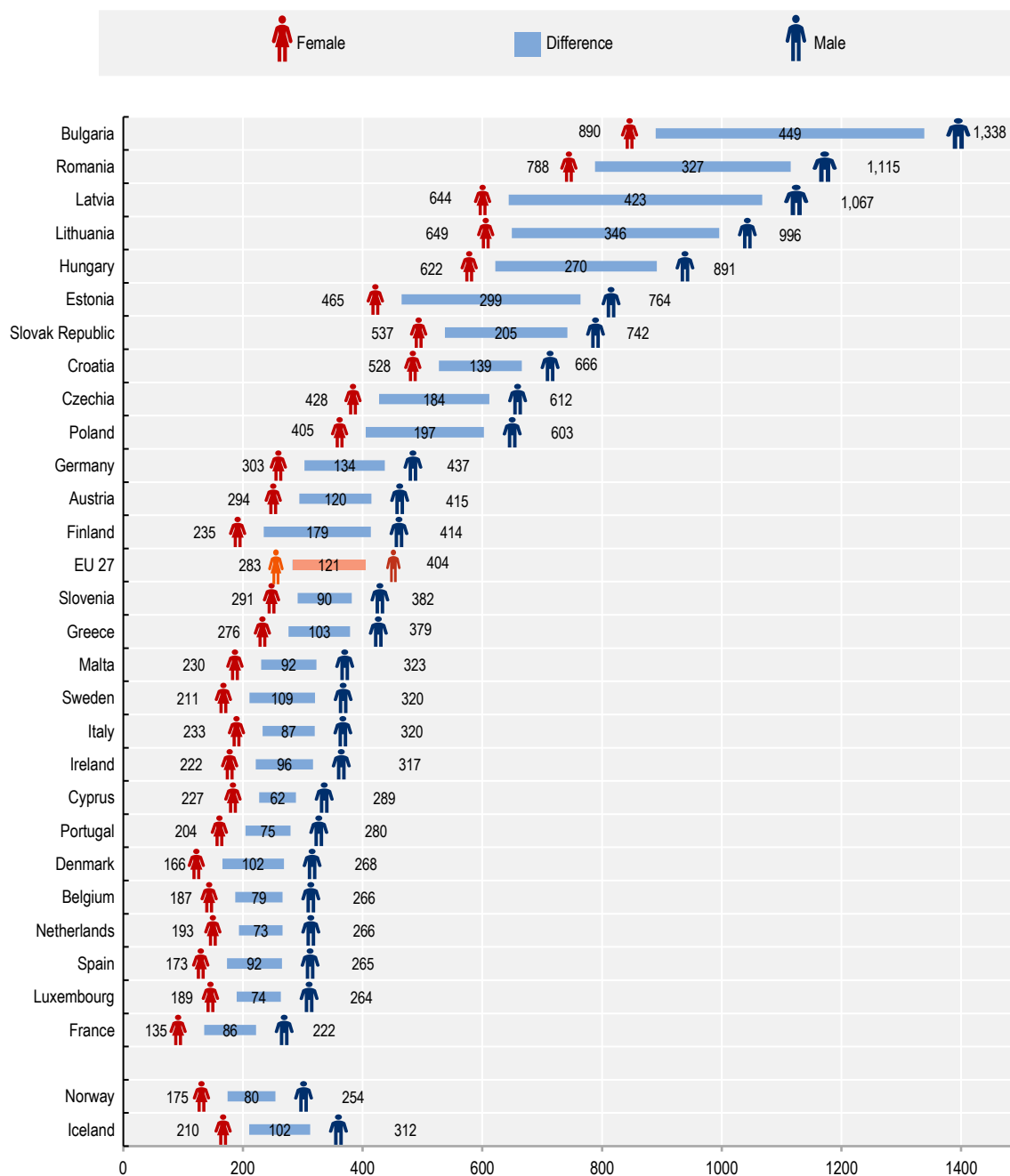
EU countries differ vastly in the magnitude of cardiovascular mortality, with Central and Eastern European countries experiencing both higher rates and younger ages at death; the CVD mortality burden is highest in northeastern Europe (Bugiardini, 2023^[18]; Cenko et al., 2023^[19]). These countries also have the highest overall burden of CVD (in terms of incidence, mortality, DALYs) among people aged 55 and over (Cenko et al., 2023^[19]).

In 2022, the EU average age-standardised mortality rate (ASMR) for circulatory disease was 404 and 283 per 100 000 population for males and females respectively. The rates ranged from 222 and 135 per 100 000 population in males and females respectively in France to 1 338 and 890 in males and females respectively in Bulgaria, a six to seven-fold variation (see Figure 2.3). This large gap is characteristic of a more general geographical pattern across the EU, with higher rates in Central and Eastern European countries. For example, male and female ASMRs rates were four times higher in Romania, Latvia and Lithuania than in Norway, Spain and Luxembourg.

In most EU countries, the mortality rate from circulatory diseases is about 26-60% higher in males than in females (the EU average being 43%) except in Finland, Latvia, Estonia, France and Denmark where it is over 60% higher. Although CVD mortality rates are higher in males than in females in all EU countries, as in most countries globally, in all EU countries CVD claims a larger number of lives in females than in males; it also claims a larger proportion of total deaths in females than in males (ESC EU 27 Cardiovascular Realities, 2025^[4]). This may seem counterintuitive at first but is a result of longer life expectancy in women. The proportion of total deaths attributable to CVD is higher in Central and Eastern European countries than in Western European countries, especially among females. In Estonia, Hungary, Lithuania, Latvia, Romania and Bulgaria half to two-thirds of total deaths among females are attributable to CVD.

Figure 2.3. CVD Age-Standardised Mortality Rates reveal persistent regional inequalities in Europe

CVD ASMRs per 100 000 population, 2022



Note: EU27 average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

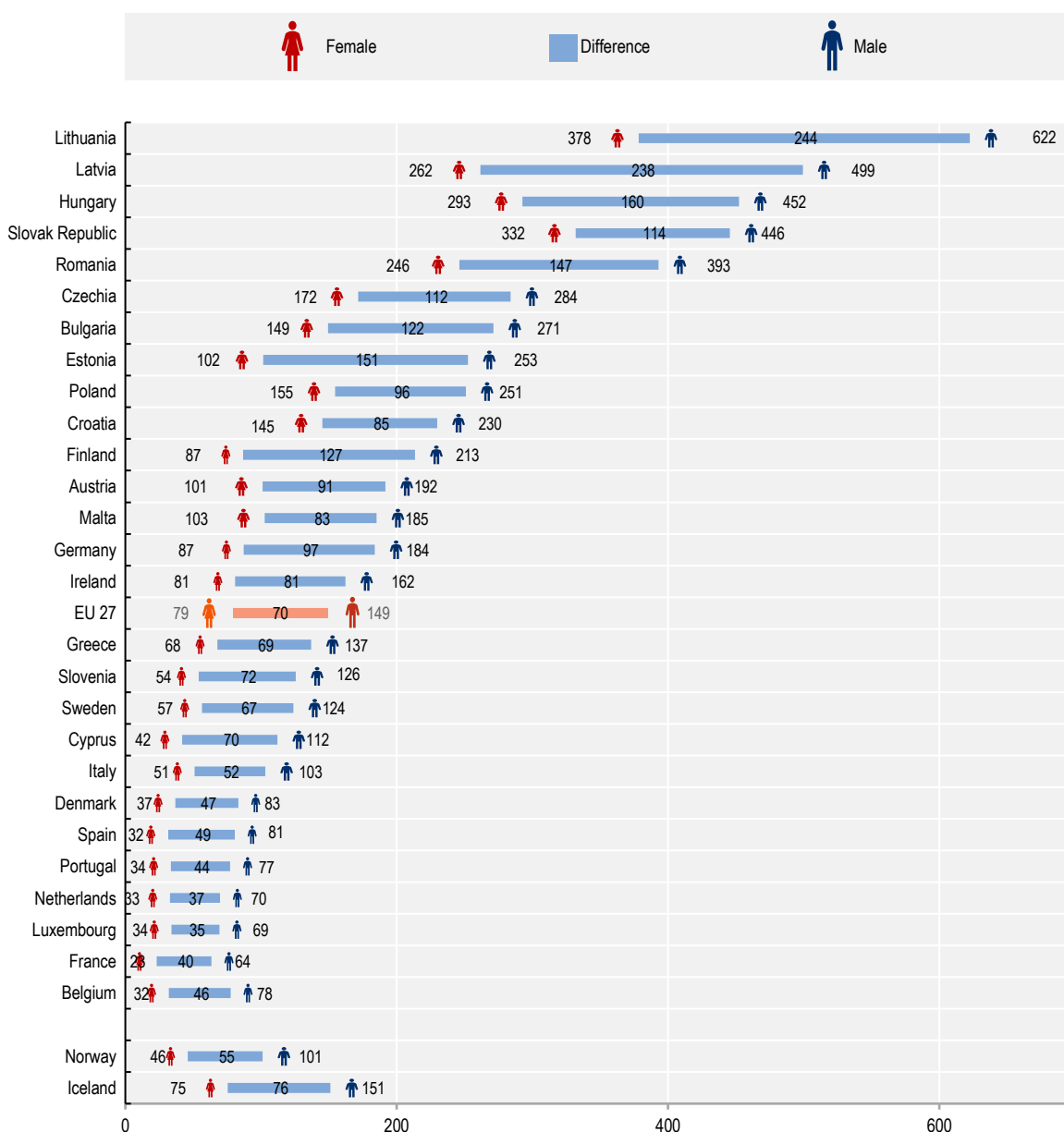
In the EU, mortality from CVD, IHD and stroke is higher in males than in females in each case (OECD/European Commission, 2024^[9]; Peters and Woodward, 2022^[20]). Mortality rates from IHD showed wider differentials by sex (a 10-fold variation in males and 16-fold variation in females) than mortality from circulatory diseases overall. The average mortality rate for males in the EU was almost double the rate in females (Figure 2.4). The sex differential in mortality from IHD was greater in Western and Southern European countries than in Central and Eastern European countries: in the former mortality from IHD was about 2-2.2 times higher in males than in females, whereas in the latter it was 1.6-1.8 times higher. Hence Central and Eastern European countries have both higher IHD mortality rates and a smaller differential in mortality rates between males and females compared with Western and Southern EU countries.

Mortality rates from stroke showed smaller differentials by sex than mortality from IHD and circulatory diseases overall, the average for the EU being 24% higher mortality in males than females (Figure 2.5). The male-female differentials also showed less regional variation, with little or no difference in male and female mortality rates from stroke in Ireland, Iceland and the Netherlands and a moderate excess of male mortality of about 30% or less in most Western European countries. In several Central and Eastern European countries male mortality rates from stroke exceeded female mortality rates by 30-50%, like the case of Bulgaria.

Higher CVD mortality in Central and Eastern European countries is attributed to the higher prevalence of smoking, obesity, harmful alcohol consumption, physical inactivity and differences in the efficacy of public health policies and quality of care (Sørensen and Bredahl Kristensen, 2023^[21]; Wang et al., 2023^[22]). Life expectancy in these countries is significantly lower than that in the rest of Europe, largely due to the high burden of CVD (Cenko et al., 2023^[19]; Steel et al., 2025^[5]). In Western and Southern European countries, there have been substantial declines in CVD mortality rates in recent decades.

Figure 2.4. IHD mortality rates vary 8 to 10-fold between EU countries for men and women, respectively

IHD ASMRs per 100 000 population, 2022

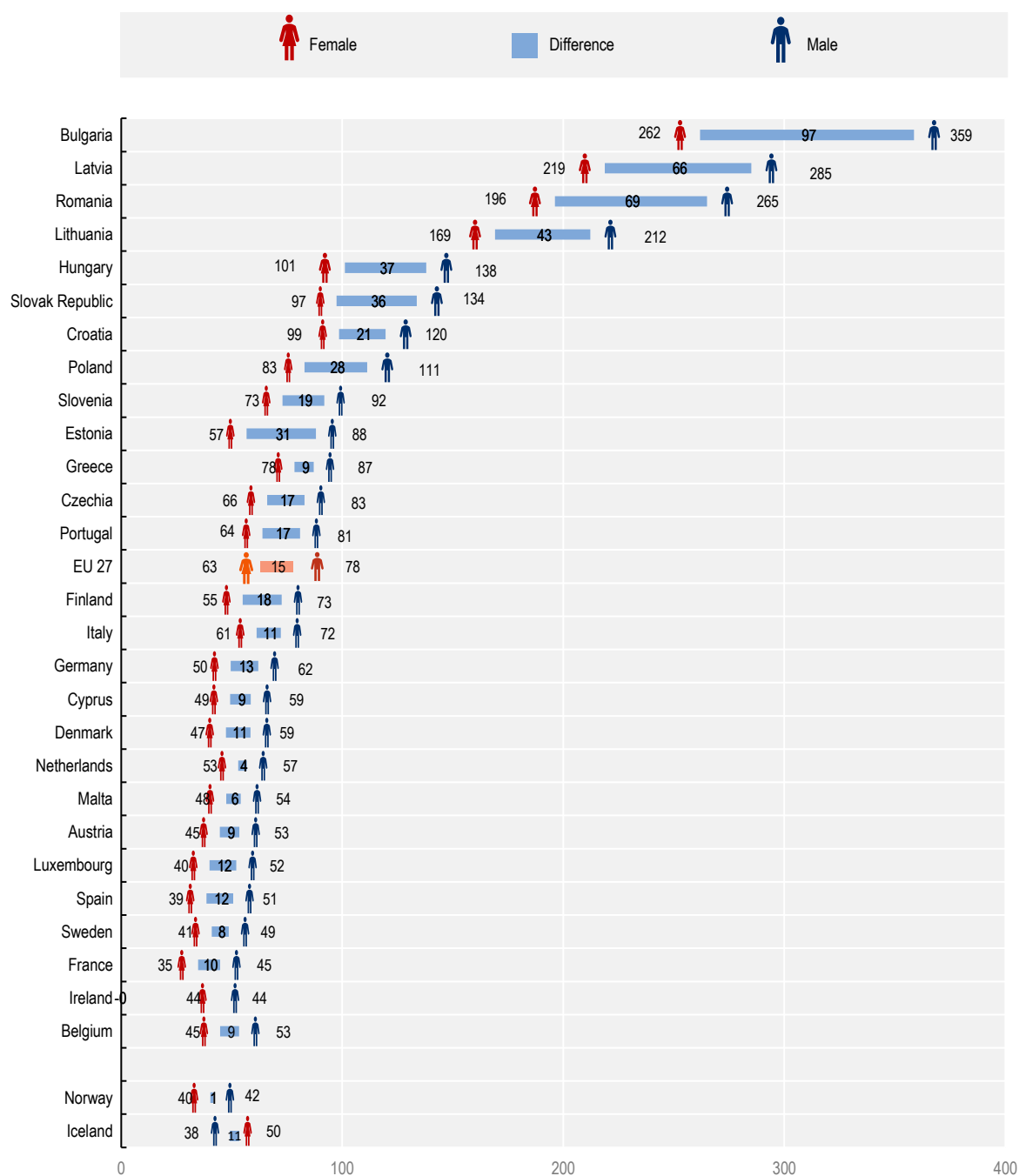


Note: EU27 average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

Figure 2.5. Stroke mortality rates vary 10-fold between EU countries for both men and women

Stroke ASMRs per 100 000 population, 2022



Note: EU27 average is weighted.

Source: Eurostat (hlth_cd_asdr2), 2025.

Figure 1 plots male-to-female mortality ratios against 2022 ASMRs for IHD and stroke. For IHD, a clear negative association is observed ($R^2 = 0.52$): countries with higher overall IHD mortality tend to show smaller male-to-female mortality ratios, meaning that the gender gap narrows as total mortality increases. In countries where IHD mortality is relatively low – such as France, Cyprus and Spain – men are

disproportionately more affected than women. In contrast, countries with high IHD mortality, such as Hungary, Lithuania and the Slovak Republic, record lower male-to-female ratios, suggesting that the relative excess mortality among men diminishes as overall mortality rises. This pattern implies that while IHD remains a leading cause of death for both sexes, the relative disadvantage for men is greatest in countries that have already achieved low levels of IHD mortality. This highlights the need to continue reducing male IHD mortality across the EU – particularly in Central and Eastern European countries – while also addressing the persistently high levels of female IHD mortality in those same settings, as reflected in the smaller gender gaps.

For stroke, the association between overall mortality and male-to-female ratios is weaker and slightly positive ($R^2 = 0.15$). Countries with higher stroke mortality, such as Bulgaria, Romania and Latvia, tend to have somewhat larger gender gaps, whereas those with lower mortality, including Norway, Greece and the Netherlands, show narrower differences. However, the range of sex ratios for stroke is small (all below 1.4), indicating that gender disparities are modest and not systematically related to overall mortality levels. This likely reflects differences in the age profile and clinical nature of stroke compared with IHD, where sex-related mortality patterns are more pronounced.

These patterns provide valuable insights for cardiovascular health policy, underscoring the importance of a stronger focus on IHD among men across the EU. This is particularly urgent given that IHD accounts for nearly one-third of all CVD deaths, many of which are attributable to modifiable and preventable risk factors (Cherla et al., 2024^[23]). At the same time, the lower male-to-female mortality ratios observed in countries with high IHD mortality – such as those in Central and Eastern Europe – suggest that female IHD mortality in these settings is unduly high relative to that of men. This points to the need for prevention and early detection efforts to address both sexes. Furthermore, IHD remains a major contributor to the excess mortality observed in Central and Eastern European countries, highlighting the need for more targeted prevention, early detection, and intervention strategies. Beyond mortality, the broader health consequences of both IHD and stroke should also be considered. Stroke, in particular, can have devastating long-term effects on mental well-being, often leading to behavioural changes, cognitive impairment, and conditions such as memory loss and dementia (Rost et al., 2022^[24]).

Figure 2.6. Sex differences in cardiovascular mortality are greater for IHD than for stroke, and show a strong negative association with IHD mortality rates



Note: EU27 average is weighted.

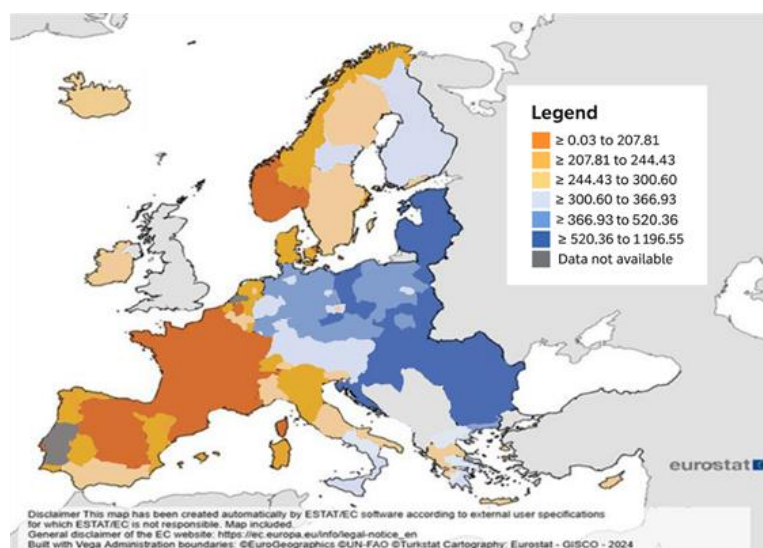
Source: Eurostat (hlth_cd_asdr2), 2025.

2.3. There are large geographical disparities in CVD mortality across EU countries

As highlighted in the previous section, the burden of CVD morbidity and mortality varies significantly between EU countries (ESC Cardiovascular Realities, 2024^[2]), with countries in Central and Eastern Europe experiencing significantly higher rates compared with Western European countries (Mensah et al., 2023^[25]), with the highest CVD disease burden is reported for countries in Northeastern Europe (Cenko et al., 2023^[19]). Mensah et al. note from the GBD study that age-standardised mortality rates for CVD among countries in Central Europe ranged from 132.6 to 581.4 per 100 000 in 2022; a 4.4-fold difference (Mensah et al., 2023^[25]). They note that the variation among countries in Central and Eastern Europe ranged from 215.0 to 553.0 per 100 000, a 2.6-fold difference, and among Western European countries the 2.5-fold difference was similar (ranging from 80.2 to 199.9 per 100 000).

The geographic distribution of CVD mortality across Europe reveals significant regional disparities (Figure 2.7). Western and Southern European regions, including much of France, Spain, and parts of Italy, exhibit the lowest mortality rates, generally falling below 244.43 deaths per 100 000 population. These areas are represented in lighter orange shades, suggesting relatively effective public health interventions, better access to preventive care, and healthier lifestyle patterns. In contrast, Central and Eastern European regions – particularly in countries such as Bulgaria, Romania, and parts of the Baltic states – show significantly higher mortality rates, often exceeding 520.36 deaths per 100 000, as indicated by dark blue shading. These disparities may reflect systemic differences in healthcare infrastructure, socio-economic conditions, and the prevalence of risk factors such as smoking, poor diet, and limited physical activity. Several countries also display considerable variation between regions and intra-national disparities. For instance, while northern Italy shows relatively low CVD mortality, southern regions tend toward higher rates. Similarly, in Germany, regional differences suggest that national averages may obscure localised cardiovascular health challenges.

Figure 2.7. CVD continues to drive excess mortality in Central and Eastern European countries



Note: Data represent standardised death rates (SDR) per 100 000 inhabitants due to diseases of the circulatory system (ICD-10 I00–I99) by NUTS 2 region of residence, sourced from Eurostat. The SDRs follow Eurostat's standard age-standardisation method using the European Standard Population (2013). Data for Portugal are incomplete due to a mismatch between Eurostat's NUTS-2021-based indicator and Portugal's use of NUTS-2024 for 2022 data. This affects only regional breakdowns.

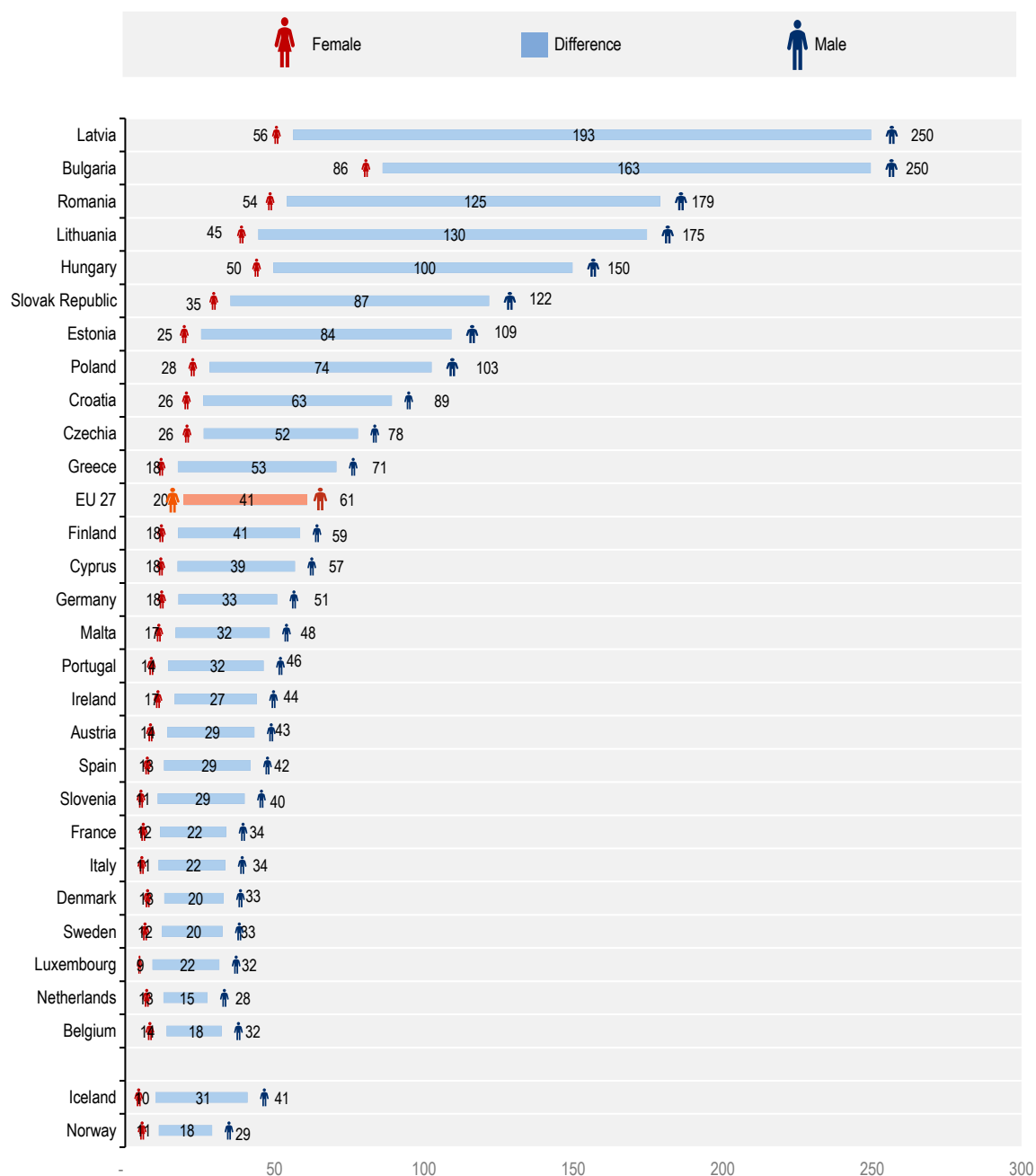
Source: Eurostat (hlth_cd_asdr2), 2022.

2.4. Premature and avoidable mortality from CVD shortens working lives

Premature mortality (deaths below a specified age limit) refers to deaths that occur at a younger age than expected and is often used as a measure of the burden of potentially preventable deaths and for assessing the effectiveness of public health and healthcare systems. It also has consequences for economic costs and the loss of productivity because of working lives cut short. The age limit used differs between data sources; for the Eurostat data discussed here the age limit is 65 years (some data sources use 70 or 75 years as the upper limit). Because of the small number of premature deaths in countries with smaller populations, the discussion below is limited to EU countries with larger populations. In 2022, the average mortality rate from CVD at ages under 65 for the EU was 61 and 20 per 100 000 population in males and females respectively (Figure 2.8). Mortality rates showed a 6- to 9-fold variation in mortality in males between some Central and Eastern European countries (e.g. Bulgaria, Latvia, Romania) and Western European countries (e.g. Norway, the Netherlands, Belgium). The range was more moderate in females at 4- to 8-fold.

Figure 2.8. The CVD mortality rate for men under age 65 is more than three times that for women in the same age category

CVD ASMRs under 65, 2022



Note: EU27 average is weighted.

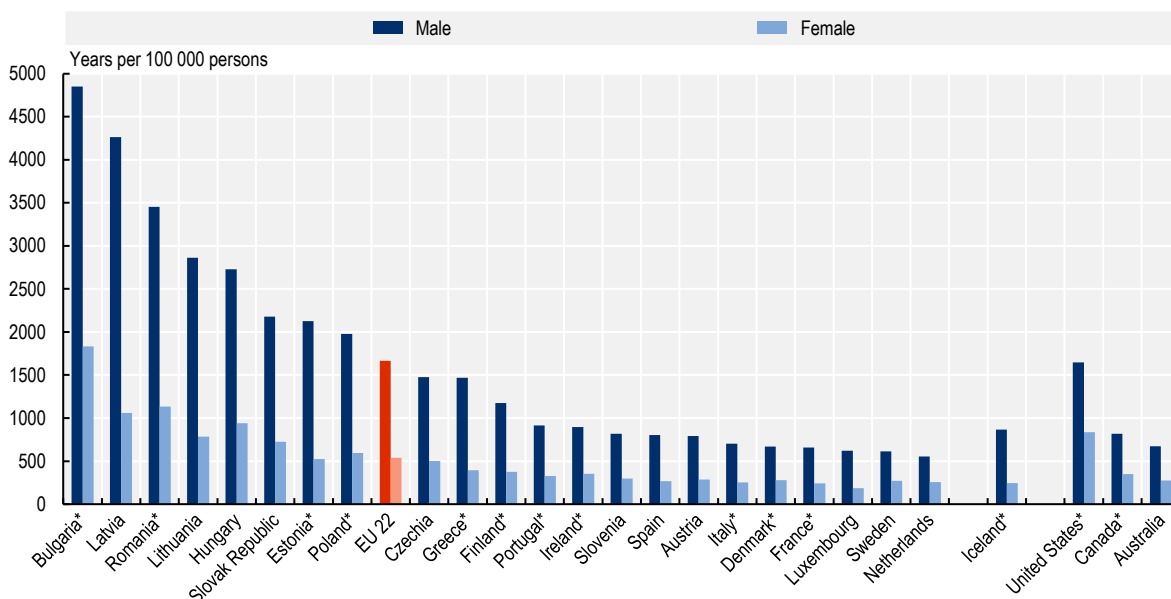
Source: Eurostat (hlth_cd_asdr2), 2025.

The excess of male over female mortality rates for CVD is significantly greater at ages under 65 compared to all ages. During the 2012-2022-decade, premature mortality from CVD fell by an average for the EU of 20% in males and 23% in females, although there were large variations between countries. As already mentioned, premature CVD mortality increased in several EU countries during 2019-2021, reflecting the impact of the pandemic, the increases being largest in some Central and Eastern European countries (Lithuania, Latvia, Romania, Bulgaria) (Cherla et al., 2024^[23]).

2.4.1. Over 60 million potential years of life lost are attributable CVD each year in

Deaths from CVD in those aged <70 years, commonly referred to as premature, are a particular concern, with more than 60 million potential years of life lost to CVD in Europe annually (Townsend et al., 2021^[26]). Potential years of life lost (PYLL) is a summary measure of premature mortality, providing an explicit way of weighting deaths occurring at younger ages, which may be preventable. The upper limit used for calculating PYLLs varies depending on the data source. Between 1995 and 2020, avoidable deaths from CVD in the European Union declined markedly, though disparities remain. Using WHO mortality data and OECD/Eurostat definitions, 11.4 million avoidable CVD deaths – mainly due to IHD – accounted for over 213 million potential years of life lost. Mortality reductions were substantial (–57%) but uneven across sex, age, and regions, with persistent though narrowing gaps between males and females and between Eastern and Western Europe (Cherla et al., 2024^[23]). PYLL from CVD also shows large gender gaps, with men consistently experiencing higher premature mortality than women. On average, men in EU countries lose 1 664 years and women lose 540 years of life annually per 100 000 population due to CVD (Figure 2.9). In Bulgaria, men lose 4 848 years per 100 000 population, more than twice the 1 831 years lost by women. Similar patterns are seen in Latvia (4 262 vs. 1 059), Romania (3 451 vs. 1 132) and Lithuania (2 861 vs. 785).²

Figure 2.9. On average, men in EU countries lose 1 664 years and women lose 540 years of life annually per 100 000 population due to CVD



Note: EU22 average is unweighted. Data from 2023. Countries marked with an asterisk (*) are represented with 2022 data.

Source: OECD, 2025.

2.4.2. CVD mortality is a major factor slowing life expectancy gains

Between 1990 and 2011, reductions in deaths from CVD and cancers led to substantial improvements in life expectancy in European countries and the United Kingdom (Steel et al., 2025^[5]). In 2018, OECD reported on the slowdown in improvements in life expectancy in many European countries after 2011 and called for further analysis to better understand the relative contributions of different factors (Raleigh, 2019^[27]). Evidence now shows that deaths from CVD were the primary driver of the reduction in life expectancy improvements seen across Europe between 2011-2019 (OECD/The King's Fund, 2020^[1]; Steel et al., 2025^[5]).

The COVID-19 pandemic caused life expectancy to fall between 2019-2021 in most but not all European countries. Increases in CVD mortality will have contributed to these falls in life expectancy. The countries that best maintained gains in life expectancy after 2011 (Norway, Iceland, Sweden, Denmark and Belgium), maintained or boosted life expectancy even during the pandemic; these countries had fewer heart disease and cancer deaths (Steel et al., 2025^[5]). Although by 2023 life expectancy in most EU countries had recovered to or exceeded the pre-pandemic 2019 level, as a leading cause of death, trends in mortality from CVD will be a significant determinant of trends in life expectancy in EU countries in the foreseeable future. CVD remains one of the leading health challenges for the EU, especially in the wake of the COVID-19 pandemic.

An analysis of trends in avoidable (preventable and treatable) mortality from CVD at ages under 75 in EU countries between 1995 and 2020 by Cherla et al. found that 11.4 million deaths were avoidable, resulting in 213.1 million potential life years lost (Cherla et al., 2024^[23]). Nearly 2 of every 3 deaths were in males and 2 of every 5 deaths were in working age adults (25-64 years). More CVD deaths were considered treatable (52.3%) than preventable (47.7%). IHD followed by cerebrovascular disease and hypertensive diseases were the leading causes of avoidable CVD mortality, together accounting for 89% of avoidable cardiovascular deaths.

People with CVD face poorer health and well-being outcomes than those with any other chronic disease. CVD is a leading cause of disability and premature death, and the results highlight the broader impact it has on people's lives beyond clinical outcomes. Across all measured dimensions – well-being, social functioning, physical health, and mental health – people with CVD report significantly worse outcomes than their peers without CVD. These findings are consistent with existing literature showing that CVD affects multiple aspects of patients' lives beyond physical symptoms. Physical limitations caused by CVD – such as fatigue, shortness of breath, and reduced exercise capacity – restrict mobility and hinder participation in social and leisure activities, contributing to feelings of isolation and lower social functioning (Mavaddat et al., 2014^[28]). The psychological burden is also substantial: people living with CVD often face increased anxiety and fear of recurrent cardiac events, as well as challenges in adapting to lifestyle changes and long-term medication regimens, all of which can exacerbate depressive symptoms and reduce overall mental health (Borkowski and Borkowska, 2024^[29]). Furthermore, multimorbidity is highly prevalent among CVD patients and is strongly associated with poorer self-rated health and lower quality of life, sometimes even more than the presence of CVD alone (Skou et al., 2022^[30]) (Dunlay and Chamberlain, 2016^[31]). Evidence from OECD also highlights that while improved acute care has reduced mortality, many patients continue to struggle with long-term consequences and ongoing disability (OECD, 2015^[32]).

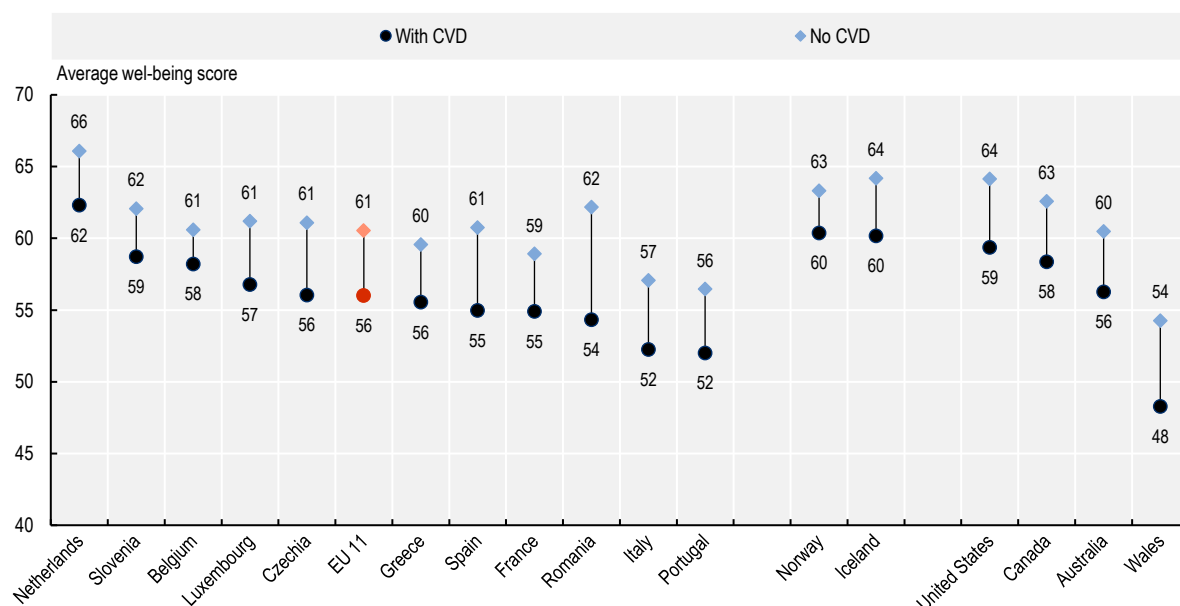
Box 2.2. The OECD Patient-Reported Indicator Survey of People Living with Chronic Health Conditions (PaRIS)

The OECD's Patient-Reported Indicator Surveys took place in 2023/24 and resulted in a dataset of 107 011 patients linked to 1 816 primary care practices across 19 countries: Australia, Belgium, Canada, Czechia, France, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Romania, Saudi Arabia, Slovenia, Spain, Switzerland, the United States and Wales (United Kingdom). The main instrument is a survey among primary care service users aged over 45 years who accessed primary care services in the last six months. An additional survey among their primary care practices collected data on the characteristics of the practices and the primary care services provided.

Source: OECD (2025^[8]), *Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS)*, <https://doi.org/10.1787/c8af05a5-en>.

The PaRIS survey uses a multilevel analysis approach, accounting for differences at the country, primary care practice, and patient levels. Among the PaRIS population living with chronic conditions, we examined four different patient-reported outcome measures (PROMs) – well-being, social functioning, physical health, and mental health – in two groups: those who self-reported having cardiovascular or heart disease, and those who did not. Well-being levels (Figure 2.10) are consistently lower (4.5-point difference for the EU 11 average) among people with CVD. In all countries surveyed, the average well-being score for people with CVD falls below that of people without CVD by several points. This highlights the enduring toll that cardiovascular conditions can take on overall life satisfaction.

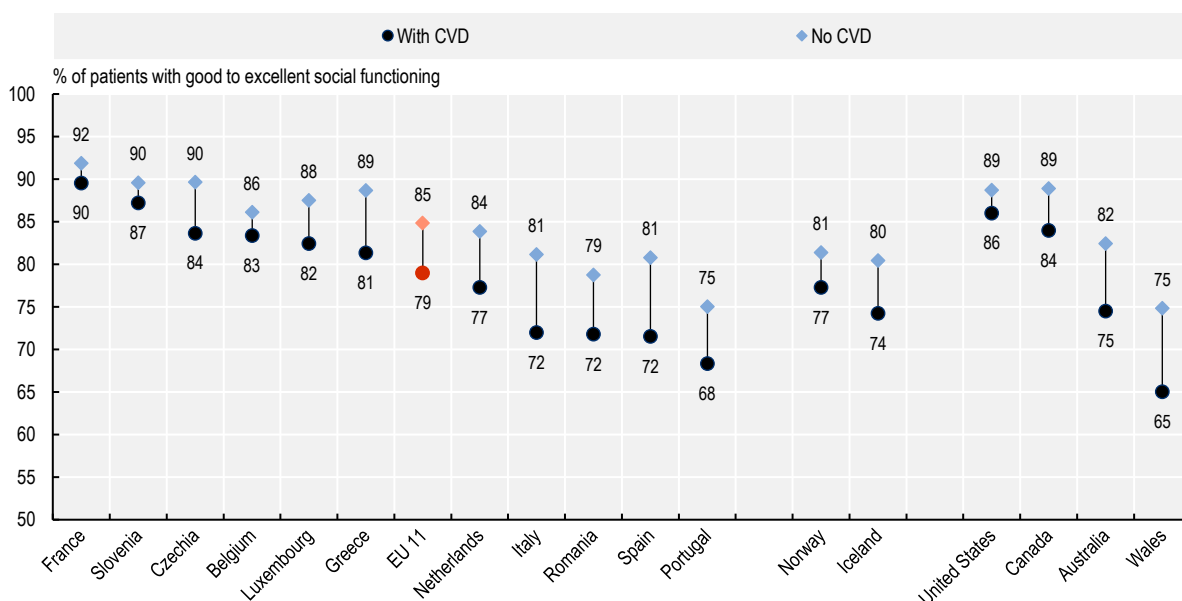
Figure 2.10. Living with CVD is associated with lower levels of well-being among people living with chronic conditions



Note: EU11 average is unweighted. WHO-5 well-being index. Response to five questions measuring well-being. raw scale 0-25 converted to 0-100 scale, higher scores represent higher well-being. *Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. Sorted by people living with CVD. Differences between people living with CVD and people living without CVD are statistically significant ($p < 0.05$) for all countries, except for Belgium and the United States. Source: OECD PaRIS Database, 2024.

Social functioning (Figure 2.11) shows a similar pattern, with people with CVD reporting lower ability to participate in social activities or maintain social relationships (5.8 p.p. difference for the EU 11 average). The gap is especially wide in countries such as Spain, Italy and Greece. Countries such as France and Slovenia report narrower differences, suggesting more inclusive health and social environments for people with CVD.

Figure 2.11. CVD widens the social gap among people living with chronic conditions



Note: EU11 average is unweighted. PROMIS® Scale v1.2 – Global Health. Answer to the question: “In general, please rate how well you carry out your usual social activities and roles [further specified in questionnaire]”, “good, very good or excellent” versus “fair or poor”. *Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. Sorted by people living with CVD. Differences between people living with CVD and people living without CVD are statistically significant ($p < 0.05$) for Czechia, Greece, the Netherlands, Italy, Spain, Canada, Australia, Wales.

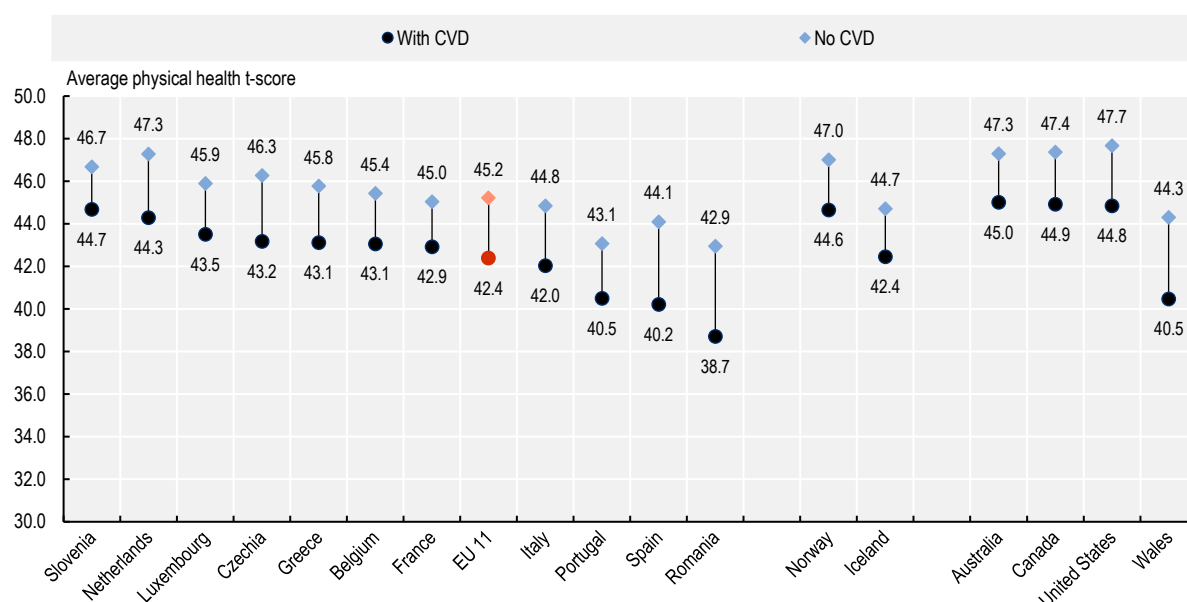
Source: OECD PaRIS Database, 2024.

Physical health (Figure 2.12) is where the gap between those with and without CVD is most marked (1.8-point difference for the EU 11 average). These findings point to the significant physical limitations and daily life constraints experienced by people living with CVD. Likewise, mental health scores (Figure 2.13) also tend to be lower among people with CVD (1.3-point difference for the EU 11 average). The lowest absolute mental health scores for people with CVD are observed in countries such as Italy, Romania and Portugal. These results align with broader research showing higher rates of depression and anxiety among people with cardiovascular conditions, as well as the impact of mental ill health as a risk factor for CVD (see Chapter 3).

I sometimes feel more tired than others, both physically and mentally. I am learning to say 'No' to social events when I don't feel up to it, but I am often worried other people won't understand my point and just think I am lazy and rude. I have decided to ask for a part-time because working 8 hours a day didn't allow me to save energy for other activities such as walks/yoga which I really need to do.

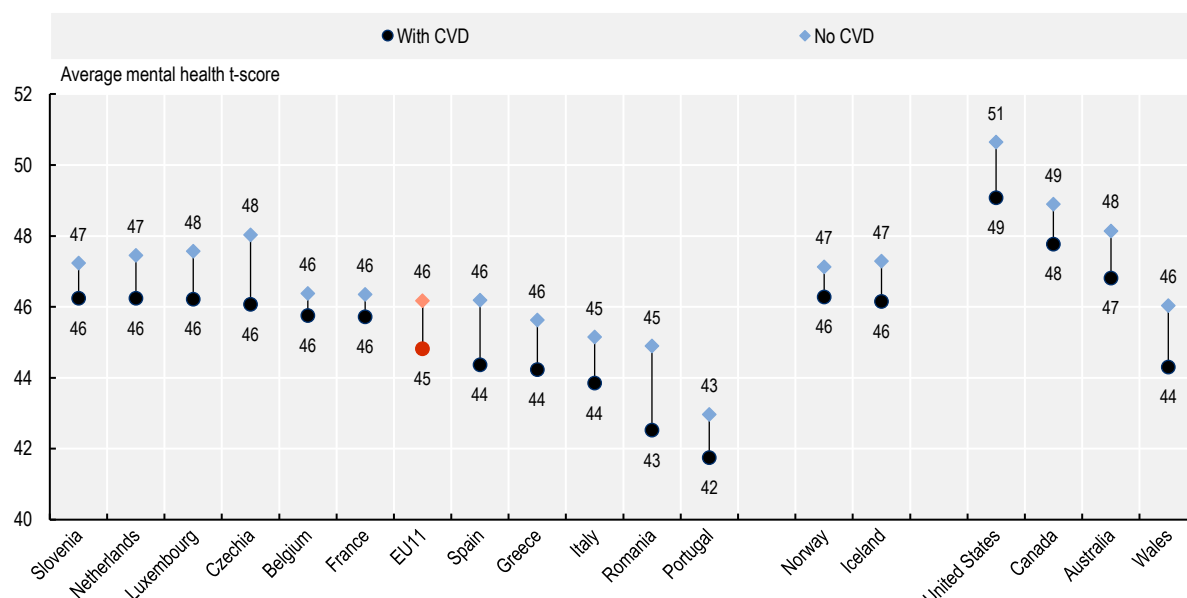
Francesca, 34, female living with hypertrophic cardiomyopathy and an implantable cardioverter-defibrillator.

Figure 2.12. People with CVD report the poorest physical health scores among people living with chronic conditions



Note: EU11 average is unweighted. PROMIS® Scale v1.2 – Global Health component for physical health is based on responses to four questions measuring physical function, pain, and fatigue (response options 1-5). Raw scores (4-20) are converted to a T-score metric, where 50 represents the mean and 10 the standard deviation of the PROMIS reference population, with a range of 16.2-67.7. Higher T-scores indicate better physical health...¹*Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. Sorted by people living with CVD. Differences between people living with CVD and people living without CVD are statistically significant ($p < 0.05$) for all countries, except for the United States. ***Spain had the highest response rate, which may have negatively affected the outcomes due to the broader inclusion of more socially disadvantaged groups.
Source: OECD PaRIS Database, 2024.

Figure 2.13. Mental Health outcomes are slightly worse for people living with chronic conditions who report having CVD



Note: EU11 average is unweighted. PROMIS® Scale v1.2 – Global Health component for mental health is based on responses to four questions on quality of life, emotional distress, and social health (response options 1-5). Raw scores (4-20) are converted to a T-score metric, where 50 represents the mean and 10 the standard deviation of the PROMIS reference population, with a range of 21.2-67.6. Higher T-scores indicate better mental health. *Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. Sorted by people living with CVD. Differences between people living with CVD and people living without CVD are statistically significant ($p < 0.05$) for Czechia, Spain, Romania and Wales.

Source: OECD PaRIS Database, 2024.

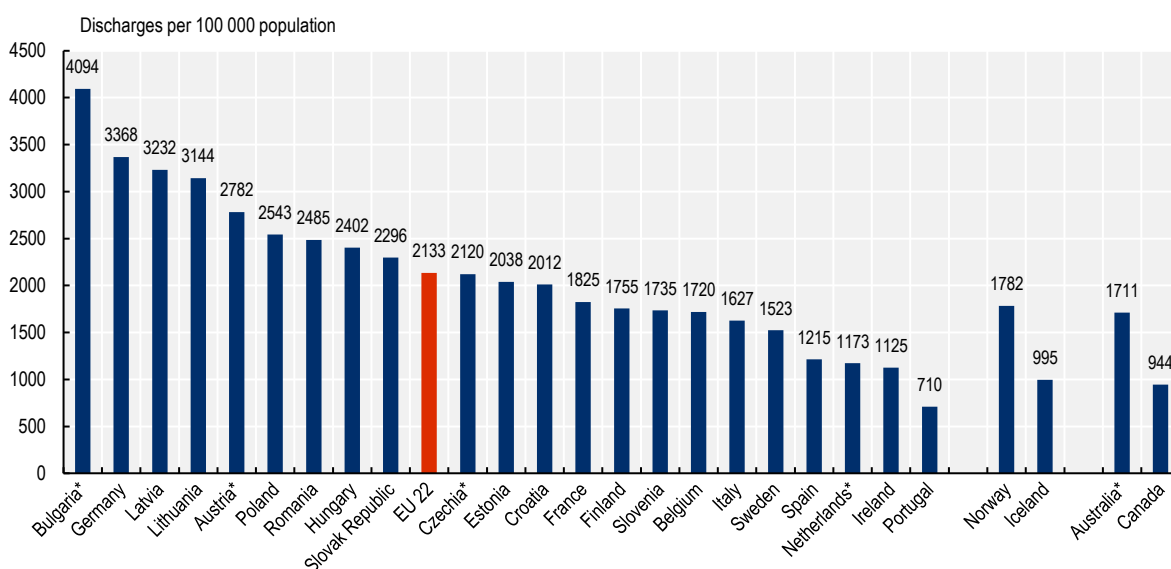
2.5. CVD leads to over 9.2 million hospital admissions across 22 EU countries each year

2.5.1. CVD are the most common cause of hospitalisation in almost all EU countries

Hospital discharge rates are closely linked to other indicators like disease prevalence, severity, and healthcare system efficiency. Higher prevalence of a condition, such as CVD, often leads to more hospital admissions and, consequently, higher discharge rates. High quality healthcare delivery, including early detection and effective primary care management, can reduce hospital admissions and impact discharge rates. Conversely, areas with limited healthcare access may have lower discharge rates due to lower levels of hospital use, higher in-hospital mortality or longer hospital stays.

CVD were the leading cause of hospitalisations across EU Member States in 2023, except for Ireland, Romania and Croatia. In Romania and Croatia, circulatory diseases were the second leading cause of hospitalisation (Eurostat, 2023^[33]).³ In 2023, Bulgaria recorded the highest hospital discharge rate for CVD across OECD countries, with 4 094 discharges per 100 000 population, well above the EU average of 2 133 (Figure 2.14). Germany (3 368) Latvia (3 232) and Lithuania (3 144) also reported high discharge rates, with lowest rates observed in Ireland (1 125), Iceland (995) and Portugal (710).

Figure 2.14. There is significant variation in CVD hospital discharge rates across EU

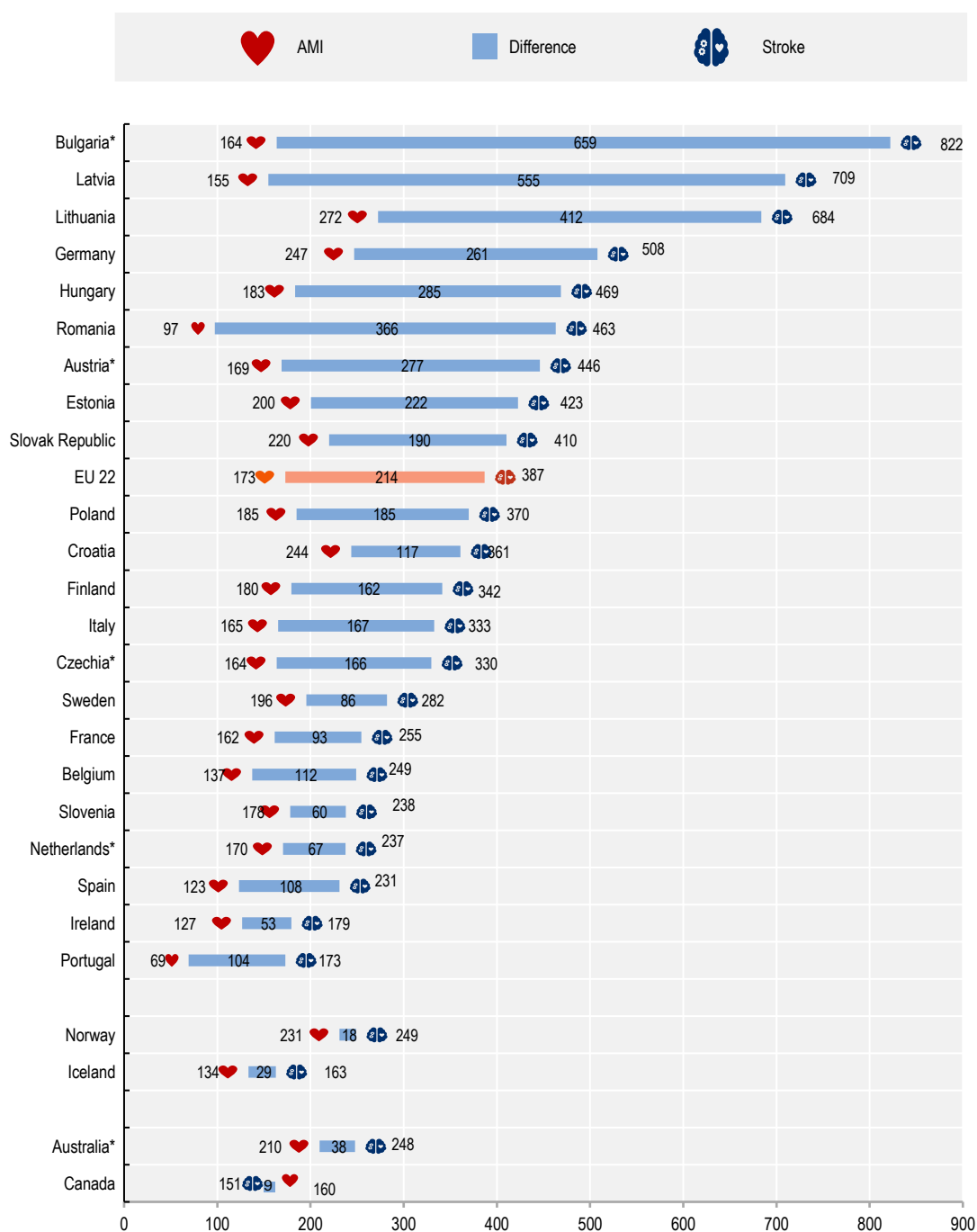


Note: EU22 average is unweighted. Data from 2023. Data for countries with and asterisk (*) refer to the year 2022. Portugal refers to 2024.
Source: OECD, 2025.

Hospital discharge rates for the specific conditions of stroke and acute myocardial infarction (AMI) vary widely across EU countries. Stroke leads to more hospitalisations. In 2023, the EU average stroke discharge rate stood at 387 per 100 000 population – with a five-fold difference between the highest and lowest discharge rate in countries (Figure 2.15). Bulgaria (822) and Latvia (709) reported the highest rates. In contrast, Iceland (163) and Ireland (179) reported substantially lower stroke discharge rates. For AMI, the EU average for hospital discharges in 2023 was 173 discharges per 100 000 population – a rate that differs 4-fold between EU countries. Lithuania reported a markedly higher rate than the EU average of 272, followed by Germany (247). These high figures likely indicate elevated AMI incidence, which may be linked to lifestyle-related risk factors, socio-economic disparities, and limitations in preventive care or early management. Romania (97) and Portugal (69) reported the lowest discharge rates for AMI.

Figure 2.15. Hospital discharges for stroke are double that of AMI

Discharges per 100 000 persons



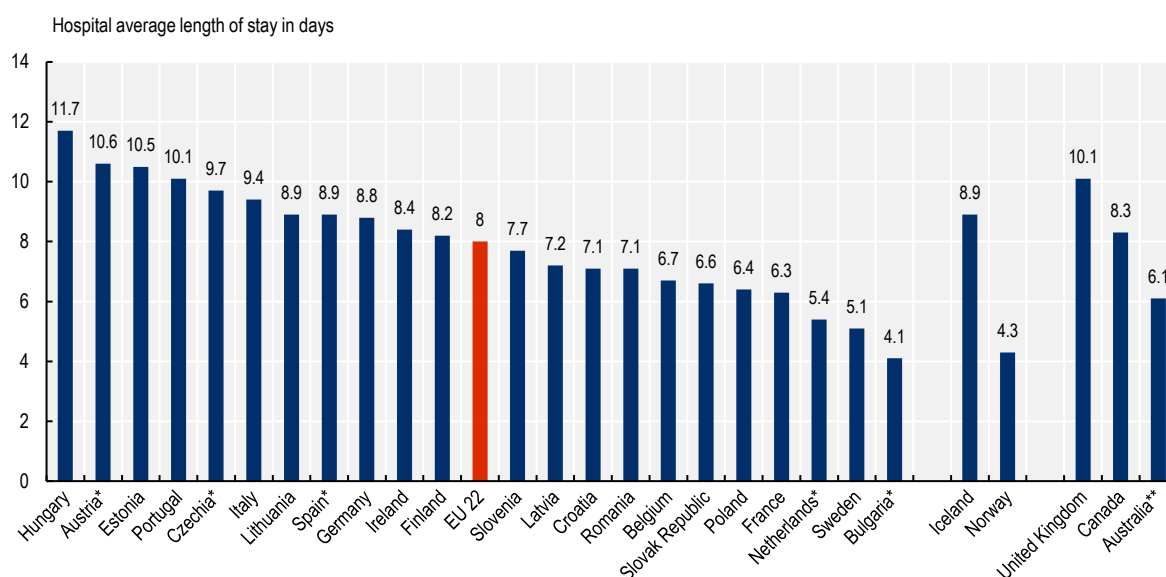
Note: EU22 average is unweighted. Data from 2023. Data for countries with and asterisk (*) refer to the year 2022. Portugal refers to 2024.
Source: OECD, 2025.

2.5.2. In addition to being frequent events, hospital stays for CVD are often extended

Prolonged hospital stays place a significant burden on people leaving with CVD through lost income and reduced quality of life, while also straining healthcare systems and national economies due to high treatment costs and resource needs. The average length of stay for patients hospitalised with CVD varies based on factors such as disease severity, treatment type, patient demographics, and health system design, varying significantly across EU countries, averaging eight days in the EU (Figure 2.16). In 2023, countries such as Bulgaria and Norway reported relatively short stays, averaging 4.1 and 4.3 days, respectively. Hungary and Austria recorded notably longer hospital stays, averaging 11.7 and 10.6 days, respectively. Overall, the CVD length of stay is slightly longer than the average length of stay for all causes, which averaged 7.4 days in EU countries in 2023—and the two are highly related (R^2 0.61).

Differences in CVD length of stay across countries are influenced not only by disease severity but also by variations in care models, discharge planning, rehabilitation services, social support, and even hospital registration practices (Jang et al., 2020^[34]) (Moura et al., 2023^[35]). The findings from Bulgaria and Norway are particularly interesting: both report short stays, but likely for different reasons – resource constraints in Bulgaria versus strong integrated care and rehabilitation systems in Norway. This highlights that shorter hospital stays should not automatically be interpreted as a sign of greater efficiency. Without adequate post-discharge follow-up and community-based support, shorter stays may increase the risk of readmission and worsen patient outcomes.

Figure 2.16. The EU average for CVD hospital length of stay is eight days



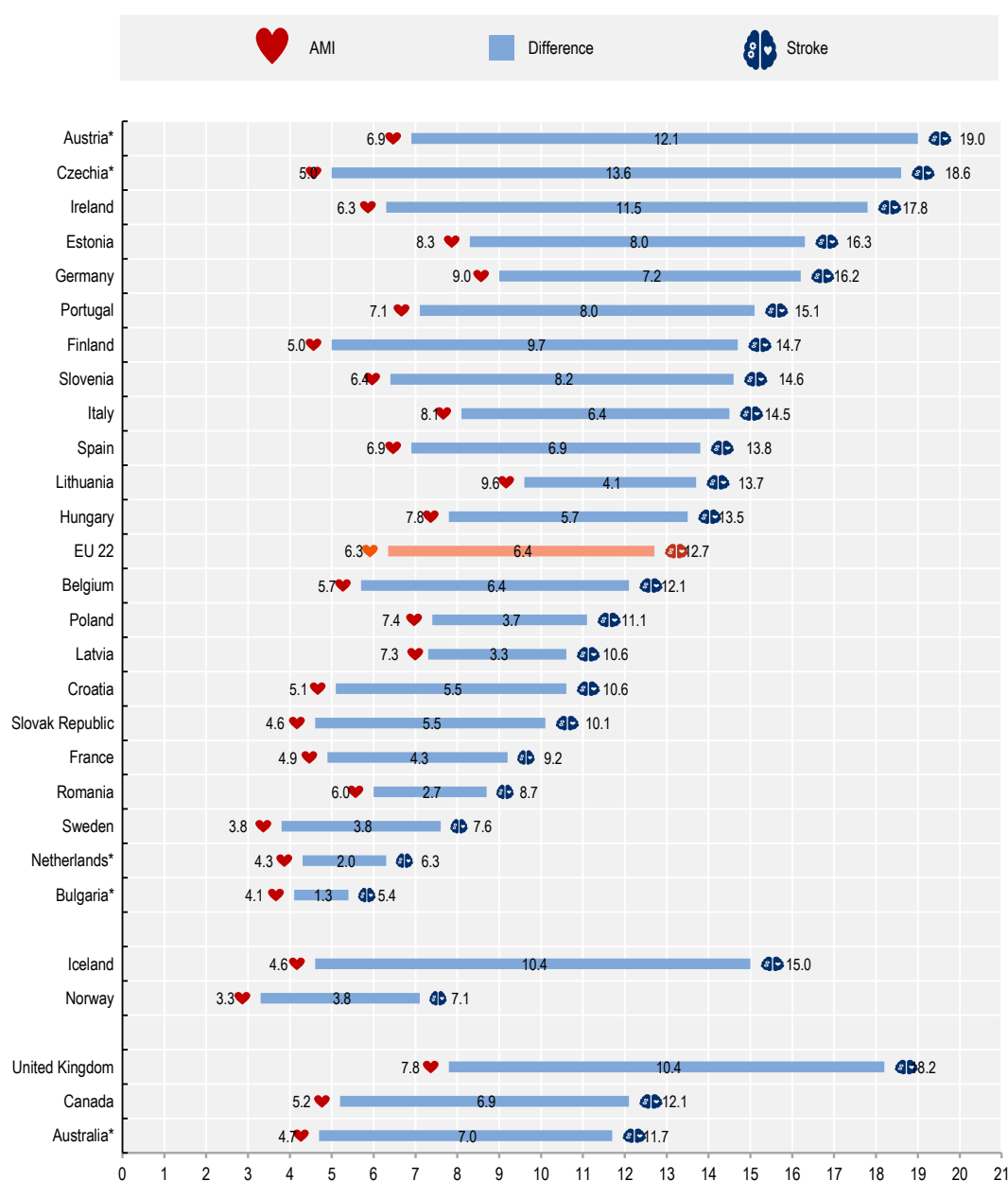
Note: EU22 average is unweighted. Data from 2023. Data for countries with and asterisk (*) refer to the year 2022. Portugal refers to 2024. Source: OECD, 2025.

Stroke patients generally require longer hospitalisation due to the severity of neurological impairments – such as paralysis or speech loss – and the need for early rehabilitation. In 2023, the EU average for stroke-related hospital stays was 12.7 days, with an almost 13-day difference between the longest and shortest average stroke related hospitalisation in countries. The shortest average stays were in Bulgaria (5.4 days) and the Netherlands (6.3 days) (Figure 2.17). Austria (19 days), the United Kingdom (18.7 days) and Czechia (18.6 days) reported the longest stays, indicating more prolonged recovery periods within hospital settings. Hospital stays for AMI have been modestly decreasing on average in

OECD countries – by half a day between 2010 and 2022. The EU average length of stay for AMI was 6.3 days in 2022. Sweden led with the shortest hospitalisation time at just 3.8 days – approximately six days less than the countries with the longest average hospital stay for AMI, Germany and Lithuania (9 and 9.6 days respectively). A broad variation in hospitalisation lengths for CVD across countries may reflect systemic differences in population health status, health system efficiency, clinical guideline adherence, and discharge effectiveness (OECD, 2023^[36]). Shorter stays in some countries may indicate better management of CVD episodes through integrated care models and early intervention.

Figure 2.17. Stroke patients in the EU typically experience hospital stays twice that of AMI patients

Hospital average length of stay in days



Note: EU22 average is unweighted. Data from 2023. Data for countries with and asterisk (*) refer to the year 2022. Portugal refers to 2024.
Source: OECD, 2025.

2.6. Gender inequalities significantly affect care and, consequently, health outcomes of CVD

Gender inequalities significantly affect awareness, prevention, diagnosis, management, and outcomes of CVD. Research across European countries has demonstrated substantial gender disparities, particularly in awareness and recognition of coronary artery disease (CAD). Women exhibit notably lower levels of awareness regarding CAD compared to men, with social inequalities exacerbating this gender gap, especially among lower socio-economic groups (Daponte-Codina et al., 2022^[37]). Women's lower awareness of CVD partly reflects their historical exclusion from prevention strategies, research, and the broader cardiovascular health discourse (Burgess et al., 2025^[38]). This gap is further compounded by public campaigns and medical education that have predominantly framed male symptom patterns as the norm, leaving women less likely to recognise their own symptoms or seek timely care. For the broader population, strengthening CAD awareness remains crucial to reducing CVD morbidity and mortality. The tendency of women to prioritise other health conditions with lower epidemiological impact underscores the need for gender-responsive and targeted awareness strategies.

In primary care settings, assessment and management of cardiovascular risk factors are markedly influenced by gender. Cardiovascular risk factors are frequently under-assessed and undertreated in women compared to men (Hyun et al., 2017^[39]). This discrepancy partly arises from the different symptom patterns often presented by women, which may not align with the traditional – male-based – clinical descriptions of CVD, complicating timely diagnosis and intervention. Such clinical oversight persists largely due to diagnostic and intervention practices traditionally based on data predominantly derived from male populations, reinforcing gender biases in clinical approaches (BHF, 2019^[40]).

Although CVD affects more men than women overall, there are gender differences in the diagnosis and management of CVD. International evidence shows that women at risk of or with CVD are less likely to be prescribed medication (Zhao et al., 2020^[41]), included in randomised clinical trials (Melloni et al., 2010^[42]) and more likely to be misdiagnosed, have a worse prognosis and higher mortality than men after acute CVD events (Gao et al., 2019^[43]; Wenzl et al., 2022^[44]). Data for England also shows gender differences in prescribing for CVD and related conditions (Bostock, 2021^[45]; Pinho-Gomes et al., 2020^[46]), and lower uptake of cardiac rehabilitation (BHF, 2019^[40]).

When I suffered my stroke, I was misdiagnosed. “She’s too young (34) to have a stroke”, “Maybe it’s ‘only’ an anxiety crisis”. Being a woman was against me when I needed emergency care.

Diana, 48, stroke survivor.

A survey of 2 609 people from six European countries (Bulgaria, Croatia, Czechia, Germany, Spain and Sweden) of awareness about heart disease in 2017-2018 showed that women were approximately one-fifth as likely as men to consider heart disease as a main health issue or leading cause of death, and were significantly less likely to have ever had a cardiovascular screening test (Daponte-Codina et al., 2022^[37]). Only about 16% of respondents were able to identify the symptoms of a heart attack. These findings highlight not a deficit of awareness among women, but the long-standing failure of health systems, research agendas and public communication to address women's cardiovascular health adequately. Historically, prevention campaigns, clinical training and medical research have been designed primarily around male symptom profiles and experiences, leaving women less likely to be informed, screened or treated in a timely manner. Addressing these systemic and structural gaps requires gender-responsive

prevention and education strategies that promote equitable access to information, screening and care (Vogel et al., 2021^[47]).

Clinical outcomes following cardiovascular events such as heart attacks further underscore these gender inequalities. Female patients experiencing heart attacks face higher mortality rates when treated by male physicians rather than female physicians (Greenwood, Carnahan and Huang, 2018^[48]). This finding highlights the life-saving benefits of patient – physician gender concordance and emphasises the importance of targeted medical training to address gender biases in clinical practice. Symptom recognition in cardiovascular events differs significantly between genders, affecting women’s timely access to care. Women frequently experience atypical symptoms such as fatigue, shortness of breath, nausea, or back pain, as opposed to the characteristic chest pain often presented by men (American Heart Association, 2021^[49]). Similarly, stroke symptoms in women, including fatigue, confusion, and generalised weakness, often lead to delayed recognition and management (American Heart Association, 2019^[50]).

Sex-specific biological differences significantly influence pharmacological treatment efficacy and the incidence of adverse drug reactions in women. Women experience higher rates of adverse reactions due to physiological variations affecting drug metabolism and pharmacodynamics (Lacroix et al., 2023^[51]). Notably, gender-specific variations are particularly pronounced in statin therapy, where women exhibit variable therapeutic responses and increased sensitivity to side effects, underlining the importance of gender-specific pharmacological guidelines (Raparelli et al., 2017^[52]). Addressing gender inequalities in cardiovascular healthcare requires comprehensive integration of gender-specific knowledge into clinical research, healthcare delivery, and public policy. The Lancet Women and Cardiovascular Disease Commission (Vogel et al., 2021^[47]) underscores the necessity for global initiatives promoting the integration of sex- and gender-specific data into clinical practice. Policies facilitating the creation of gender-sensitive healthcare frameworks are essential for effectively addressing chronic conditions prevalent among women (Temkin et al., 2023^[53]). Furthermore, structural adjustments in healthcare systems to accommodate gender differences are imperative. Integrating gender-specific diagnostic criteria and treatment protocols within healthcare systems would enable earlier diagnosis, improved management strategies, and better patient outcomes for women affected by CVD (Maas and Appelman, 2010^[54]).

CVD affects men and women differently across the lifespan, requiring distinct yet equally important policy responses. Men tend to experience a higher CVD burden overall, with elevated mortality and earlier onset of conditions such as ischaemic heart disease. In contrast, women often face disparities in diagnosis and management, which can lead to delays in treatment and poorer outcomes (Patwardhan et al., 2024^[55]). Women are also more likely to develop certain types of CVD that are less common in men, such as spontaneous coronary artery dissection (SCAD), which accounts for up to 70% of SCAD cases and predominantly affects younger or middle-aged women without traditional cardiovascular risk factors (Yang, Offen and Saw, 2024^[56]). These are both critical issues that demand targeted approaches: prevention efforts, including addressing modifiable risk factors, would benefit from a stronger focus on men, while improving clinical recognition, diagnosis, and management of CVD in women warrants greater policy attention. (Lock et al., 2021^[57]). It is important to maintain a balanced perspective. Placing disproportionate emphasis on one set of disparities can lead to bias; both male and female CVD burdens should be addressed with equal consideration through evidence-based, gender-sensitive policy recommendation.

To mitigate gender disparities, healthcare policies can address structural biases and systemic barriers within healthcare systems. Rather than focussing solely on increasing the representation of women in cardiology, policies can better promote gender-sensitive clinical practice and ensure that all healthcare providers – regardless of gender – are equipped to deliver equitable care. This includes providing targeted training on recognising diverse symptom patterns, addressing implicit bias in diagnosis and treatment, and creating clinical environments that support unbiased decision making (Greenwood, Carnahan and Huang, 2018^[48]). To strengthen equity in cardiovascular care, the availability and use of data disaggregated by gender – or at minimum, by sex, can be improved. Robust, disaggregated data are key to uncover

disparities, guide targeted interventions, and inform inclusive policy design (Vogel et al., 2021^[47]). By targeting the root causes of gender disparities, such approaches can lead to more meaningful and sustainable improvements in cardiovascular outcomes for both women and men.

Box 2.3. Inequalities in primary care in CVD management between men and women in England

CVDPREVENT is a national audit of general practitioner (GP) records in England to support primary care to monitor the prevalence of CVD, or conditions that lead to a higher risk of developing CVD, and clinical care for people with CVD. The data set includes a wide range of process and outcome measures of CVD care. The associated Data & Improvement Tool is designed to support quality improvement in general practice, reduce health inequalities and improve outcomes for individuals and populations. The Tool enables drill down of the national data across various levels, down to individual practice level, to enable teams to understand and improve the performance of their services. The data is available by age, gender, deprivation and ethnic group.

CVDPREVENT clinical audit data up to December 2023 shows inequalities in cholesterol management in secondary prevention by sex:

- among patients with CVD, women were more likely than men to have never been prescribed a lipid lowering therapy (LLT) and were less likely than men to have a recent prescription for a LLT; around 200 000 females with CVD had a record of high cholesterol and no recent LLT prescription;
- women were less likely to achieve target cholesterol levels compared to males;
- women with a recent LLT prescription were much more likely to have achieved target cholesterol levels than females with no recent LLT prescription.

These inequalities were present in all age groups, geographic regions of England, across all ethnic groups and deprivation quintiles, and were consistent over time.

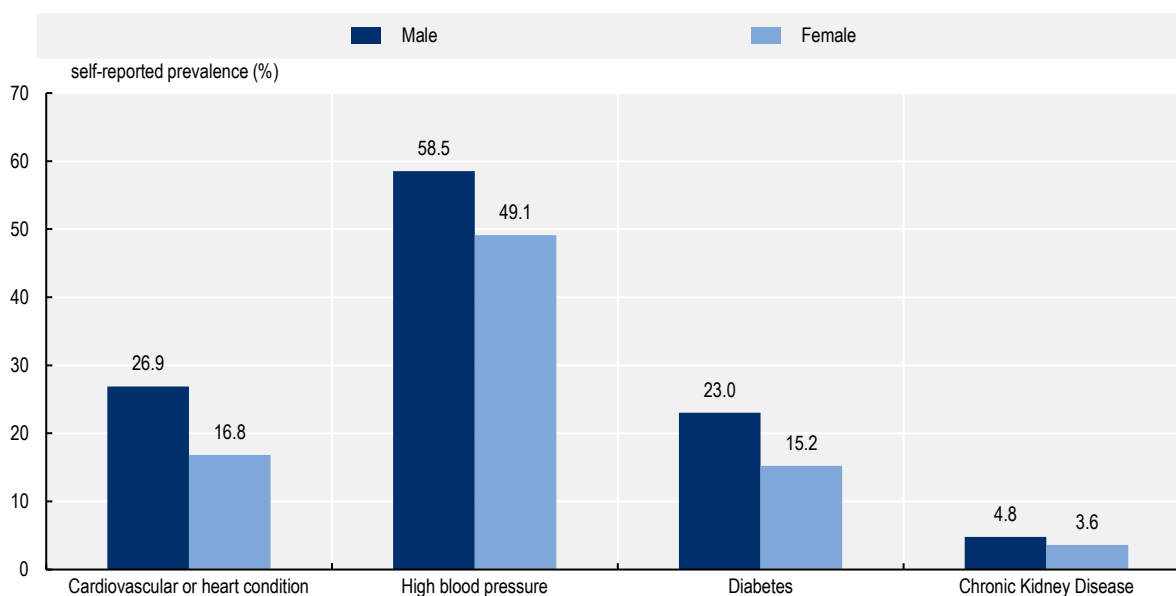
Source: (HQIP, 2023^[58]).

2.6.1. Gender inequalities in patient-reported outcomes have been observed in the primary care population

CVD is a common condition among primary care users aged 45 and older with chronic conditions, as captured in the PaRIS survey (Box 2.2) (OECD, 2025^[8]). Self-reported data indicate a significant gender disparity, with 26.9% of men reporting CVD compared to 16.8% of women. This pattern extends to other related conditions such as diabetes and high blood pressure, which are key risk factors for CVD (see Figure 2.18). Hypertension is most frequently reported condition among primary care users, affecting 58.5% of men and 49.1% of women. Similarly, diabetes, another major contributor to cardiovascular risk, is more common among men (23%) than women (15.2%). Chronic kidney disease (CKD), often linked to both hypertension and diabetes, is reported by a smaller proportion of the surveyed population, with 4.8% of men and 3.6% of women affected. Although the prevalence is lower compared to other chronic conditions, its impact on cardiovascular health is significant, as CKD can both contribute to and result from CVD.

Figure 2.18. CVD, High blood pressure, diabetes and chronic kidney disease are more prevalent among male primary care users living with chronic conditions

Self-reported conditions among people living with chronic conditions in PaRIS



Note: EHIS-2019 was carried out in all EU Member States, plus Iceland, Norway, Albania, Serbia and Türkiye.

Source: OECD PaRIS Database 2024.

These self-reported patterns are strongly aligned with data from CVDPREVENT, a national audit of GP records in NHS England. CVDPREVENT systematically tracks the prevalence, comorbidities, and clinical management of CVD through anonymised primary care data, offering a robust complement to the PaRIS patient-reported findings. Like PaRIS, CVDPREVENT data confirms that hypertension is highly prevalent among adults (18.9% age-sex standardised), and CVD is more frequently recorded in men (9.0%) than in women (5.0%). The audit also reveals substantial inequalities, with the prevalence, treatment, and outcomes of CVD varying significantly by deprivation and ethnic group. These insights reinforce the critical role of primary care in both identifying at-risk populations and closing equity gaps in cardiovascular health across England (see Box 2.4).

Women's symptoms are often labelled as "atypical" simply because they don't match the male-defined model of cardiovascular disease. My own experience is a clear example of how dangerous that bias can be. When I entered menopause, my cardiac health declined significantly. Yet no one connected this to the well-documented hormonal changes—like the drop in oestrogen and progesterone—that directly affect cardiovascular function. The impact of menopause on women with existing heart conditions is almost entirely ignored. While policymakers and researchers increasingly talk about the post-menopausal rise in CVD risk, no one is asking the critical question: what happens to a heart that is already diseased during this transition? Women like me are invisible in the data, in the risk models, and in the clinical decision-making tools used every day across Europe. Risk calculators for sudden cardiac death still rely almost exclusively on age, not sex—despite clear physiological differences.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Box 2.4. CVDPREVENT in England

CVDPREVENT data shows that GP recorded prevalence of CVD among patients aged 18 and over is 6.9% overall, the prevalence in women being 5.0% and in men 9.0% (see table). The prevalence of hypertension in adults is almost 1 in 5 (18.0%). Data for England also shows that hypertension is commonly undiagnosed, and some of the groups that are at the lowest risk of hypertension are the most likely to be undiagnosed (Office for National Statistics, 2023^[59]). Adults who were the least likely to have hypertension (such as younger adults, those whose general health was good, and those who were not overweight or obese) were the most likely to be undiagnosed.

Directly age standardised GP recorded prevalence (%) in patients aged 18 and over

% prevalence	CVD	Hypertension	CKD	Heart failure
Indicator	CVDP001CVD	CVDP001HYP	CVDP001CKD	CVDP001HF
Female	5.0	18.0	4.7	1.0
Male	9.0	19.7	4.5	1.8
Persons (age-sex standardised)	6.9	18.9	4.6	1.4

Note: CVD: Directly age standardised prevalence of GP recorded CVD (wide definition) in patients aged 18 and over: 6.51%. The wide definition includes coronary heart disease (CHD), stroke, transient ischaemic attack (TIA), peripheral arterial disease (PAD), heart failure (HF), and abdominal aortic aneurism (AAA).

Source: CVDPREVENT data. For more information please see the following sources: CVD: <https://data.cvdprevent.nhs.uk/data-explorer?period=20&level=1&area=1&indicator=12>; Hypertension: <https://data.cvdprevent.nhs.uk/data-explorer?period=20&level=1&area=1&indicator=11>; CKD: <https://data.cvdprevent.nhs.uk/data-explorer?period=20&level=1&area=1&indicator=8>; Heart failure: <https://data.cvdprevent.nhs.uk/data-explorer?period=20&level=1&area=1&indicator=46>.

2.6.2. *There are deep socio-economic divides in CVD across and within EU countries*

Reducing health inequalities between and among EU members remains an important challenge for European health systems and policies, especially as the COVID-19 pandemic exacerbated health inequalities across Europe (OECD, 2023^[60]). Overall excess mortality in Europe during the pandemic was associated with high poverty levels and unequal income distributions (Pizzato et al., 2024^[16]). Equity-oriented strategies focussing on both prevention and treatment of CVD have the potential to reduce inequalities in the burden of CVD morbidity and mortality and thereby improve population health and life expectancy.

The prevalence of and mortality from CVD in Europe is higher in more disadvantaged population groups (OECD/The King's Fund, 2020^[11]). Lower socio-economic groups have experienced significant declines in cardiovascular mortality rates over the last 25 years. However, the COVID-19 pandemic reversed these favourable trends in some countries and widened health inequalities because of its disproportionately higher mortality impact on disadvantaged population sub-groups. Wide socio-economic inequalities in CVD mortality are characteristic of many European countries, including those with generous social welfare schemes e.g. the Nordic countries. Across Europe, CVD accounts for almost half of the excess deaths among lower socio-economic groups (OECD/The King's Fund, 2020^[11]; ESC EHN Fighting cardiovascular disease, 2020^[61]; Mensah et al., 2017^[62]).

Major socio-economic risk factors associated with CVD include lower income and education levels, living in deprived areas, higher unemployment rates, and increased exposure to environmental risk factors. The higher prevalence of risk factors among lower socio-economic groups is a major driver of poorer cardiovascular outcomes. Lower socio-economic groups also have poorer access to healthcare, reducing the likelihood of early diagnosis, proper clinical management of risk factors such as hypertension, and receipt of treatments such as cholesterol-lowering medications. It is important to note that higher socio-economic groups have lower levels of most modifiable CVD risk factors and can serve as benchmarks.

As a male patient with a strong educational background and a supportive professional network, I recognize the privileges that have aided my recovery. My education allowed me to actively engage with my healthcare providers and understand my condition, while my income provided access to quality care. However, I am acutely aware of the disparities faced by others, particularly women, who may experience delayed diagnoses due to atypical symptoms or gender biases. This motivates me to advocate for equitable healthcare policies that address these gaps.

Caius, artist, researcher, patient advocate, and heart attack survivor.

National Nordic registries provide strong evidence of disparities in cardiovascular morbidity and mortality between deprived and affluent areas, and by socio-economic position as defined by occupation, income or education level (Højstrup, Thomsen and Prescott, 2023^[63]). For example, cardiovascular mortality risks are between 1.6 and 2.1 times higher for people with a low level of education compared with the highly educated. Likewise, CVD is one of the largest contributors to socio-economic inequalities in life expectancy in England, accounting for 23% of the 9-year life expectancy gap between males in the most and least

deprived deciles of the population⁴, and 19% of the 7-year gap between females in the most and least deprived deciles (OHID, 2023^[64]). In 2020, the CVD mortality rate in England in people under 75 was almost four-times higher in the most deprived 10% of the population compared with the least deprived 10% of the population and showed a clear gradient by deprivation. Mortality rates from chronic ischaemic heart disease and hypertensive disease in people living in the most deprived decile of areas in England are over double the rates in people living in the least deprived decile of areas, and for diabetes the differential is almost three times higher (Cherla et al., 2024^[23]).

A study of changes in cardiovascular mortality in 12 European populations by gender, educational level and occupational class found that although absolute declines in cardiovascular mortality (deaths per 100 000 person-years) were larger among lower socio-economic groups, relative declines (%) were faster among higher socio-economic groups between the 1990s and the early 2010s (Di Girolamo et al., 2019^[65]). However, the COVID-19 pandemic exacerbated existing health disparities because socio-economically disadvantaged groups across Europe and beyond faced an increased risk of infection, severe illness and death from the virus (OECD, 2021^[13]; McGowan et al., 2021^[66]). As noted in Section 0, CVD increased the mortality risk from COVID-19 and in several countries CVD mortality levelled off or increased during the pandemic. Although COVID-19's direct effects on health outcomes attenuated as the pandemic passed, its indirect effects could continue to have adverse impacts on inequalities in CVD outcomes.

As a male with higher education and stable income, I have generally had better access to quality healthcare and information than others might. However, I am aware that socioeconomic factors deeply influence outcomes in cardiovascular disease. Men are often at higher risk but also may neglect early symptoms. Women face significant challenges in diagnosis and treatment, which need more awareness and equality in care delivery. Education helps me advocate for my health and navigate complex systems

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

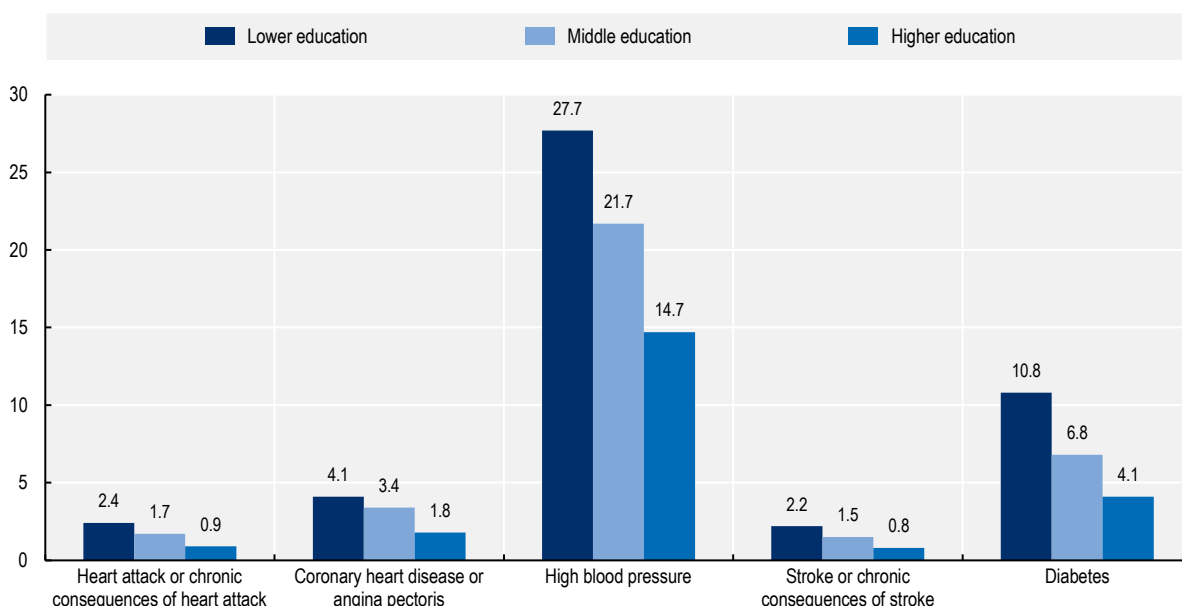
Educational attainment is commonly used as a proxy for socio-economic position and has been shown to be significantly related to prevalence of CVD and the overall health status among individuals living with chronic conditions. As a result, education level emerges as a critical factor influencing both the likelihood of developing CVD and the quality of life experienced once diagnosed. A longitudinal study in the Netherlands reported that the risks of coronary heart disease (CHD) and stroke were higher in people with lower compared with higher education status (Méjean et al., 2013^[67]).

Data from the 2019 European Health Interview Survey (EHIS) reveal a clear inverse relationship between educational attainment and the prevalence of several cardiovascular-related conditions. Figure 2.19 shows that individuals with lower levels of education consistently report higher rates of conditions such as heart attack, coronary heart disease, high blood pressure, stroke, and diabetes. These disparities may partly reflect differences in behavioural risk factors, which tend to be more common among individuals with lower educational attainment (Puka et al., 2022^[68]). High blood pressure emerges as the most prevalent condition across all education levels, with nearly 30% of individuals with lower education affected and disparities are particularly pronounced for conditions like stroke and diabetes, where the prevalence among the lower-

educated population is more than double that of their higher-educated counterparts (see Figure 2.19). Similarly, data on primary care users from the OECD PaRIS data (see Box 2.2) shows that those with lower educational attainment report higher prevalence of CVD (22.9%) compared to those with higher education (19.9). The same pattern appears for high blood pressure, diabetes, and chronic kidney disease (see Annex 2.A).

Figure 2.19. Educational inequalities in cardiovascular self-reported prevalence

Percentage of self-reported CVD prevalence by education attainment

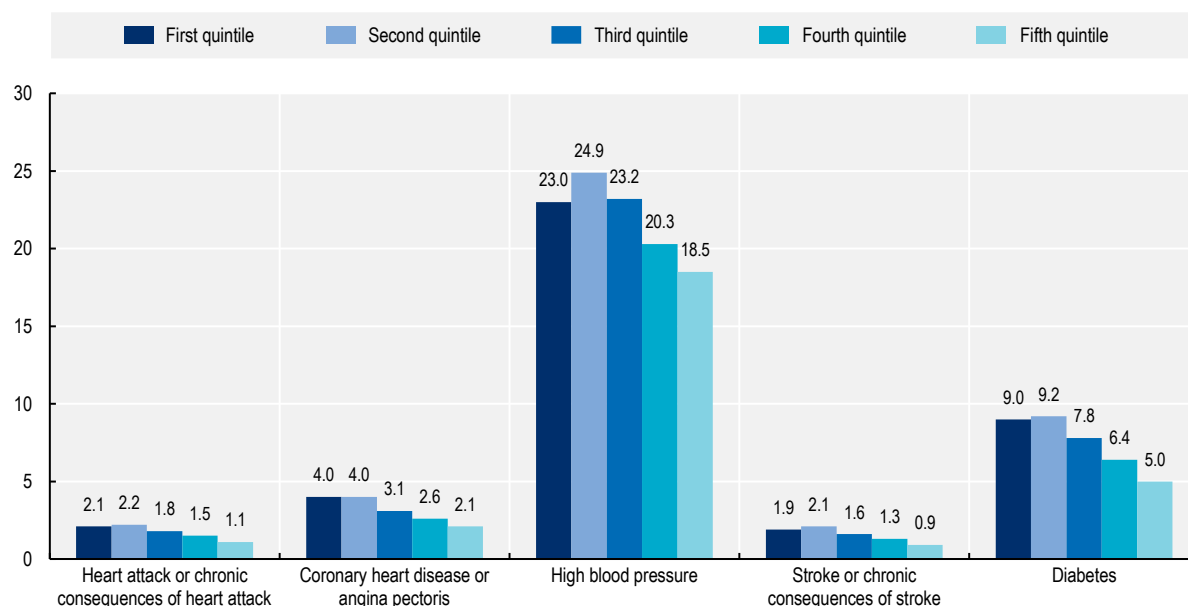


Note: EHIS-2019 was carried out in all EU Member States, plus Iceland, Norway, Albania, Serbia and Türkiye. Age and sex standardised.
Source: European Health Interview Survey, 2019.

Data from the EHIS 2019 also reveal a clear inverse relationship between income level and the prevalence of several cardiovascular-related conditions. Figure 2.20 shows that individuals in the lowest income groups consistently report higher rates of heart attack, coronary heart disease, high blood pressure, stroke, and diabetes compared to those in higher income groups. Likewise, OECD PaRIS data reveals a clear gradient in CVD prevalence linked to income levels, with higher prevalence observed among lower-income groups (23.3%) compared to mid-income (20.3%) and high-income groups (19.0%). This pattern similarly emerges in high blood pressure (52.2% in low-income groups vs. 49.8% in high-income groups) and diabetes prevalence (23.1% low income vs. 17.0% high income), indicating an inverse relationship between socio-economic status and chronic cardiovascular conditions (see Annex 2.A).

Figure 2.20. Income inequalities in cardiovascular self-reported prevalence

Percentage of self-reported CVD prevalence by income level



Note: EHIS-2019 was carried out in all EU Member States, plus Iceland, Norway, Albania, Serbia and Türkiye. Age and sex standardised.
Source: European Health Interview Survey, 2019.

2.6.3. Migrant and ethnic minority populations experience higher mortality from CVD

The ethnic diversity of European populations is increasing. For example, in 2020, 1.9 million migrants entered the EU from non-EU countries (ESC Cardiovascular Realities, 2024^[2]). Migrants and their descendants now constitute around 8% of the population in Finland, 15% in Denmark, 16% in Iceland, 17% in Norway and as high as 22% in Sweden (Højstrup, Thomsen and Prescott, 2023^[63]). The proportions are considerably higher in urban areas. Compared to resident populations, ethnic minorities in Europe are disproportionately affected by CVD and its risk factors including hypertension and type 2 diabetes (Dal Canto, Farukh and Faconti, 2018^[69]). This higher incidence seems to be the result of complex interactions between genetic and environmental elements that influence the pathophysiology of CVD, as well as significant barriers to access prevention, diagnosis and treatment services – including socio-economic inequities, limited health-literacy, geographic inaccessibility, financial constraints, insufficient health insurance coverage, shortages of trained personnel, fragmented primary care systems, delays in diagnosis, high out-of-pocket costs, poor adherence, and structural biases in referral and treatment practices.

I have experienced hospitalizations related to my cardiac condition. The care was generally attentive, but coordination of post-discharge rehabilitation and follow-up was sometimes fragmented. Access to cardiac rehabilitation programs was helpful but not always consistent or accessible due to geographic or logistic reasons.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Several minority groups experience higher rates of CVD, but there are differences between groups in terms of the relative impacts of different CVDs. Much of the epidemiological evidence relates to people of South Asian and African-Caribbean origin living in the United Kingdom and United States; evidence from Europe is sparse. People of South Asian origin (India, Pakistan, Bangladesh, Nepal, Sri Lanka) comprise a large and growing population in several European countries including the United Kingdom, Italy, France, Germany, Spain, Greece, the Netherlands and the Nordic countries. According to Eurostat, more than 2.5 million first-generation South Asian immigrants lived in Europe as of 2011, the largest population being in the United Kingdom (Cainzos-Achirica et al., 2019^[70]). There are large numbers of people of South Asian origin living also in other diaspora countries, such as the United States, Canada, the Middle East, Malaysia, South Africa and Australia.

CVD mortality is high and rising in South Asia, in contrast to the declining trend elsewhere (Goh et al., 2024^[71]). There is consistent evidence, from South Asian countries of origin, South Asian migrants living across the globe in Europe, Canada, the United States and elsewhere and from multinational studies, of a higher incidence, prevalence and mortality from CVD and particularly coronary heart disease (CHD) in these groups compared to most other racial/ethnic groups (Cainzos-Achirica et al., 2019^[70]; Razieh et al., 2022^[72]; Raleigh and Colombo, 2023^[73]; Raleigh, Goldblatt and Colombo, 2025^[74]). South Asian groups also develop heart disease at a younger age and present higher prevalence of hypertension and type 2 diabetes (Volgan et al., 2018^[75]), increasing the risk of diabetic renal disease (Hanif and Susarla, 2018^[76]) (Goff, 2019^[77]). The causes of increased CHD risk among South Asian groups are multifactorial and include genetic and epigenetic factors, central obesity, impaired glucose tolerance and insulin resistance, adverse changes to lifestyle and diet following migration, and environmental determinants such as deprivation (Volgan et al., 2018^[75]; Ho et al., 2022^[78]; Patel et al., 2021^[79]).

In contrast to South Asian groups, African-Caribbean groups in the United Kingdom have a significantly lower risk of heart disease compared to other ethnic groups, despite having a high prevalence of hypertension and diabetes (Chaturvedi, 2003^[80]). Heart disease rates are low in Africa Region, and rates in the Caribbean also appear low (Yusuf et al., 2001^[81]; Yuyun et al., 2020^[82]). However, more nuanced patterns emerge when examining migrant populations. For example, West African and Caribbean migrants in the United Kingdom exhibit higher stroke mortality but lower ischaemic heart disease mortality compared with the UK-born population, with generational gaps decreasing over time (Harding, Rosato and Teyhan, 2007^[83]). Moreover, migrants often experience worse prognosis after hospitalisation for acute myocardial infarction compared with native populations, with differences across ethnicities (van Oeffelen et al., 2014^[84]) (Zhu, Huang and Chen, 2023^[85]). Cardiovascular risk may also increase with length of stay in the host country (Lozano Sánchez et al., 2013^[86]). Including these findings highlights the complex interaction between ethnicity, migration and cardiovascular outcomes.

There is strong evidence from the United Kingdom and the United States of a higher incidence of and mortality rates from hypertension and stroke in African-Caribbean groups, who are also more prone to

develop diabetes and at a younger age (Shah and Kanaya, 2014^[87]), compared with the White population, and they develop hypertension and have strokes at a younger age (Fluck et al., 2023^[88]). ONS data for England show significantly higher mortality rates for stroke and hypertension among people from Black Caribbean and Black African groups compared with people from the White British group (ONS, 2021^[89]; ONS, 2023^[90]). However, consistent with the above epidemiological evidence, mortality rates for chronic ischaemic heart disease are lower in people of Black ethnicity.

The prevalence of hypertension is also high in Africa Region and the West Indies (Yusuf et al., 2001^[81]) (Minja et al., 2022^[91]). Explanations for black-white differences in hypertension prevalence include a myriad of factors such as a complex interaction between socio-economic factors, environmental responses to diet, stress, genetic/physiological differences, health related behaviours and systematic structural disparities, including economic inequality, racial discrimination, and structural racism. (Brondolo et al., 2011^[92]) (Abrahamowicz et al., 2023^[93]) The American Heart Association's 2025 Heart Disease and Stroke Statistical Update reports that while progress has been made in reducing cardiovascular disparities, Black communities in the United States face disproportionately higher risk of heart disease, stroke and hypertension, leading to disproportionately high death rates from these causes (AHA, 2025^[94]; AHA, 2025^[95]). AHA also notes that:

- *CVD prevalence*: among people aged 20 and older in the United States, nearly 60% of Black adults have some type of CVD, including coronary heart disease, heart failure, stroke and hypertension, compared with about 49% of all US adults.
- *Stroke*: the prevalence of stroke among adults in the United States is highest among Black women (5.4%) and Black men (4.8%), compared with all women at 2.9% and all men at 3.6%.
- *Hypertension*: Black adults in the United States have some of the highest prevalence rates of hypertension in the world: 58.4% in Black women and 57.5% in Black men compared to 50.4% of all US adult men and 43% of all women.
- *Heart failure*: Black adults account for over 50% of heart failure hospitalisations among US adults under 50.

2.6.4. People with serious mental illness and disabilities experience higher mortality from CVD

Several studies have reported that people living with a severe mental illness (SMI) have a greater risk of developing and dying from CVD, which is a major contributor to their shorter life expectancy. An international study of 3.2 million people with severe mental illness showed a substantially increased risk for developing CVD compared to the general population (Correll et al., 2017^[96]; Rødevand et al., 2023^[97]; Solmi et al., 2024^[98]). It showed that people with SMI, including schizophrenia, bipolar disorder and major depression, have a 53% higher risk of having CVD than healthy controls, with a 78% higher risk of developing CVD over the longer term; their risk of dying from CVD was 85% higher than people of a similar age in the general population. Similar findings are reported for the United Kingdom, and that life expectancy in people with SMI is 15-20 years lower than the general population (Correll et al., 2017^[96]).

Nordic studies have reported that patients with severe mental illness have mortality rates two to three times higher than the general population, with an associated reduction in life expectancy of 15 and 20 years for women and men, respectively (Sørensen and Bredahl Kristensen, 2023^[21]). A study from Denmark reported increased risks of CVD in people with intellectual disabilities than in those without, and the risks increased with the severity of intellectual disability (Wang et al., 2023^[22]). A study from Norway identified barriers to healthcare for people with intellectual disabilities on an individual and a structural level (Plasil et al., 2024^[99]). The underlying reason for the barriers is that health problems, such as CVD, are overlooked as the condition of intellectual disability overshadows other diagnoses. The authors concluded that the

focus on intellectual disability leads to shortcomings in the prevention, diagnoses, and treatment of CVD in this group.

A systematic review and meta-analysis of international studies, including studies in Europe, found that overall mortality was twice as high among people with disabilities than among people without disabilities or the general population, and they have a life expectancy about 14 years shorter (Kuper et al., 2024^[100]). People with disabilities were at higher risk of mortality from specific cause including CVD. The Confidential Inquiry into premature deaths of people with intellectual disabilities in the United Kingdom found that 37% of deaths among people with intellectual disabilities were avoidable through better access to high quality healthcare, as opposed to 13% among people without intellectual disability (Plasil et al., 2024^[99]).

2.6.5. CVD remains one of the leading health challenges for the EU, especially in the post COVID-19 pandemic era

Although there have been achievements in reducing the prevalence of some risk factors for CVD some other risk factors are becoming more prevalent (see Chapter 3). Advances in CVD care and management, and progress in reducing CVD mortality, have led to increasing numbers of people living with chronic cardiovascular conditions, including heart failure and vascular dementia. The proportion of older people is rising because of declining fertility rates and longer life expectancies have further accelerated population ageing. As a result of these trends, the burden of CVD and its concurrence with other diseases e.g. diabetes and dementia, leading to multimorbidity, is likely to rise.

Inequalities in CVD risk factors, prevalence, treatment, morbidity and mortality, between and within EU countries, are wide and an obstacle to improvements in population health and life expectancy. The Central and Eastern European EU countries, which already had higher CVD mortality and lower life expectancy than other EU countries, experienced the largest rises in CVD mortality during the pandemic, thereby widening the gaps between EU countries when they had been narrowing pre-pandemic. The wide geographical inequalities in CVD mortality within the EU show the significant potential there is for reducing the human, social and economic impacts of CVD in the EU.

The pandemic illustrated the risks that CVD can present when there are serious emergent risks to public health. For example, although the pandemic has subsided, COVID-19 is still claiming lives and the risks of a severe season of influenza or other respiratory infections remain a threat to health, especially in ageing populations. People with CVD are at greater risk of developing serious complications of and dying from flu (OECD/The King's Fund, 2020^[1]; Ho and Hendi, 2018^[101]). Severe influenza outbreaks, such as the one in 2014-2015 when life expectancy fell across Europe, can also impact on CVD mortality. As with COVID-19, influenza and pneumonia can trigger acute cardiovascular events like heart attack and stroke, and in turn, individuals with CVD are more susceptible to dying from influenza or pneumonia (Ho and Hendi BMJ 2018, (OECD/The King's Fund, 2020^[1]). The CVD risks from respiratory viruses, such as a severe flu season, remain a public health hazard in ageing populations. CVD is also triggered by other chronic conditions or their therapies including, for example, diabetes, hypertension, chronic kidney disease, pulmonary disease, and cancer. For example, advances in oncological treatment have led to improved cancer survival but have also increased CVD morbidity and mortality due to the cardiotoxicity of cancer treatment.

Extreme ambient temperatures, both heatwaves and cold spells, increasingly pose a threat to cardiovascular health: epidemiological evidence shows that each 1°C rise above optimum temperature increases cardiovascular mortality by about 2.1% (heat effect), and cold spells raise CVD-related mortality by about 32% with morbidity also increasing; overall, both extreme heat and cold are associated with higher risk of death from ischaemic heart disease, stroke and heart failure, especially in older and vulnerable populations (heat effect) (Singh et al., 2024^[102]); cold exposure effect (Fan et al., 2023^[103]); and extreme-temperature attribution studies estimate that for every 1 000 cardiovascular deaths, about 2 are attributable to extreme heat days and about 9 to extreme cold days (Alahmad et al., 2023^[104]). In EU countries, and especially in those with high CVD mortality rates, there is significant scope for further

reductions in this leading cause of death given that 80% of the deaths are attributable to modifiable risk factors (ESC Cardiovascular Realities, 2024^[2]). Given the heavy burden of CVD on populations and social, economic, and healthcare systems, there is an urgent need for action to reduce its impact by scaling up the deployment of existing cost-effective interventions for prevention and treatment. Reducing the burden of CVD and addressing related inequalities remains a key potential driver of future improvements in life expectancy.

2.7. The Economic burden of CVD in EU continues to increase

CVD has long been a major contributor to healthcare expenditures and economic losses in the European Union (EU). Since the early 2000s, multiple studies have quantified the financial impact of CVD, revealing increasing costs associated with medical care, productivity losses, and informal caregiving. These studies highlight the growing economic challenge posed by CVD and underscore the urgent need for policy interventions focussed on prevention and cost-effective disease management.

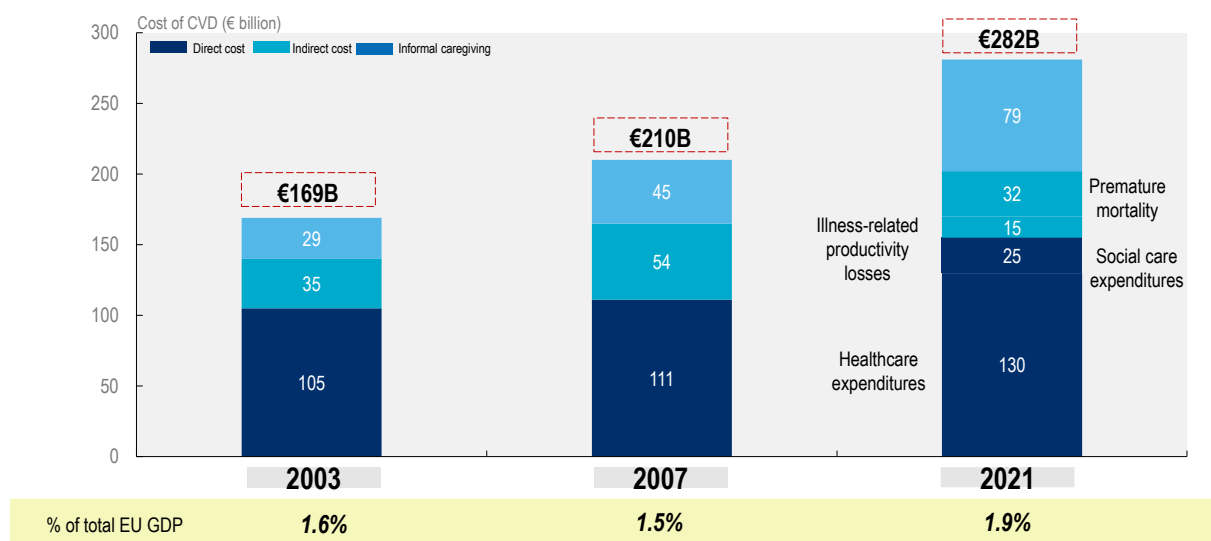
One of the earliest comprehensive analyses of CVD-related costs in the EU was conducted in 2003, estimating the total economic burden at EUR 169 billion across 25 member states. Direct healthcare expenditures accounted for EUR 105 billion, representing 12% of total healthcare spending, with hospital care being the largest contributor, followed by medication and outpatient services. Indirect costs, including productivity losses (EUR 35 billion) and informal caregiving (EUR 29 billion), further underscored the widespread financial impact of CVD (Leal et al., 2006^[105]).

A follow-up study by Wilkins et al. (2017) provided updated estimates, reporting that the cost of CVD had risen to EUR 210 billion by 2017 across 28 EU countries. This analysis, published by the European Heart Network, detailed cost distribution, with direct healthcare expenses comprising EUR 111 billion (53% of total costs), productivity losses due to mortality and morbidity at EUR 54 billion (26%), and informal care costs at EUR 45 billion (21%). The study also highlighted disparities in spending across EU nations, with Western and Northern European countries incurring higher absolute costs, while Central and Eastern European nations bore a proportionally higher burden relative to their healthcare budgets (Wilkins et al., 2017^[106]).

The most recent analysis by Luengo-Fernandez et al., uncover the total economic burden of CVD in the EU at EUR 282 billion annually, amounting to approximately 2% of the region's gross domestic product (GDP). This substantial financial commitment is distributed across several key components: direct healthcare costs, social care costs, informal care, and productivity losses. On a per capita basis, CVD-related costs averaged EUR 630 per EU citizen, varying from EUR 381 in Cyprus to EUR 903 in Germany.⁵ Notably, health and social care expenditures for CVD represented 11% of total healthcare spending in the EU, with significant variation among member states – from 6% in Denmark to 19% in Hungary (Luengo-Fernandez et al., 2023^[107]).

The 2021 study by Luengo-Fernandez et al. provides the most comprehensive and precise estimate of the economic burden of CVD in the EU, surpassing previous studies in several key ways. It utilises more extensive and up-to-date data sources, covers all EU countries with purchasing power parity adjustments, and offers a more detailed cost breakdown, distinguishing between direct healthcare costs, productivity losses, and informal care. Unlike earlier estimates, it accounts for demographic shifts, such as an ageing population and changing workforce dynamics, and improves the estimation of indirect costs by integrating real-time labour market data and caregiving contributions (see Figure 2.21).

Figure 2.21. Assessments over time reveal an increasing economic and financial burden of CVD across the EU



Note: The graph presents and consolidates findings from three separate studies that estimated the financial burden of CVD. percentage of total EU GDP was calculated using Eurostat data and the GDP of EU member states at the time of each study. Figures are presented in nominal terms and are not adjusted for inflation.

Source: Eurostat; Leal et al. (2006_[105]), "Economic burden of cardiovascular diseases in the enlarged European Union", <https://doi.org/10.1093/eurheartj/ehi733>; Wilkins et al. (2017_[106]), European Cardiovascular Disease Statistics 2017; Luengo-Fernandez et al. (2023_[107]), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", <https://doi.org/10.1093/eurheartj/ehad583>.

In the following paragraphs, we present a more detailed overview of the key findings from Luengo-Fernandez et al., whose work offers the most robust and policy-relevant assessment currently available.

2.7.1. Health system burden: healthcare expenditures (EUR 130 billion, 46% of total costs)

Healthcare-related costs constitute nearly half of the total economic burden of CVD in the EU. These expenditures encompass hospital admissions, outpatient care, medication, and other direct medical interventions.

Hospital care (EUR 79 billion, 61% of healthcare costs)

Hospital-related expenditures dominate healthcare spending on CVD, driven by the high incidence of acute cardiovascular events, prolonged inpatient stays, and the need for complex surgical and interventional procedures. The cost burden varies across EU countries, reflecting differences in healthcare infrastructure, treatment approaches, and patient demographics. Countries with higher rates of acute myocardial infarctions and stroke admissions show disproportionately high hospital expenditures.

Medications (EUR 31 billion, 24%)

Pharmaceutical costs remain a significant component of healthcare spending, largely due to the long-term nature of CVD treatment. The widespread prescription of lipid-lowering agents (e.g. statins), antihypertensives, anticoagulants, and novel biologic therapies contributes to sustained expenditure

growth. Variability in drug pricing policies across EU nations, as well as disparities in access to newer medications, accounts for differences in per capita spending.

Outpatient and primary care (EUR 20 billion, 15%)

Primary and specialist consultations, diagnostic testing, and follow-up care contribute to the remaining healthcare expenditures. The emphasis on early detection, preventive screening, and long-term disease management plays a crucial role in cost mitigation by reducing hospital admissions. Countries with strong primary care systems exhibit lower overall healthcare costs per capita, suggesting potential cost-saving opportunities through enhanced primary care models.

2.7.2. Social Care Expenditures (EUR 25 billion, 9%)

Social care costs, including long-term institutional care and home-based assistance, represent the smallest but still substantial component of CVD-related spending.

Long-term institutional care (EUR 15 billion, 60%)

Patients with severe CVD-related disabilities, such as stroke-induced paralysis or advanced heart failure, often require prolonged stays in nursing homes and other assisted-living facilities. The demand for long-term care services is expected to rise due to demographic ageing, placing further strain on national budgets.

Home-based care (EUR 10 billion, 40%)

Many CVD patients receive formal care at home, including physiotherapy, nursing visits, and personal assistance. Countries with robust home healthcare infrastructure allocate a larger share of social care budgets to community-based services, reducing reliance on institutional care.

2.7.3. Family and Community Contributions: Informal Care Costs (EUR 79 billion, 28%)

The economic burden extends beyond formal healthcare services, with informal caregiving representing the second-largest cost category. An estimated **7.5 billion hours of unpaid care** were provided by family members and friends, translating into **EUR 79 billion in economic value**. The majority of informal care is provided by women, with significant implications for gender equity in labour force participation. The need for constant assistance with daily activities, medication management, and mobility support increases caregiver strain, particularly among older adults caring for spouses with advanced-stage CVD.

Southern and Central and Eastern European nations tend to rely more heavily on informal caregiving due to weaker social care systems and cultural preferences for family-based support. By contrast, Nordic countries, which invest heavily in public healthcare services, report lower informal care costs relative to their total CVD burden.

Workforce Impact: Lost Productivity and Employment (EUR 47 billion, 17%)

CVD significantly impacts economic productivity through absenteeism, premature mortality, and work-related disability. The analysis estimates that **256 million working days were lost** in 2021 due to illness and disability, while **1.3 million working years were lost** due to premature deaths.

Illness-related productivity losses (EUR 15 billion, 32%)

Employees with CVD frequently require time off for treatment, rehabilitation, and disease-related complications. Conditions such as heart failure, stroke, and ischemic heart disease contribute to prolonged

absences and increased sick leave utilisation. Workplace interventions promoting cardiovascular health could help mitigate these costs.

Premature mortality (EUR 32 billion, 68%)

Productivity losses due to premature CVD-related deaths constitute the majority of this category. Deaths occurring before retirement age (often defined as 65 years) result in substantial economic losses, particularly in high-income countries with ageing workforces. Stroke and coronary artery disease remain leading contributors to mortality-related productivity losses, underscoring the need for targeted prevention programmes.

From Cost to Action: Why Data Matters in CVD Policy

The economic burden of CVD highlights the pressing need for informed and targeted policy responses. Effective strategies – ranging from expanding access to primary care and investing in preventive health programmes to optimising pharmacological treatments – offer significant potential to reduce both incidence and long-term healthcare costs of the disease (see Chapter 4). At the same time, regulatory measures promoting healthier lifestyles, such as taxes on unhealthy foods and incentives for physical activity, can help address key risk factors (see Chapter 6). However, the success of these interventions depends on a foundational element: access to high-quality, up-to-date, and disaggregated data (see Chapter 5). Without reliable information on where resources are spent, which interventions are effective, and where gaps remain, policymaking risks being reactive rather than strategic.

To support this evidence-based approach, future research could prioritise longitudinal analyses of CVD-related expenditures, particularly considering evolving demographics and emerging treatment options. To address this gap, the latest OECD Policy Survey aimed to assess how national governments track, report, and analyse expenditures related to CVD. The broader objective was to map the capacity of health systems to understand and manage the economic dimensions of CVD, which is essential for effective policy, planning, and resource allocation in public health. The survey results uncovered a considerable variability in how governments track and report expenditures related to CVD. A small portion of countries – such as Canada, Estonia and the Netherlands – reported that their governments do track CVD-related spending, while others (e.g. Austria, Colombia) either do not or are unsure (e.g. Czechia). Among those that do monitor such spending, data sources like insurance claims and provider reporting (e.g. DRGs, fee-for-service systems) are used inconsistently. Canada and Estonia stand out for leveraging both insurance and provider-based data to track CVD expenditures, suggesting more robust monitoring mechanisms in these contexts.

In terms of institutional responsibility, several countries, such as Israel and Canada, indicated the involvement of their Ministry of Health in monitoring CVD spending, although this too was not universal. The responses show that some countries may rely on broader health finance or insurance bodies or lack clear designation. Regarding expenditure trends over the past five years, there was limited but telling information. Estonia reported a significant increase, while Colombia and Singapore noted a slight increase. Most countries did not provide concrete trend data, possibly due to data gaps or inconsistent reporting systems. Finally, qualitative comments highlight key challenges: Canada noted the absence of recent data, and Estonia mentioned issues with data completeness and underreporting due to diagnostic limitations. These insights underscore the structural and methodological hurdles countries face in capturing the true economic burden of CVD.

The survey results reveal significant variation across countries in how they track and report expenditures related to CVD. This gap significantly limits the ability of policymakers to design targeted, cost-effective interventions. Strengthening national capacities to collect, integrate, and analyse CVD expenditure data is essential for driving smarter investments, improving population health outcomes, and managing the long-term economic burden of CVD. The case of Estonia provides several valuable lessons for other EU countries (Box 2.5).

Box 2.5. Building a clearer picture of CVD expenditures in Estonia

Estonia, a small Baltic nation known for its digital innovation, is emerging as a leader in tracking the economic burden of CVD in Europe. Among the countries surveyed, Estonia stands out for its structured and data-informed approach to monitoring public spending on CVD-related services.

The Estonian Government actively tracks and reports expenditures on cardiovascular health through its national systems. This tracking is embedded in the administrative flow of data: Estonia makes use of insurance claims and hospital provider data (e.g. diagnostic-related groups (DRGs) and fee-for-service reporting), enabling it to capture a more detailed and nuanced picture of where resources are being allocated and which areas may require attention. Responsibility for monitoring these expenditures is clearly defined: the Ministry of Health plays a central role in overseeing the collection and use of this information.

Estonia reported that government spending on CVD-related services has increased significantly over the past five years, with a marked emphasis on enhancing prevention and care systems. In more detailed expenditure categories, Estonia noted that around 14% of CVD-related spending is directed toward primary care and outpatient services (including physician costs), while hospitalisation and acute care account for approximately 0.47% of reported expenditures. Other categories, such as long-term care and rehabilitation, were not included in the reported figures, reflecting areas for possible future data improvements.

Despite this encouraging framework, Estonia openly acknowledged data limitations. In the survey's additional comments, officials noted incomplete coverage of data and underdiagnosis of CVD cases, particularly in primary care, due to fragmented information systems. Estonia's example shows how countries can build robust expenditure tracking systems with clear institutional leadership and a willingness to confront data limitations. For other European countries seeking to strengthen their understanding of the economic impact of CVD, Estonia offers both inspiration and practical lessons.

Source: OECD 2025 CVD Policy Survey

2.8. Analysing the socio-economic burden of CVD in EU in a wider context

As health systems confront increasing financial pressures from ageing populations, rising treatment costs, and the growing prevalence of non-communicable diseases (NCDs), a clear understanding of their comparative economic burden is essential. Analysing how different conditions contribute to direct healthcare costs and productivity losses can reveal important insights about the nature of each disease and help identify opportunities for more efficient resource allocation, and improved support systems for affected individuals.

This section provides a comparative analysis of the economic burden associated with CVD and cancer – two of the most prevalent and costly NCDs in high-income countries. Cancer is included in this comparison not only because it is a leading cause of death and disability, but also because of its distinct cost profile: it tends to result in higher productivity losses due to premature mortality and often requires expensive, intensive treatment for a short period of time. Finally, this section situates the economic burden of CVD and cancer within the broader context of government spending in other sectors. This comparison underscores the weight of these health conditions on public finances and reinforces the need for sustained investment in prevention, early detection, and comprehensive care strategies.

2.8.1. Total societal economic burden of CVD exceeds cancer

Comparative analyses indicate that CVD impose a substantial economic burden across the European Union, often exceeding the costs associated with other costly diseases such as cancer. In 2021, the total economic burden of cancer in Europe not including informal care costs was estimated at EUR 203 billion (Manzano et al., 2025^[108]), which included EUR 134 billion in healthcare expenditures, compared to EUR 155 billion for CVD and EUR 70.4 billion in productivity losses, compared to EUR 48 billion for CVD. The 2021 estimates for cancer exclude the costs of informal care – that is, unpaid support provided by family members or friends. The most recent available data from 2018 indicate that cancer-related informal care costs, adjusted to 2021 euros, amounted to EUR 27 billion (Hofmarcher et al., 2020^[109]), compared to EUR 79 billion for CVD.

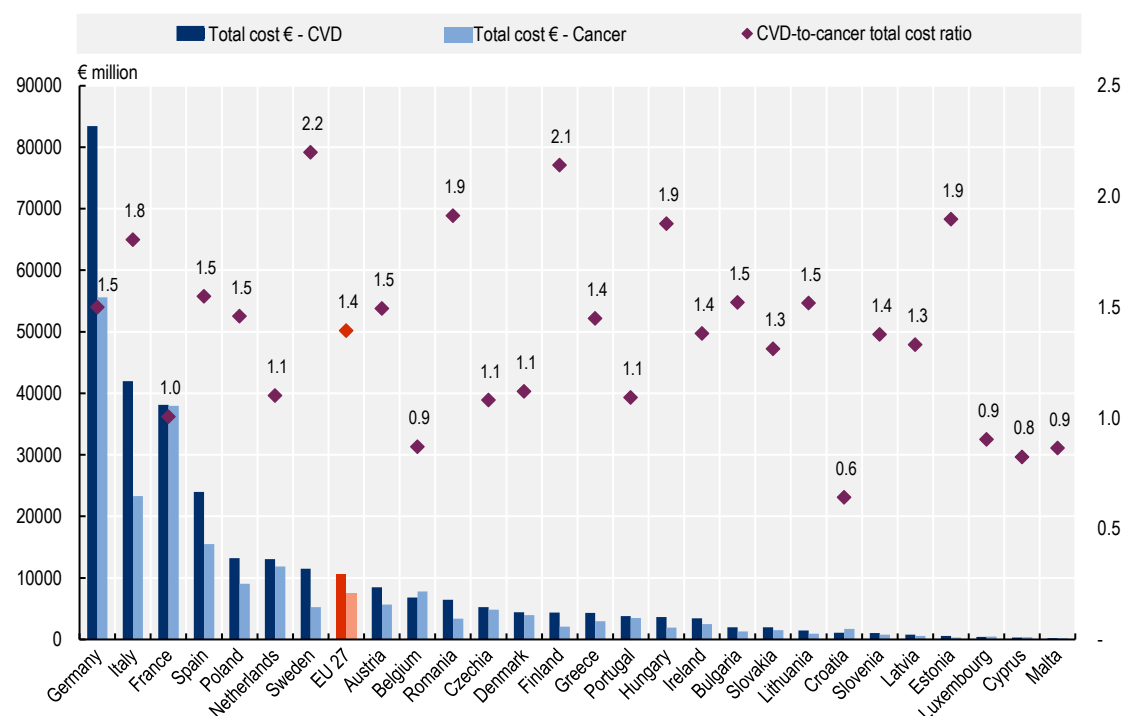
In 2021, the total societal cost of CVD – inclusive of direct healthcare costs and losses related to informal caregiving and productivity – was higher than cancer-related costs in most EU countries. In Sweden and Finland, the societal costs of CVD are double that of cancer. Austria reported a total CVD cost of EUR 8.47 billion per year, compared to EUR 5.67 billion for cancer (Figure 2.22). Similarly, Germany⁵ spent EUR 83.4 billion on CVD versus EUR 55.6 billion on cancer, while France allocated EUR 38.1 billion to CVD compared to EUR 37.9 billion for cancer.

This cost differential is largely driven by higher costs of health and social healthcare and informal care associated with CVD. This cost differential is largely driven by higher direct social and healthcare costs and informal care associated with CVD. In 15 out of the 27 countries in Table 2.2 direct healthcare costs for CVD in 2021 are larger than those of Cancer in 2023 (in 2021 euros), with an average difference of 52%. The other 12 countries had on average direct costs of cancer 24% larger than for CVD. In Sweden, higher CVD costs are driven by more intensive formal care, but also productivity losses per capita that are three times higher than for cancer. The differences in informal care costs are even more pronounced, with all EU countries spending significantly more on informal care for CVD – by an average margin of nearly 400% compared to cancer. This is especially prominent in Central and Eastern Europe, where the CVD burden is shaped by higher reliance on informal care (almost 10 times that of cancer), together with earlier onset and higher disease prevalence. This stark contrast reflects not only the differing nature of the two diseases and their impact on morbidity and long-term care needs but also points to a critical challenge in care provision and coverage. The high reliance on informal care in CVD highlights potential gaps in formal support systems and places a considerable burden on families and caregivers.

This is not the case when looking at productivity losses due to morbidity and mortality. Out of the 27 countries in Table 2.2, 14 had larger productivity losses due to cancer for the year 2018 (in 2021 euros) than for CVD in the year 2021 with an average difference of 33%. This notable disparity reflects both the distinct characteristics of the diseases and the varying effectiveness of health systems in mitigating their broader economic impact. Because of indirect costs, in some countries, cancer-related costs exceed or closely match those for CVD. For example, in Belgium, total cancer costs were EUR 7.8 billion – considerably higher than the EUR 6.80 billion spent on CVD. Overall, while absolute CVD costs are highest in larger Western European economies, the relative economic impact is particularly severe in lower-income EU countries, highlighting persistent cross-national disparities and the need for co-ordinated policy responses targeting prevention, early intervention, and long-term care for cardiovascular conditions.

Figure 2.22. The total societal costs of CVD exceed that of cancer more than two-fold in some European Countries

Ratio of the economic costs of CVD compared to cancer (CVD to cancer)



Note: All costs expressed in 2021 euros. For Cancer, Health & social care are estimated with 2023 data and Informal care + Productivity losses with 2018 data.

Source: Hofmarcher et al. (2020^[109]), "The cost of cancer in Europe 2018", <https://doi.org/10.1016/j.ejca.2020.01.011>; Luengo-Fernandez et al. (2023^[107]), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", <https://doi.org/10.1093/eurheartj/ehad583>; Manzano et al. (2025^[108]), "Comparator Report on Cancer in Europe 2025 - Disease Burden, Costs and Access to Medicines and Molecular Diagnostics", IHE report.

Table 2.2. CVD average total societal costs nearly double cancer, but direct costs are only 52% higher

Annual costs of CVD and cancer (€ million) in the European Union

Country	Health & social care total (€)		Productivity losses (€)		Informal care (€)		Total costs (€)		Total costs €/capita PPP	
	CVD	Cancer	CVD	Cancer	CVD	Cancer	CVD	Cancer	CVD	Cancer
Austria	5 142	3 813	1078	1 432	2 246	419	8 466	5 665	831	556
Belgium	3 940	4 298	1 310	2 789	1 547	729	6 797	7 816	530	609
Bulgaria	839	1024	651	235	493	45	1 983	1 303	525	345
Croatia	406	979	195	650	507	97	1 108	1 727	434	676
Cyprus	186	299	69	52	54	25	309	375	382	463
Czechia	2 487	3 801	929	831	1 813	205	5 229	4 837	666	616
Denmark	2 001	1 355	1 413	1 763	979	806	4 393	3 924	561	501
Estonia	250	130	129	143	188	25	567	299	520	273
Finland	2 479	943	970	750	937	355	4 386	2 048	635	297
France	24 290	22 226	6 697	12 270	7 157	3 461	38 144	37 956	519	517
Germany	44 865	33 486	13 184	16 720	25 352	5 411	83 400	55 617	903	602
Greece	2 237	1 841	1075	806	1003	330	4 315	2978	491	339
Hungary	1 848	1 219	921	554	852	157	3 621	1 930	577	307
Ireland	2 041	1 630	855	673	546	189	3 442	2 492	566	410
Italy	23 747	12 353	4 497	5 481	13 734	5 436	41 978	23 271	725	402
Latvia	252	391	293	138	205	35	750	564	515	387
Lithuania	559	706	473	205	406	36	1 438	947	742	489
Luxembourg	267	288	70	134	75	35	412	456	502	555
Malta	95	170	51	29	37	13	183	212	406	472
Netherlands	8 670	6 750	2 289	4 075	2 100	1034	13 059	11 859	643	584
Poland	6 127	5 807	2 586	2 628	4 466	598	13 179	9 032	590	405
Portugal	1 803	2 172	723	891	1 245	390	3 771	3 454	425	389
Romania	2 220	2 403	1 396	789	2 806	165	6 422	3 357	634	332
Slovak Republic	942	968	459	453	562	76	1 963	1 496	447	341
Slovenia	632	359	124	321	292	81	1048	761	585	425
Spain	13 063	8 188	3 462	4 620	7 434	2 662	23 959	15 470	535	345
Sweden	3 998	2 789	5 903	1 919	1 608	526	11 509	5 234	536	389
Average	5 755	4 459	1 919	2 272	2913	865	10 586	7 596	571	445

Note: All costs expressed in 2021 euros. For Cancer, Health & social care are estimated with 2023 data and Informal care + Productivity losses with 2018 data. Estimates follow a societal cost-of-illness framework that includes health and long-term social care, informal care, and productivity losses. The “health and social care” columns exclude administration/overheads, household or ancillary items (e.g. patient transport), prevention and rehabilitative care, and healthcare retailing; hospital costs cover day cases and overnight admissions with a primary diagnosis. National cost-of-illness series often report complete payer coverage and local coding patterns (e.g. secondary diagnoses that still drive resource use) and hence can be larger than those presented.

Source: Hofmarcher et al. (2020^[109]), “The cost of cancer in Europe 2018”, <https://doi.org/10.1016/j.ejca.2020.01.011>; Luengo-Fernandez et al. (2023^[107]), “Economic burden of cardiovascular diseases in the European Union: a population-based cost study”, <https://doi.org/10.1093/eurheartj/ehad583>; Manzano et al. (2025^[108]), “Comparator Report on Cancer in Europe 2025 - Disease Burden, Costs and Access to Medicines and Molecular Diagnostics”, IHE report.

2.8.2. The Global Economic Impact of CVD: A complex and uneven burden

CVD represent a significant and escalating economic burden worldwide. Between 2025 and 2050, cardiovascular prevalence is projected to rise by 90%, with deaths increasing by 73.4%, reaching an estimated 35.6 million cardiovascular deaths in 2050 (up from 20.5 million in 2025) (Chong et al., 2024^[3]). However, the scale and composition of this burden differ markedly between countries and regions, reflecting variations in healthcare systems, funding structures, and epidemiological patterns. Additionally, differences in study methodologies make it challenging to directly compare cost estimates across global contexts.

In the EU, the economic burden of CVD is substantial but shaped by the relatively strong foundation of universal healthcare systems. According to the above mentioned study by the European Cardiology Society (Luengo-Fernandez et al., 2023^[107]) covering all 27 EU plus Member States plus Norway and Iceland, the total cost of CVD in the EU amounted to EUR 282 billion in 2021, including direct healthcare costs, productivity losses, and informal care costs. Due to universal health coverage, out-of-pocket spending on CVD-related healthcare is lower compared to many non-EU countries, and costs are more equitably distributed. However, indirect costs – especially productivity losses – remain high due to the chronic and disabling nature of CVD, particularly in working-age populations.

In contrast, the United States exhibits significantly higher per-patient CVD costs. A recent study by the American Heart Association (American Heart Association, 2024^[110]) projected that total annual costs related to CVD and stroke will exceed \$1.8 trillion by 2050, driven by high medical prices, widespread use of advanced interventions, and substantial productivity losses. However, these figures are derived using a different methodology from that used in the EU study: US estimates rely on quasi-experimental approaches that compare healthcare costs of individuals with CVD to matched statistical twins without CVD. This design captures a broad range of attributable costs, but it also makes direct comparisons with EU estimates challenging, as the latter rely on population-level cost allocations rather than individual-level counterfactuals.

In China, the economic burden of coronary heart disease is increasing rapidly, reflecting rising prevalence, demographic ageing, and persistent inequalities in access to healthcare. A study by Mi et al. (Mi et al., 2023^[111]) estimated that total annual costs associated with coronary heart disease exceeded JPY 140 billion (~EUR 18 billion), but the analysis primarily covered hospital expenditures and lacked full accounting of outpatient care, productivity losses, and informal caregiving. Moreover, wide urban – rural disparities limit the generalisability of the findings. These limitations make it difficult to construct a comprehensive and directly comparable picture of CVD costs in China relative to the EU.

Republic of Türkiye presents another illustrative case. The modelling study by Balbay (Balbay, 2018^[112]) highlighted the growing cost of CVD in Republic of Türkiye, projected to rise substantially by 2035 due to demographic and behavioural risk factors. While this study accounted for both direct and indirect costs, the analysis was based on national projections and modelling assumptions rather than observed data and excluded informal care costs. Therefore, although the results offer valuable insight into trends, their comparability to empirically derived EU estimates is limited.

Addressing the global burden of CVD requires improved data harmonisation for international comparison. Understanding how cost structures differ between health systems – and how those systems manage or fail to mitigate indirect and informal care costs – can guide policymakers toward more effective strategies.

In 2021, the economic burden of CVD represented a substantial share of overall public expenditure across sectors. Comparing CVD expenditure as a percentage of GDP to other government spending priorities further illustrates its economic significance (see Table 2.3). In 2021, general government expenditures in the EU were distributed across key sectors, reflecting the region's policy priorities. Health spending reached EUR 1 251 billion, or 8.1% of the EU's GDP, while education accounted for EUR 806 billion (4.8% of GDP), and social protection – the largest expenditure – amounted to EUR 3 309 billion, or 19.2% of

GDP. Spending on economic affairs, which includes areas such as transport and energy, amounted to EUR 991 billion (5.8% of GDP). Notably, defence expenditures stood at EUR 227 billion, or 1.3% of GDP. When compared to the estimated EUR 281 billion in annual costs attributed to CVD across the EU, the economic burden of CVD rivals and sometimes surpasses that of national defence. This stark comparison underscores the immense financial impact of CVD and highlights the importance of prioritising preventive and treatment strategies within public health policy. For instance, in several European countries, CVD-related spending in 2021 is comparable to or even exceeds defence spending – highlighting its role as a major public expenditure item. In a bivariate regression analysis between CVD spending as a share of GDP and other government functions, Economic Affairs emerges as the strongest correlate, with a Pearson correlation of 49.9%, a linear regression coefficient of 3.5, and an R^2 of 0.25. This suggests that higher national investments in economic infrastructure and development tend to be accompanied by proportionally higher spending on CVD, potentially reflecting broader fiscal capacity or strategic prioritisation of health as part of economic policy.

Across countries, additional patterns emerge. Higher CVD expenditure often coincides with relatively lower investment in sectors such as education and social protection – particularly in countries like Bulgaria and Hungary, which allocate around 1.38% of GDP to CVD despite generally lower overall public service expenditure. Conversely, countries such as Austria and Italy exhibit high CVD spending alongside substantial investment in social protection, indicating a different dynamic where elevated health expenditures are part of a broader welfare model. This contrast underscores that while CVD imposes a significant economic burden across Europe, its relative weight and policy implications vary considerably depending on each country's overall public spending capacity, budgetary priorities, and healthcare system structure. Understanding these contextual differences is crucial for designing targeted policy responses that balance health needs with broader fiscal and social objectives.

Table 2.3. Higher CVD burden coincides with relatively lower social investment

Annual costs of CVD and selected government expenditure 2021 (in percentage GDP)

Country	CVD	General public services	Economic affairs	Education	Social protection
Austria	1.44%	5.8%	9.4%	4.9%	21.9%
Belgium	0.86%	7.0%	7.0%	6.2%	20.8%
Bulgaria	1.38%	4.9%	6.6%	4.3%	12.9%
Croatia	0.84%	5.1%	7.8%	5.4%	13.9%
Cyprus	1.04%	6.5%	4.8%	5.1%	13.3%
Czechia	1.19%	4.6%	7.3%	4.7%	13.2%
Denmark	0.65%	5.6%	4.1%	5.8%	20.3%
Estonia	0.90%	3.9%	5.6%	5.9%	13.3%
Finland	1.06%	6.7%	5.1%	5.9%	25.0%
France	1.06%	6.1%	7.0%	5.1%	24.8%
Germany	1.34%	6.0%	6.5%	4.5%	20.5%
Greece	1.31%	7.7%	10.6%	4.0%	20.3%
Hungary	1.37%	7.9%	9.2%	5.0%	13.0%
Ireland	0.51%	2.3%	3.1%	2.8%	8.2%
Italy	1.39%	7.7%	6.7%	4.2%	22.6%
Latvia	1.05%	4.0%	8.2%	5.9%	13.9%
Lithuania	1.17%	3.0%	4.1%	4.7%	14.2%
Luxembourg	0.41%	4.6%	5.4%	4.7%	18.4%
Malta	0.71%	5.2%	8.6%	4.6%	10.1%
Netherlands	1.08%	3.8%	6.2%	5.0%	16.4%
Poland	1.15%	4.1%	5.9%	4.9%	17.1%
Portugal	0.94%	6.5%	5.5%	4.7%	18.1%
Romania	1.05%	4.9%	6.0%	3.2%	13.3%
Slovak Republic	1.11%	5.4%	6.7%	4.6%	15.9%
Slovenia	1.35%	5.1%	7.0%	5.8%	17.9%
Spain	1.12%	5.7%	6.4%	4.5%	20.1%
Sweden	0.81%	5.2%	5.3%	7.3%	19.2%
Average	1.05%	5.4%	6.5%	5.0%	17.0%

Source: Eurostat. Hofmarcher et al. (2020^[109]), "The cost of cancer in Europe 2018", <https://doi.org/10.1016/j.ejca.2020.01.011>; Luengo-Fernandez et al. (2023^[107]), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", <https://doi.org/10.1093/eurheartj/ehad583>.

2.8.3. Understanding the drivers of CVD's economic burden: Key cost factors **Investigating the drivers of CVD-related costs**

Understanding the drivers of CVD-related healthcare expenditure across EU countries is essential for designing effective policies aimed at controlling escalating healthcare budgets

CVD remains a leading cause of morbidity, mortality, and healthcare expenditure across Europe and globally, as illustrated in previous sections. As policymakers and healthcare systems strive for financial sustainability, it is crucial to understand the factors driving CVD-related costs. Demand-side drivers originate from the characteristics and behaviours of individuals and populations that affect their use of healthcare services. Supply-side drivers stem from the structure, organisation, and incentives of healthcare systems and providers that shape how care is delivered and financed. A clear distinction between these

two dimensions helps clarify the complex dynamics behind CVD-related costs and inform targeted interventions to improve health outcomes while managing expenditures.

Demand-side drivers: Demographic changes, disease prevalence, comorbidities, health behaviour

Demographic trends, particularly population ageing, are a major demand-side driver of rising healthcare costs. Older individuals experience higher incidences of chronic diseases, including CVD, and typically require more frequent and intensive medical care. The prevalence and severity of cardiovascular conditions – such as hypertension, stroke, and coronary artery disease – rise with age, contributing to increased healthcare utilisation and associated costs (Salvatore et al., 2021^[113]). Furthermore, the prevalence of CVD and its associated comorbidities (e.g. obesity, diabetes, hypertension) significantly impacts healthcare demand. Populations with higher rates of these conditions generate greater expenditures due to more frequent hospitalisations, specialist visits, and medication use. Understanding these prevalence dynamics is critical for designing preventive strategies to reduce disease incidence and mitigate healthcare costs (Maddox et al., 2017^[114]).

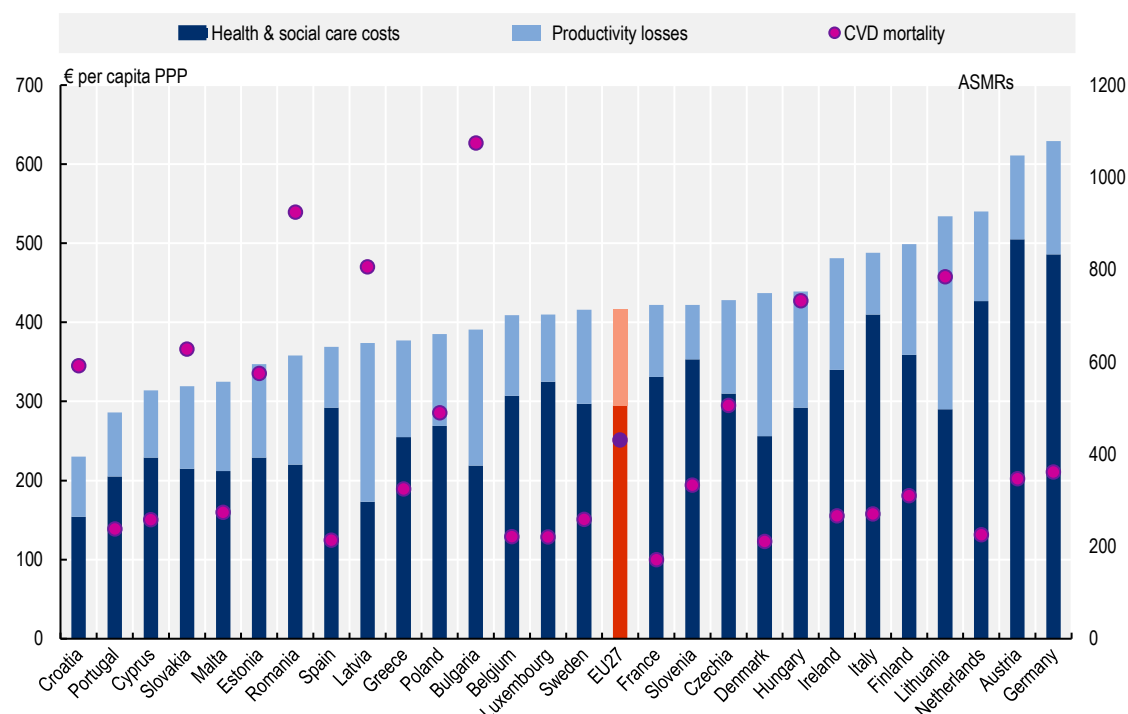
Direct health and social care expenditures – driven by service prices, care pathways, and treatment intensity – account for the largest share of the economic burden of CVD. These costs are virtually uncorrelated with age-standardised mortality rates (ASMR) from CVD (Figure 2.23) (Pearson correlation: 18%), suggesting that in the EU there is limited scope to further reduce CVD mortality solely through direct healthcare spending. Conversely, this also implies limited potential to significantly lower the overall economic burden of CVD through the prevention of CVD deaths alone.

Indirect costs show a similar pattern. Productivity losses, while partly linked mechanically to premature deaths, correlate only moderately with ASMR (56%) and explain just 31% of the variation in the total economic burden. Together, these findings help explain why, despite ASMR from CVD varying more than six-fold across European countries, total CVD-related costs vary by just over three-fold (Figure 2.23).

This reflects a fundamental shift in the nature of CVD's economic burden: in most EU countries, CVD is increasingly a chronic condition rather than an acute, fatal event. Advances in prevention, diagnosis, and treatment have extended survival, but have also increased the number of people living for many years with CVD, often requiring long-term medication, regular specialist visits, and repeated hospital interventions. As a result, the primary cost driver is no longer the treatment of acute, life-threatening episodes, but the ongoing management of chronic disease.

High CVD mortality does not necessarily translate into higher spending, and high spending does not necessarily translate into lower mortality. Health systems with comparatively low mortality rates may still face substantial costs, often due to high service prices, intensive treatment protocols, or costly hospital care. Conversely, countries with higher mortality rates may spend relatively little, reflecting differences in care access, coverage, or resource allocation. This lack of a clear relationship suggests that strategies focussed solely on reducing deaths are unlikely to achieve meaningful cost containment. To manage spending effectively, policy responses can better address service prices, provider payment systems, and the efficiency of care pathways. In particular, investments in prevention and chronic care models – those that improve health outcomes and reduce morbidity – can yield substantial economic returns by preserving the productivity of the working-age population, even when short-term mortality gains are limited.

Figure 2.23. Disease burden (CVD mortality) explains only 18% of the variation in health and social care spending



Source: Eurostat (hlth_cd_asdr2), 2025; Hofmarcher et al. (2020^[109]), "The cost of cancer in Europe 2018", <https://doi.org/10.1016/j.ejca.2020.01.011>; Luengo-Fernandez et al. (2023^[107]), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", <https://doi.org/10.1093/eurheartj/ehad583>.

It has been widely documented that patient's behaviour greatly influences health outcomes and consequentially, disease related costs. More specifically, patient adherence to prescribed medications and treatment protocols has a profound effect on CVD-related costs. Better adherence improves disease control, reduces complications, and ultimately lowers healthcare utilisation and expenditures (Ho, Bryson and Rumsfeld, 2009^[115]). Conversely, poor adherence increases the risk of adverse events and hospitalisations. More specifically, modifiable risk factors such as smoking, poor diet, and physical inactivity contribute to the demand for CVD care. Effective public health interventions targeting these factors can reduce the incidence of CVD, prevent disease progression, and substantially lower long-term healthcare costs (Landrigan et al., 2018^[116]). Analogously, the extent to which populations utilise preventive healthcare services, such as screening and early detection programmes, directly influences CVD-related expenditures. Gaziano and authors showed that countries that invest in preventive services typically achieve better disease management and long-term cost control by reducing the need for costly acute interventions (Gaziano et al., 2013^[117]).

Supply-side drivers: Technological innovation, policy framework, health system structure and incentives

On the supply side, several key factors – technological innovation, policy frameworks, and the structural and financial organisation of health systems – play a pivotal role in shaping the cost dynamics of CVD care and related costs.

Technological innovation has transformed the landscape of CVD treatment, introducing a range of advanced interventions such as minimally invasive surgeries, implantable cardiac devices, and cutting-

edge pharmaceuticals. While these innovations hold considerable promise for improving patient outcomes, they often come with high price tags, putting additional pressure on healthcare budgets. Balancing innovation with affordability requires robust mechanisms for evaluating the value of new technologies. In this context, rigorous health technology assessments are essential to determine which innovations provide meaningful health benefits relative to their costs, ensuring that resource allocation remains both effective and sustainable (Salvatore et al., 2021^[113]). It is equally important to involve multiple stakeholders – including clinicians, patients and caregivers, payers, and manufacturers – in such assessments, so that evaluation criteria are comprehensive, inclusive and aligned with real-world needs and values (Freitas, Oliveira and Vieira, 2025^[118]).

Equally important are the policy and governance frameworks that steer public health priorities and shape health system responses to CVD. Comprehensive and well-enforced public health policies, including tobacco control, nutrition regulation and the promotion of physical activity, can play a crucial role in preventing CVD (see Chapter 6). Countries that invest in such upstream preventive strategies tend to experience lower healthcare expenditures in the long run, highlighting the cost-saving potential of proactive governance (Maddox et al., 2017^[114]).

Moreover, the efficiency with which healthcare systems allocate and utilise resources greatly influences the economic burden of CVD. Systems that streamline care delivery, reduce redundancy, and prioritise evidence-based interventions tend to achieve better outcomes at lower costs. Cross-national comparisons show that countries with more efficient models of care often report fewer avoidable hospital admissions and more sustainable expenditure patterns. Sharing and implementing best practices across systems can therefore play a vital role in enhancing the financial sustainability of CVD care (On behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee, 2021^[119]).

Finally, the underlying organisation of health systems and the incentive structures they employ have a direct impact on cost trajectories. In fee-for-service models, providers may have financial motivations to increase the volume of tests and procedures, which can lead to unnecessary interventions and higher costs. In contrast, integrated care systems or those based on capitation payments tend to encourage care co-ordination, preventive services, and long-term cost containment. These alternative models can align financial incentives with patient-centred outcomes, fostering a more efficient and sustainable approach to managing cardiovascular health (On behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee, 2021^[119]). OECD research shows that weaker PHC systems are associated with higher CVD spending, although the relationship remains modest and not statistically significant. For instance, countries with weak gatekeeping⁶ reported an average CVD spending of EUR 302 per capita, compared to EUR 285 in those with strong gatekeeping. Similarly, countries with limited comprehensiveness, as defined by having limited incentives for quality, spent EUR 315 per capita on average, versus EUR 271 in countries with strong incentives – a notable difference of EUR 44. In terms of continuity of care,⁷ countries classified as having moderate continuity spent the most (EUR 309), followed by strong continuity (EUR 294) and limited continuity (EUR 290), although this dimension showed less variation. When combining these three features, countries with limited gatekeeping, weak incentives, and low continuity exhibited the highest average CVD expenditure, at EUR 362 per capita (see 0).

2.8.4. Balancing demand and supply: Tackling the complex drivers of cardiovascular healthcare costs

In summary, the healthcare costs associated with CVD are driven by a multifaceted interaction between demand- and supply-side determinants. On the demand side, demographic changes such as population ageing and increased life expectancy contribute to a growing number of individuals at risk of CVD. Rising disease prevalence, often linked to modifiable risk factors like unhealthy diets, physical inactivity, smoking,

and obesity, further intensifies healthcare needs. Socio-economic disparities also play a significant role, as lower-income and less-educated populations tend to experience higher CVD incidence, limited access to preventive care, and delayed treatment, amplifying both the health and economic burdens. Moreover, patient behaviours – including adherence to treatment, health literacy, and engagement with preventive services – critically influence outcomes and costs. On the supply side, variations in healthcare system organisation, financing models, and care delivery efficiency substantially affect how resources are allocated and utilised. The adoption of new technologies and innovations – such as digital health tools, telemedicine, and advanced treatments – can improve outcomes but also drive up short-term costs. Policy frameworks and reimbursement mechanisms further shape provider incentives and influence investment in prevention versus acute care. Efficiency gaps, fragmented care pathways, and uneven access across regions can lead to cost escalation and suboptimal health outcomes.

Addressing these interrelated factors requires a comprehensive and balanced policy approach. Health systems can further strengthen primary and preventive care, promote integrated service delivery, and ensure equitable access to effective interventions. Policymakers have an opportunity to also invest in data-driven planning, cost-effectiveness evaluation, and workforce development to improve efficiency and sustainability. By tackling both demand- and supply-side pressures in tandem, countries can achieve a more resilient, equitable, and cost-effective response to the growing challenge of CVD.

References

- Abrahamowicz, A. et al. (2023), “Racial and Ethnic Disparities in Hypertension: Barriers and Opportunities to Improve Blood Pressure Control”, *Current Cardiology Reports*, Vol. 25/1, pp. 17-27, <https://doi.org/10.1007/s11886-022-01826-x>. [93]
- AHA (2025), “2025 Heart Disease and Stroke Statistics: A Report of US and Global Data From the American Heart Association”, *Circulation*, Vol. 151/8, <https://doi.org/10.1161/cir.0000000000001303>. [95]
- AHA (2025), *Cardiovascular health risks continue to grow within Black communities, action needed* | American Heart Association, <https://newsroom.heart.org/news/cardiovascular-health-risks-continue-to-grow-within-black-communities-action-needed> (accessed on 8 July 2025). [94]
- Alahmad, B. et al. (2023), “Associations Between Extreme Temperatures and Cardiovascular Cause-Specific Mortality: Results From 27 Countries”, *Circulation*, Vol. 147/1, pp. 35-46, <https://doi.org/10.1161/circulationaha.122.061832>. [104]
- American Heart Association (2024), “Forecasting the Economic Burden of Cardiovascular Disease and Stroke in the United States Through 2050: A Presidential Advisory From the American Heart Association”, *Circulation*, Vol. 150/4, <https://doi.org/10.1161/cir.0000000000001258>. [110]
- American Heart Association (2021), *Heart Attack Symptoms in Women*, (accessed on 23 September 2024), <https://www.heart.org/en/health-topics/heart-attack/warning-signs-of-a-heart-attack/heart-attack-symptoms-in-women>. [49]
- American Heart Association (2019), *Is it fatigue – or a stroke? Women shouldn't ignore these warning signs*, <https://www.heart.org/en/news/2019/05/31/is-it-fatigue-or-a-stroke-women-shouldnt-ignore-these-warning-signs>. [50]

- Bae, S. et al. (2020), "Impact of cardiovascular disease and risk factors on fatal outcomes in patients with COVID-19 according to age: a systematic review and meta-analysis", *Heart*, Vol. 107/5, pp. 373-380, <https://doi.org/10.1136/heartjnl-2020-317901>. [11]
- Balbay, Y. (2018), "Modelling the Burden of Cardiovascular Disease in Turkey: Part 1", *The Anatolian Journal of Cardiology*, <https://doi.org/10.14744/anatoljcardiol.2018.89106>. [112]
- BHF (2019), *Bias and biology: how the gender gap in heart disease is costing women's lives. British Heart Foundation briefing*, <https://www.bhf.org.uk/-/media/files/heart-matters/bias-and-biology-briefing.pdf>. [40]
- Bodenheimer, T. et al. (2014), "The 10 Building Blocks of High-Performing Primary Care", *The Annals of Family Medicine*, Vol. 12/2, pp. 166-171, <https://doi.org/10.1370/afm.1616>. [123]
- Borkowski, P. and N. Borkowska (2024), "Understanding Mental Health Challenges in Cardiovascular Care", *Cureus*, <https://doi.org/10.7759/cureus.54402>. [29]
- Bostock, B. (2021), "Cardiovascular disease: the gender divide", *Practice Nursing*, Vol. 32/5, pp. 184-188, <https://doi.org/10.12968/pnur.2021.32.5.184>. [45]
- Brondolo, E. et al. (2011), "Racism and Hypertension: A Review of the Empirical Evidence and Implications for Clinical Practice", *American Journal of Hypertension*, Vol. 24/5, pp. 518-529, <https://doi.org/10.1038/ajh.2011.9>. [92]
- Bugiardini, R. (2023), "Tackling cardiovascular health inequalities in European countries", *The Lancet Regional Health–Europe*, Vol. 33, <https://doi.org/10.1016/j.lanepe.2023.100730>. [18]
- Burgess, S. et al. (2025), "The under-representation of women in cardiovascular clinical trials: State-of-the-art review and ethical considerations", *American Heart Journal*, Vol. 282, pp. 81-92, <https://doi.org/10.1016/j.ahj.2024.12.011>. [38]
- Cainzos-Achirica, M. et al. (2019), "Epidemiology, risk factors, and opportunities for prevention of cardiovascular disease in individuals of South Asian ethnicity living in Europe", *Atherosclerosis*, Vol. 286, pp. 105-113, <https://doi.org/10.1016/j.atherosclerosis.2019.05.014>. [70]
- Cenko, E. et al. (2023), "Clinical determinants of ischemic heart disease in Eastern Europe", *The Lancet Regional Health - Europe*, Vol. 33, p. 100698, <https://doi.org/10.1016/j.lanepe.2023.100698>. [19]
- Chaturvedi, N. (2003), "Ethnic differences in cardiovascular disease", *Heart*, Vol. 89/6, pp. 681-686, <https://doi.org/10.1136/heart.89.6.681>. [80]
- Cherla, A. et al. (2024), "Trends in avoidable mortality from cardiovascular diseases in the European Union, 1995–2020: a retrospective secondary data analysis", *The Lancet Regional Health - Europe*, Vol. 47, p. 101079, <https://doi.org/10.1016/j.lanepe.2024.101079>. [23]
- Chong, B. et al. (2024), "Global burden of cardiovascular diseases: projections from 2025 to 2050", *European Journal of Preventive Cardiology*, Vol. 32/11, pp. 1001-1015, <https://doi.org/10.1093/eurjpc/zwae281>. [3]
- Correll, C. et al. (2017), "Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls", *World Psychiatry*, Vol. 16/2, pp. 163-180, <https://doi.org/10.1002/wps.20420>. [96]

- Council of the European Union (2024), *Conclusions on the improvement of cardiovascular health in the European Union*, <https://ehnheart.org/wp-content/uploads/2024/12/Conclusions-on-the-improvement-of-cardiovascular-health-in-the-European-Union.pdf> (accessed on 8 July 2025). [10]
- CVD-COVID-UK Consortium (2023), “The impact of the COVID-19 pandemic on cardiovascular disease prevention and management”, *Nature Medicine*, Vol. 29/1, pp. 219-225, <https://doi.org/10.1038/s41591-022-02158-7>. [15]
- Dal Canto, E., B. Farukh and L. Faconti (2018), “Why are there ethnic differences in cardio-metabolic risk factors and cardiovascular diseases?”, *JRSM Cardiovascular Disease*, Vol. 7, <https://doi.org/10.1177/2048004018818923>. [69]
- Daponte-Codina, A. et al. (2022), “Gender and Social Inequalities in Awareness of Coronary Artery Disease in European Countries”, *International Journal of Environmental Research and Public Health*, Vol. 19/3, p. 1388, <https://doi.org/10.3390/ijerph19031388>. [37]
- Di Girolamo, C. et al. (2019), “Progress in reducing inequalities in cardiovascular disease mortality in Europe”, *Heart*, Vol. 106/1, pp. 40-49, <https://doi.org/10.1136/heartjnl-2019-315129>. [65]
- Dimova, A. et al. (2018), *Bulgaria: Health system review*, Health Systems in Transition, No. 20(4): 1–256, European Observatory on Health Systems and Policies, <https://eurohealthobservatory.who.int/publications/i/bulgaria-health-system-review-2018>. [132]
- Dunlay, S. and A. Chamberlain (2016), “Multimorbidity in Older Patients with Cardiovascular Disease”, *Current Cardiovascular Risk Reports*, Vol. 10/1, <https://doi.org/10.1007/s12170-016-0491-8>. [31]
- Džakula, A. et al. (2021), *Croatia: Health system review*, Health Systems in Transition, No. 23(2): pp.i–146., European Observatory on Health Systems and Policies, <https://eurohealthobservatory.who.int/publications/i/croatia-health-system-review-2021>. [134]
- ESC Atlas of Cardiovascular Disease Statistics (2024), “European Society of Cardiology: the 2023 Atlas of Cardiovascular Disease Statistics”, *European Heart Journal*, Vol. 45/38, pp. 4019-4062, <https://doi.org/10.1093/eurheartj/ehae466>. [6]
- ESC Cardiovascular Realities (2024), *Cardiovascular Realities 2024*, <https://www.flipsnack.com/escardio/esc-cardiovascular-realities-2024/full-view.html>. [2]
- ESC EHN Fighting cardiovascular disease (2020), *Fighting cardiovascular disease*, https://www.escardio.org/static-file/Escardio/Advocacy/Documents/2020%20ESC-EHN-blueprint_digital%20edition.pdf. [61]
- ESC EU 27 Cardiovascular Realities (2025), *EU 27 Cardiovascular Realities 2025*, <https://www.flipsnack.com/escardio/eu-27-cardiovascular-realities-2025/full-view.html>. [4]
- Eurostat (2023), *Hospital discharges and length of stay statistics*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Hospital_discharges_and_length_of_stay_statistics. [33]
- Fan, J. et al. (2023), “A systematic review and meta-analysis of cold exposure and cardiovascular disease outcomes”, *Frontiers in Cardiovascular Medicine*, Vol. 10, <https://doi.org/10.3389/fcvm.2023.1084611>. [103]

- Fluck, D. et al. (2023), "Adverse stroke outcomes amongst UK ethnic minorities: a multi-centre registry-based cohort study of acute stroke", *Neurological Sciences*, Vol. 44/6, pp. 2071-2080, <https://doi.org/10.1007/s10072-023-06640-z>. [88]
- Freitas, L., M. Oliveira and A. Vieira (2025), "Guiding stakeholder involvement in health technology assessment for medical devices: A novel approach for clarifying stakeholders' roles and contributions", *Health Policy and Technology*, Vol. 14/6, p. 101075, <https://doi.org/10.1016/j.hlpt.2025.101075>. [118]
- Gao, Z. et al. (2019), "Gender differences in cardiovascular disease", *Medicine in Novel Technology and Devices*, Vol. 4, p. 100025, <https://doi.org/10.1016/j.medntd.2019.100025>. [43]
- Gaziano, T. et al. (2013), "Comparative assessment of absolute cardiovascular disease risk characterization from non-laboratory-based risk assessment in South African populations", *BMC Medicine*, Vol. 11/1, <https://doi.org/10.1186/1741-7015-11-170>. [117]
- Goff, L. (2019), "Ethnicity and Type 2 diabetes in the UK", *Diabetic Medicine*, Vol. 36/8, pp. 927-938, <https://doi.org/10.1111/dme.13895>. [77]
- Goh, R. et al. (2024), "The burden of cardiovascular disease in Asia from 2025 to 2050: a forecast analysis for East Asia, South Asia, South-East Asia, Central Asia, and high-income Asia Pacific regions", *The Lancet Regional Health - Western Pacific*, Vol. 49, p. 101138, <https://doi.org/10.1016/j.lanwpc.2024.101138>. [71]
- Greenwood, B., S. Carnahan and L. Huang (2018), "Patient–physician gender concordance and increased mortality among female heart attack patients", *Proceedings of the National Academy of Sciences*, Vol. 115/34, pp. 8569-8574, <https://doi.org/10.1073/pnas.1800097115>. [48]
- Gumas, E. (2024), *Finger on the Pulse: The State of Primary Care in the U.S. and Nine Other Countries*, <https://doi.org/10.26099/p3y4-5q38>. [130]
- Hanif, W. and R. Susarla (2018), "Diabetes and CVD supplement: 2. Diabetes and cardiovascular risk in UK South Asians - an overview", *British Journal of Cardiology*, <https://doi.org/10.5837/bjc.2018.s08>. [76]
- Harding, S., M. Rosato and A. Teyhan (2007), "Trends for coronary heart disease and stroke mortality among migrants in England and Wales, 1979–2003: slow declines notable for some groups", *Heart*, Vol. 94/4, pp. 463-470, <https://doi.org/10.1136/hrt.2007.122044>. [83]
- Health Systems Innovation Lab at Harvard University (2022), "The State of Cardiovascular Disease in G20+ Countries", *HPHR Journal*, Vol. HSIL/2022, <https://doi.org/10.54111/0001/hsil/cvdg20>. [7]
- Ho, F. et al. (2022), "Ethnic differences in cardiovascular risk: examining differential exposure and susceptibility to risk factors", *BMC Medicine*, Vol. 20/1, <https://doi.org/10.1186/s12916-022-02337-w>. [78]
- Hofmarcher, T. et al. (2020), "The cost of cancer in Europe 2018", *European Journal of Cancer*, Vol. 129, pp. 41-49, <https://doi.org/10.1016/j.ejca.2020.01.011>. [109]
- Ho, J. and A. Hendi (2018), "Recent trends in life expectancy across high income countries: retrospective observational study", *BMJ*, p. k2562, <https://doi.org/10.1136/bmj.k2562>. [101]

- Højstrup, S., J. Thomsen and E. Prescott (2023), “Disparities in cardiovascular disease and treatment in the Nordic countries”, *The Lancet Regional Health - Europe*, Vol. 33, p. 100699, <https://doi.org/10.1016/j.lanepe.2023.100699>. [63]
- Ho, P., C. Bryson and J. Rumsfeld (2009), “Medication Adherence”, *Circulation*, Vol. 119/23, pp. 3028-3035, <https://doi.org/10.1161/circulationaha.108.768986>. [115]
- HQIP (2023), *CVDPREVENT Deep Dive: inequalities in cholesterol management by sex for patients with CVD*, <https://www.hqip.org.uk/wp-content/uploads/2024/07/CVDPREVENT-Deep-Dive-inequalities-in-cholesterol-management-by-sex-for-patients-with-CVD-FINAL-v3.pdf>. [58]
- Hyun, K. et al. (2017), “Gender inequalities in cardiovascular risk factor assessment and management in primary healthcare”, *Heart*, Vol. 103/7, pp. 492-498, <https://doi.org/10.1136/heartjnl-2016-310216>. [39]
- Jang, S. et al. (2020), “Associations Between Hospital Length of Stay, 30-Day Readmission, and Costs in ST-Segment–Elevation Myocardial Infarction After Primary Percutaneous Coronary Intervention: A Nationwide Readmissions Database Analysis”, *Journal of the American Heart Association*, Vol. 9/11, <https://doi.org/10.1161/jaha.119.015503>. [34]
- Khan, Y. et al. (2023), “Impact of the COVID-19 pandemic on delayed care of cardiovascular diseases in Europe: a systematic review”, *The Lancet*, Vol. 402, p. S61, [https://doi.org/10.1016/s0140-6736\(23\)02117-7](https://doi.org/10.1016/s0140-6736(23)02117-7). [14]
- Kiechl, S. (ed.) (2014), “Relationship of Self-Rated Health with Fatal and Non-Fatal Outcomes in Cardiovascular Disease: A Systematic Review and Meta-Analysis”, *PLoS ONE*, Vol. 9/7, p. e103509, <https://doi.org/10.1371/journal.pone.0103509>. [28]
- Kringos, D. et al. (2013), “Europe’s Strong Primary Care Systems Are Linked To Better Population Health But Also To Higher Health Spending”, *Health Affairs*, Vol. 32/4, pp. 686-694, <https://doi.org/10.1377/hlthaff.2012.1242>. [120]
- Krishna, B. et al. (2024), “Cardiovascular disease and covid-19: A systematic review”, *IJC Heart & Vascular*, Vol. 54, p. 101482, <https://doi.org/10.1016/j.ijcha.2024.101482>. [17]
- Kuper, H. et al. (2024), “The association between disability and mortality: a mixed-methods study”, *The Lancet Public Health*, Vol. 9/5, pp. e306-e315, [https://doi.org/10.1016/s2468-2667\(24\)00054-9](https://doi.org/10.1016/s2468-2667(24)00054-9). [100]
- Lacroix, C. et al. (2023), “Sex differences in adverse drug reactions: Are women more impacted?”, *Therapies*, Vol. 78/2, pp. 175-188, <https://doi.org/10.1016/j.therap.2022.10.002>. [51]
- Landrigan, P. et al. (2018), “The Lancet Commission on pollution and health”, *The Lancet*, Vol. 391/10119, pp. 462-512, [https://doi.org/10.1016/s0140-6736\(17\)32345-0](https://doi.org/10.1016/s0140-6736(17)32345-0). [116]
- Laurant, M. et al. (2018), “Nurses as substitutes for doctors in primary care”, *Cochrane Database of Systematic Reviews*, Vol. 2019/2, <https://doi.org/10.1002/14651858.cd001271.pub3>. [121]
- Leal, J. et al. (2006), “Economic burden of cardiovascular diseases in the enlarged European Union”, *European Heart Journal*, Vol. 27/13, pp. 1610-1619, <https://doi.org/10.1093/eurheartj/ehi733>. [105]

- Lock, R. et al. (2021), “A framework for developing sex-specific engineered heart models”, *Nature Reviews Materials*, Vol. 7/4, pp. 295-313, <https://doi.org/10.1038/s41578-021-00381-1>. [57]
- Lozano Sánchez, M. et al. (2013), “Evolución del riesgo cardiovascular de los inmigrantes residentes en España según procedencia y años de estancia”, *Atención Primaria*, Vol. 45/2, pp. 92-100, <https://doi.org/10.1016/j.aprim.2012.10.003>. [86]
- Luengo-Fernandez, R. et al. (2023), “Economic burden of cardiovascular diseases in the European Union: a population-based cost study”, *European Heart Journal*, Vol. 44/45, pp. 4752-4767, <https://doi.org/10.1093/eurheartj/ehad583>. [107]
- Maas, A. and Y. Appelman (2010), “Gender differences in coronary heart disease”, *Netherlands Heart Journal*, Vol. 18/12, pp. 598-603, <https://doi.org/10.1007/s12471-010-0841-y>. [54]
- Macinko, J., B. Starfield and L. Shi (2003), “The Contribution of Primary Care Systems to Health Outcomes within Organization for Economic Cooperation and Development (OECD) Countries, 1970–1998”, *Health Services Research*, Vol. 38/3, pp. 831-865, <https://doi.org/10.1111/1475-6773.00149>. [126]
- Maddox, T. et al. (2017), “The Learning Healthcare System and Cardiovascular Care: A Scientific Statement From the American Heart Association”, *Circulation*, Vol. 135/14, <https://doi.org/10.1161/cir.0000000000000480>. [114]
- Manzano, A. et al. (2025), *Comparator Report on Cancer in Europe 2025 - Disease Burden, Costs and Access to Medicines and Molecular Diagnostics*, IHE REPORT. [108]
- McGowan, V. et al. (2021), “Examining the effectiveness of place-based interventions to improve public health and reduce health inequalities: an umbrella review”, *BMC Public Health*, Vol. 21/1, <https://doi.org/10.1186/s12889-021-11852-z>. [66]
- Méjean, C. et al. (2013), “The contribution of diet and lifestyle to socioeconomic inequalities in cardiovascular morbidity and mortality”, *International Journal of Cardiology*, Vol. 168/6, pp. 5190-5195, <https://doi.org/10.1016/j.ijcard.2013.07.188>. [67]
- Melloni, C. et al. (2010), “Representation of Women in Randomized Clinical Trials of Cardiovascular Disease Prevention”, *Circulation: Cardiovascular Quality and Outcomes*, Vol. 3/2, pp. 135-142, <https://doi.org/10.1161/circoutcomes.110.868307>. [42]
- Mensah, G. et al. (2023), “Global Burden of Cardiovascular Diseases and Risks, 1990-2022”, *Journal of the American College of Cardiology*, Vol. 82/25, pp. 2350-2473, <https://doi.org/10.1016/j.jacc.2023.11.007>. [25]
- Mensah, G. et al. (2017), “Decline in Cardiovascular Mortality”, *Circulation Research*, Vol. 120/2, pp. 366-380, <https://doi.org/10.1161/circresaha.116.309115>. [62]
- Minja, N. et al. (2022), “Cardiovascular diseases in Africa in the twenty-first century: Gaps and priorities going forward”, *Frontiers in Cardiovascular Medicine*, Vol. 9, <https://doi.org/10.3389/fcvm.2022.1008335>. [91]
- Mi, Y. et al. (2023), “The economic burden of coronary heart disease in mainland China”, *Public Health*, Vol. 224, pp. 140-151, <https://doi.org/10.1016/j.puhe.2023.08.034>. [111]

- Moura, A. et al. (2023), “Association of Length of Stay With the Clinical Trajectory of Hospitalized Patients With Atrial Fibrillation: Staying Less Is More?”, *The American Journal of Cardiology*, Vol. 206, pp. 254-261, <https://doi.org/10.1016/j.amjcard.2023.08.066>. [35]
- Murtagh, S. et al. (2021), “Integrating Primary and Secondary Care to Enhance Chronic Disease Management: A Scoping Review”, *International Journal of Integrated Care*, Vol. 21/1, <https://doi.org/10.5334/ijic.5508>. [127]
- Nutting, P. et al. (2010), “Effect of Facilitation on Practice Outcomes in the National Demonstration Project Model of the Patient-Centered Medical Home”, *The Annals of Family Medicine*, Vol. 8/Suppl_1, pp. S33-S44, <https://doi.org/10.1370/afm.1119>. [122]
- OECD (2025), *Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS)*, OECD Publishing, Paris, <https://doi.org/10.1787/c8af05a5-en>. [8]
- OECD (2023), *Health at a Glance 2023: OECD Indicators*, OECD Publishing, Paris, <https://doi.org/10.1787/7a7afb35-en>. [36]
- OECD (2023), *Ready for the Next Crisis? Investing in Health System Resilience*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/1e53cf80-en>. [60]
- OECD (2021), *Health at a Glance 2021: OECD Indicators*, OECD Publishing, Paris, <https://doi.org/10.1787/ae3016b9-en>. [13]
- OECD (2015), *Cardiovascular Disease and Diabetes: Policies for Better Health and Quality of Care*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/9789264233010-en>. [32]
- OECD/European Commission (2024), *Health at a Glance: Europe 2024: State of Health in the EU Cycle*, OECD Publishing, Paris, <https://doi.org/10.1787/b3704e14-en>. [9]
- OECD/European Observatory on Health Systems and Policies (2023), *Bulgaria: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/8d90f882-en>. [131]
- OECD/European Observatory on Health Systems and Policies (2023), *Croatia: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/8a7eadc9-en>. [133]
- OECD/European Observatory on Health Systems and Policies (2023), *Malta: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/2a821e8a-en>. [136]
- OECD/European Observatory on Health Systems and Policies (2023), *Romania: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/f478769b-en>. [137]
- OECD/The Health Foundation (2025), *How Do Health System Features Influence Health System Performance?*, OECD Publishing, Paris, <https://doi.org/10.1787/7b877762-en>. [129]
- OECD/The King's Fund (2020), *Is Cardiovascular Disease Slowing Improvements in Life Expectancy?: OECD and The King's Fund Workshop Proceedings*, OECD Publishing, Paris, <https://doi.org/10.1787/47a04a11-en>. [1]

- Office for National Statistics (2023), “Risk factors for undiagnosed high blood pressure in England: 2015 to 2019”, <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandwellbeing/articles/riskfactorsforundiagnosedhighbloodpressureinengland/2015to2019>. [59]
- OHID (2023), *Segment Tool*, <https://analytics.phe.gov.uk/apps/segment-tool/>. [64]
- On behalf of the American Heart Association Council on Epidemiology and Prevention Statistics Committee and Stroke Statistics Subcommittee (2021), “Heart Disease and Stroke Statistics—2021 Update”, *Circulation*, Vol. 143/8, <https://doi.org/10.1161/cir.0000000000000950>. [119]
- ONS (2023), *National life tables – life expectancy in England and Wales: 2021 to 2023*, <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/nationallifetablesunitedkingdom/2021to2023>. [90]
- ONS (2021), *Ethnic differences in life expectancy and mortality from selected causes in England and Wales: 2011 to 2014*, <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/articles/ethnicdifferencesinlifeexpectancyandmortalityfromselectedcausesinenglandandwales/2011to2014>. [89]
- Patel, A. et al. (2021), “Quantifying and Understanding the Higher Risk of Atherosclerotic Cardiovascular Disease Among South Asian Individuals”, *Circulation*, Vol. 144/6, pp. 410-422, <https://doi.org/10.1161/circulationaha.120.052430>. [79]
- Patwardhan, V. et al. (2024), “Differences across the lifespan between females and males in the top 20 causes of disease burden globally: a systematic analysis of the Global Burden of Disease Study 2021”, *The Lancet Public Health*, Vol. 9/5, pp. e282-e294, [https://doi.org/10.1016/s2468-2667\(24\)00053-7](https://doi.org/10.1016/s2468-2667(24)00053-7). [55]
- Peikes, D. et al. (2018), “The Comprehensive Primary Care Initiative: Effects On Spending, Quality, Patients, And Physicians”, *Health Affairs*, Vol. 37/6, pp. 890-899, <https://doi.org/10.1377/hlthaff.2017.1678>. [124]
- Peters, S. and M. Woodward (2022), “Sex and gender matter in cardiovascular disease and beyond”, *Heart*, Vol. 108/13, pp. 994-995, <https://doi.org/10.1136/heartjnl-2021-320719>. [20]
- Pinho-Gomes, A. et al. (2020), “Sex differences in prevalence, treatment and control of cardiovascular risk factors in England”, *Heart*, Vol. 107/6, pp. 462-467, <https://doi.org/10.1136/heartjnl-2020-317446>. [46]
- Pizzato, M. et al. (2024), “Impact of COVID-19 on total excess mortality and geographic disparities in Europe, 2020–2023: a spatio-temporal analysis”, *The Lancet Regional Health - Europe*, Vol. 44, p. 100996, <https://doi.org/10.1016/j.lanepe.2024.100996>. [16]
- Plasil, T. et al. (2024), “‘A potentially ticking time bomb’ – barriers for prevention, diagnosis, and treatment of cardiovascular disease in people with intellectual disabilities”, *Journal of Applied Research in Intellectual Disabilities*, Vol. 37/6, <https://doi.org/10.1111/jar.13279>. [99]
- Puka, K. et al. (2022), “Educational Attainment and Lifestyle Risk Factors Associated With All-Cause Mortality in the US”, *JAMA Health Forum*, Vol. 3/4, p. e220401, <https://doi.org/10.1001/jamahealthforum.2022.0401>. [68]

- Raleigh, V. (2019), “Trends in life expectancy in EU and other OECD countries : Why are improvements slowing?”, *OECD Health Working Papers*, No. 108, OECD Publishing, Paris, <https://doi.org/10.1787/223159ab-en>. [27]
- Raleigh, V. and F. Colombo (2023), “Cardiovascular disease should be a priority for health systems globally”, *BMJ*, p. e076576, <https://doi.org/10.1136/bmj-2023-076576>. [73]
- Raleigh, V., P. Goldblatt and F. Colombo (2025), “Ethnic differences in mortality in England and Wales after the pandemic”, *BMJ*, p. q2856, <https://doi.org/10.1136/bmj.q2856>. [74]
- Raparelli, V. et al. (2017), “Treatment and Response to Statins: Gender-related Differences”, *Current Medicinal Chemistry*, Vol. 24/24, <https://doi.org/10.2174/0929867324666161118094711>. [52]
- Razieh, C. et al. (2022), “Differences in the risk of cardiovascular disease across ethnic groups: UK Biobank observational study”, *Nutrition, Metabolism and Cardiovascular Diseases*, Vol. 32/11, pp. 2594-2602, <https://doi.org/10.1016/j.numecd.2022.08.002>. [72]
- Regional Health– Europe, T. (2021), “Pandemic heightens the need to combat cardiovascular diseases”, *The Lancet Regional Health - Europe*, Vol. 8, p. 100217, <https://doi.org/10.1016/j.lanepe.2021.100217>. [12]
- Rødevand, L. et al. (2023), “Characterizing the Shared Genetic Underpinnings of Schizophrenia and Cardiovascular Disease Risk Factors”, *American Journal of Psychiatry*, Vol. 180/11, pp. 815-826, <https://doi.org/10.1176/appi.ajp.20220660>. [97]
- Rost, N. et al. (2022), “Post-Stroke Cognitive Impairment and Dementia”, *Circulation Research*, Vol. 130/8, pp. 1252-1271, <https://doi.org/10.1161/circresaha.122.319951>. [24]
- Salvatore, F. et al. (2021), “Identification of Health Expenditures Determinants: A Model to Manage the Economic Burden of Cardiovascular Disease”, *International Journal of Environmental Research and Public Health*, Vol. 18/9, p. 4652, <https://doi.org/10.3390/ijerph18094652>. [113]
- Shah, A. and A. Kanaya (2014), “Diabetes and Associated Complications in the South Asian Population”, *Current Cardiology Reports*, Vol. 16/5, <https://doi.org/10.1007/s11886-014-0476-5>. [87]
- Singh, N. et al. (2024), “Heat and Cardiovascular Mortality: An Epidemiological Perspective”, *Circulation Research*, Vol. 134/9, pp. 1098-1112, <https://doi.org/10.1161/circresaha.123.323615>. [102]
- Skou, S. et al. (2022), “Multimorbidity”, *Nature Reviews Disease Primers*, Vol. 8/1, <https://doi.org/10.1038/s41572-022-00376-4>. [30]
- Solmi, M. et al. (2024), “Regional differences in mortality risk and in attenuating or aggravating factors in schizophrenia: A systematic review and meta-analysis”, *European Neuropsychopharmacology*, Vol. 80, pp. 55-69, <https://doi.org/10.1016/j.euroneuro.2023.12.010>. [98]
- Sørensen, H. and F. Bredahl Kristensen (2023), “Cardiovascular diseases and health inequalities in Europe—a pressing public health challenge”, *The Lancet Regional Health - Europe*, Vol. 33, p. 100722, <https://doi.org/10.1016/j.lanepe.2023.100722>. [21]

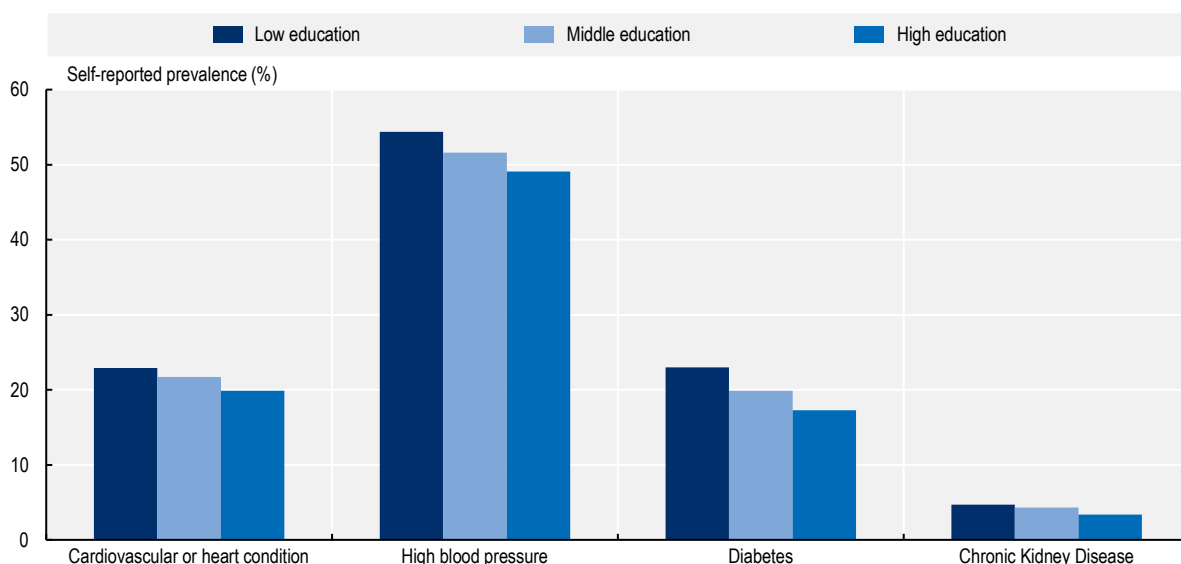
- Starfield, B., L. Shi and J. Macinko (2005), "Contribution of Primary Care to Health Systems and Health", *The Milbank Quarterly*, Vol. 83/3, pp. 457-502, <https://doi.org/10.1111/j.1468-0009.2005.00409.x>. [125]
- Steel, N. et al. (2025), "Changing life expectancy in European countries 1990–2021: a subanalysis of causes and risk factors from the Global Burden of Disease Study 2021", *The Lancet Public Health*, Vol. 10/3, pp. e172-e188, [https://doi.org/10.1016/s2468-2667\(25\)00009-x](https://doi.org/10.1016/s2468-2667(25)00009-x). [5]
- Temkin, S. et al. (2023), "Chronic conditions in women: the development of a National Institutes of health framework", *BMC Women's Health*, Vol. 23/1, <https://doi.org/10.1186/s12905-023-02319-x>. [53]
- Theodorou, M., C. Charalambous and G. Williams (2024), *Cyprus: Health system review*, Health Systems in Transition, No. 26(5), European Observatory on Health Systems and Policies, <https://eurohealthobservatory.who.int/publications/i/cyprus-health-system-review-2024>. [135]
- Townsend, N. et al. (2021), "Epidemiology of cardiovascular disease in Europe", *Nature Reviews Cardiology*, Vol. 19/2, pp. 133-143, <https://doi.org/10.1038/s41569-021-00607-3>. [26]
- van Oeffelen, A. et al. (2014), "Prognosis after a first hospitalisation for acute myocardial infarction and congestive heart failure by country of birth", *Heart*, Vol. 100/18, pp. 1436-1443, <https://doi.org/10.1136/heartjnl-2013-305444>. [84]
- Vogel, B. et al. (2021), "The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030", *The Lancet*, Vol. 397/10292, pp. 2385-2438, [https://doi.org/10.1016/s0140-6736\(21\)00684-x](https://doi.org/10.1016/s0140-6736(21)00684-x). [47]
- Volgan et al., (2018), "Atherosclerotic Cardiovascular Disease in South Asians in the United States: Epidemiology, Risk Factors, and Treatments: A Scientific Statement From the American Heart Association", *Circulation*, Vol. 138/1, <https://doi.org/10.1161/cir.0000000000000580>. [75]
- Wang, H. et al. (2023), "Association of intellectual disability with overall and type-specific cardiovascular diseases: a population-based cohort study in Denmark", *BMC Medicine*, Vol. 21/1, <https://doi.org/10.1186/s12916-023-02747-4>. [22]
- Wenzl, F. et al. (2022), "Sex-specific evaluation and redevelopment of the GRACE score in non-ST-segment elevation acute coronary syndromes in populations from the UK and Switzerland: a multinational analysis with external cohort validation", *The Lancet*, Vol. 400/10354, pp. 744-756, [https://doi.org/10.1016/s0140-6736\(22\)01483-0](https://doi.org/10.1016/s0140-6736(22)01483-0). [44]
- WHO/UNICEF (2018), *A vision for primary health care in the 21st century: towards universal health coverage and the Sustainable Development Goals*, World Health Organization and the United Nations Children's Fund. [128]
- Wilkins, E. et al. (2017), *European Cardiovascular Disease Statistics 2017*, European Heart Network. [106]
- Yang, C., S. Offen and J. Saw (2024), "What Is New in Spontaneous Coronary Artery Dissection?", *CJC Open*, Vol. 6/2, pp. 417-424, <https://doi.org/10.1016/j.cjco.2023.10.007>. [56]
- Yusuf, S. et al. (2001), "Global Burden of Cardiovascular Diseases", *Circulation*, Vol. 104/23, pp. 2855-2864, <https://doi.org/10.1161/hc4701.099488>. [81]

- Yuyun, M. et al. (2020), "Cardiovascular Diseases in Sub-Saharan Africa Compared to High-Income Countries: An Epidemiological Perspective", *Global Heart*, Vol. 15/1, p. 15, <https://doi.org/10.5334/gh.403>. [82]
- Zhao, M. et al. (2020), "Sex Differences in Cardiovascular Medication Prescription in Primary Care: A Systematic Review and Meta-Analysis", *Journal of the American Heart Association*, Vol. 9/11, <https://doi.org/10.1161/jaha.119.014742>. [41]
- Zhu, L., B. Huang and M. Chen (2023), "The mortality risk after myocardial infraction in migrants compared with natives: a systematic review and meta-analysis", *Frontiers in Cardiovascular Medicine*, Vol. 10, <https://doi.org/10.3389/fcvm.2023.1101386>. [85]

Annex 2.A. PaRIS analysis of CVD based on social and demographic factors

Annex Figure 2.A.1. CVD, High blood pressure, diabetes and CKD are more prevalent among lower educated primary care users

Self-reported conditions among people living with chronic conditions in PaRIS

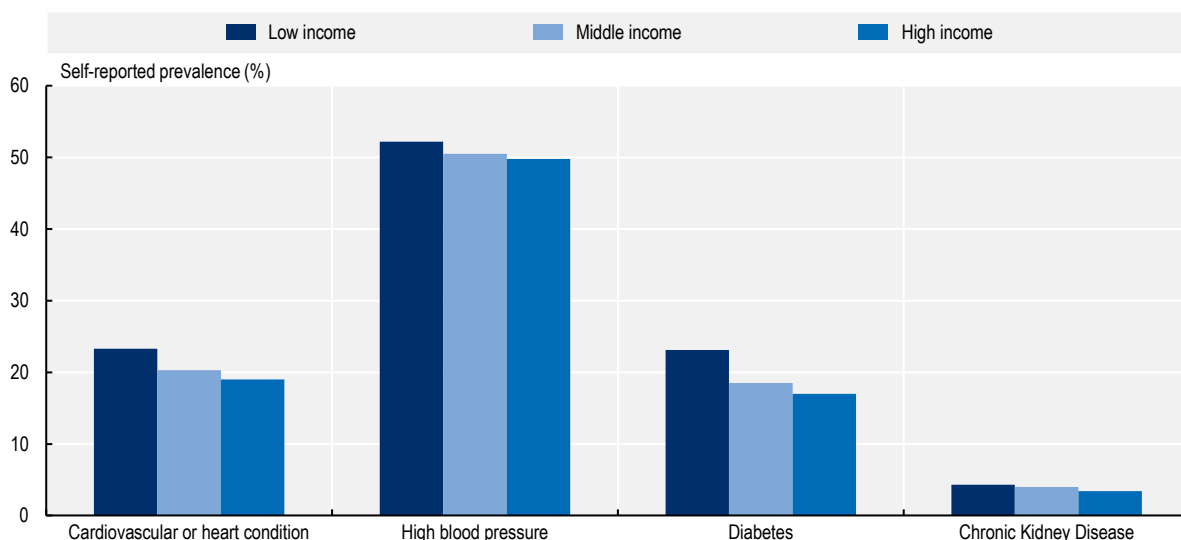


Note: The PaRIS survey was implemented in 19 countries: Australia, Belgium, Canada, Czechia, Wales (UK), France, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Romania, Saudi Arabia, Slovenia, Spain, Switzerland, the United States. Age and sex standardised.

Source: 2024 OECD PaRIS Database.

Annex Figure 2.A.2. CVD, high blood pressure, diabetes and CKD are more prevalent among low-income primary care users living with chronic conditions

Self-reported conditions among people living with chronic conditions in PaRIS



Note: The PaRIS survey was implemented in 19 countries: Australia, Belgium, Canada, Czechia, Wales (UK), France, Greece, Iceland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Romania, Saudi Arabia, Slovenia, Spain, Switzerland, the United States. Age and sex standardised.

Source: 2024 OECD PaRIS Database.

Assessing the role of primary care in CVD-related healthcare costs

Primary care substantially influences CVD related healthcare costs across EU countries

Primary care plays a pivotal role in managing chronic diseases, including cardiovascular conditions, by serving as the foundation of effective, accessible, and continuous healthcare. Effective primary care reduces overall healthcare costs through earlier diagnosis and better disease management, preventing severe cardiovascular complications (Kringos et al., 2013^[120]). Integrating primary care with public health services enhances community-level preventive strategies, reducing cardiovascular risks through lifestyle interventions and education programmes, subsequently lowering healthcare expenditures (Laurant et al., 2018^[121]). Enhanced patient education within primary care settings improves patient self-management and adherence, significantly lowering hospitalisation rates and associated healthcare costs (Nutting et al., 2010^[122]). Primary care teams utilising multidisciplinary approaches, including nurses, pharmacists, and health coaches, effectively manage chronic conditions, reducing healthcare resource use and associated costs (Bodenheimer et al., 2014^[123]). Finally, primary care-based chronic disease management programmes that emphasise proactive patient follow-up, telehealth services, and population health management significantly reduce healthcare expenditures related to cardiovascular diseases (Peikes et al., 2018^[124]).

According to Starfield's 4Cs framework – **first-contact access, comprehensiveness, continuity and co-ordination**, high-performing primary care systems are associated with better health outcomes and cost containment (Starfield, Shi and Macinko, 2005^[125]). By providing initial and continuous care, primary care practitioners can effectively manage chronic conditions, reducing costly hospitalisations and specialist interventions. First-contact access within primary care systems significantly reduces unnecessary emergency department visits and hospital admissions, directly lowering healthcare costs. Countries with robust primary care services, offering prompt access to healthcare professionals, demonstrate better management of cardiovascular risks, thereby preventing expensive acute interventions (Macinko, Starfield and Shi, 2003^[126]).

The comprehensiveness component of primary care ensures effective management of cardiovascular risk factors like hypertension, obesity, and diabetes within the community setting. Comprehensive primary care includes preventive services, lifestyle counseling, and chronic disease management, significantly lowering the need for specialist care and hospital-based interventions, and thus reducing overall healthcare expenditures (Murtagh et al., 2021^[127]). Continuity of care within primary care systems strengthens patient-provider relationships, enhancing adherence to treatment plans, medication regimens, and lifestyle modifications. Continuity ensures that cardiovascular conditions are closely monitored, reducing the risk of complications and expensive hospital remissions. Effective continuity reduces fragmentation in healthcare services, thus achieving better cost management (Starfield, Shi and Macinko, 2005^[125]). Co-ordination of care by primary care providers facilitates seamless navigation across healthcare services, reducing unnecessary duplication of tests and procedures, which are significant contributors to healthcare expenditure. Finally, well-co-ordinated primary care systems minimise fragmentation between specialist care, hospitals, and community services, optimizing resource use and thereby effectively managing healthcare costs related to cardiovascular conditions (WHO/UNICEF, 2018^[128]).

In this section we empirically explore the association of different primary care models and CVD economic burden in EU context. In order to do so, we first define operationally four dimensions of Starfiled's framework described above. First, to proxy first-contact access we use an indicator based on the gatekeeping role of primary care within health systems. Gatekeeping refers to whether primary care physicians act as the initial point of contact and control access to specialist care. This concept is captured through the OECD Health System Characteristics Survey (OECD/The Health Foundation, 2025^[129]) classifying countries into three categories: Strong gatekeeping, where referrals from primary care physicians are required for access most specialist services; Moderate gatekeeping, where referrals are not mandatory but incentivised through reduced co-payments or other mechanisms; and Limited gatekeeping, where patients can directly access specialist care without referral or incentives to consult a primary care provider first.

Second, to proxy comprehensiveness in a comparative, policy-relevant manner, we use an indicator based on the presence and scope of incentives for quality improvement in primary care. This proxy, drawn from the OECD Health System Characteristics Survey, assesses whether primary care physicians are incentivised based on performance metrics related to preventive care, chronic disease management, patient satisfaction, population health indicators, and uptake of IT services. Countries receive a base score of 3 if any incentive scheme is in place, with additional points (+0.6 each) added for each specific area covered by the scheme. The total score ranges from 0 to 6 and is then categorised into three groups: Limited incentives (0-2), Moderate incentives (3-4), and Strong incentives (5-6). This framework provides a structured way to assess the comprehensiveness and quality orientation of primary care across countries and its potential role in mitigating the economic burden of cardiovascular disease.

Third, to measure continuity of care in a cross-country context, we rely on a proxy indicator based on the proportion of the population with a regular doctor or usual source of care. This indicator, compiled from the OECD Health System Characteristics Survey, OECD PaRIS Survey (OECD, 2025^[8]), and the Commonwealth Fund International Health Policy Survey (Gumas, 2024^[130]), classifies countries into three categories: Limited continuity, where only a limited part of the population has a regular doctor; Moderate continuity, where the majority of the population does; and Strong continuity, where almost the entire population reports having a regular source of care.

A suitable proxy to categorise the level of co-ordination in primary care could not be identified for a substantial number of the 27 EU countries. However, for 11 EU countries, we were able to use data from the OECD PaRIS Survey, specifically the P3ECQ Care Co-ordination scores at the primary care level. Additionally, five EU countries – Bulgaria, Croatia, Cyprus, Malta, and Romania – did not participate in the OECD Health System Characteristics Survey. For these countries, a qualitative classification was developed based on available published literature. The variables classifying primary healthcare are described in Annex Table 0.1. Annex Figure 0.1 presents average CVD spending per capita in 2021 (in euros, PPP) across countries grouped by the quality of selected PHC system characteristics – first contact, comprehensiveness, and continuity of care.

Annex Table 0.1. Quality measuring in Primary Care

Classification of variables indicating strength in primary healthcare

Country	First contact (Gatekeeping)	Comprehensiveness (Incentives for quality)	Continuity	Coordination (P3ECQ – Co-ordination)
Austria	Limited	Limited	Moderate	
Belgium	Moderate	Limited	Strong	8.8
Bulgaria	Strong	Limited	Moderate	
Croatia	Strong	Strong	Strong	
Cyprus	Strong	Limited	Strong	
Czechia	Limited	Strong	Strong	9.2
Denmark	Moderate			
Estonia	Strong	Strong	Strong	
Finland	Strong	Limited	Strong	
France	Moderate	Strong	Moderate	8.4
Germany	Moderate	Limited	Strong	
Greece	Limited	Limited	Limited	7.1
Hungary	Limited	Limited	Strong	
Ireland	Strong	Limited	Moderate	
Italy	Strong	Limited	Moderate	9.5
Latvia	Moderate	Strong	Strong	
Lithuania	Strong	Strong	Strong	
Luxembourg	Limited	Limited	Limited	8.5
Malta	Limited	Limited	Strong	
Netherlands	Strong	Strong	Strong	7.3
Poland	Strong	Strong	Moderate	
Portugal	Strong	Strong	Moderate	7.3
Romania	Strong	Limited	Moderate	10.3
Slovak Republic	Limited	Limited		
Slovenia	Strong	Limited	Strong	8.2
Spain	Strong	Strong	Moderate	8.5
Sweden	Moderate	Strong	Moderate	

Note: P3CEQ Questionnaire (Care Co-ordination). Response to five questions measuring care co-ordination. Scale ranges from 0 to 15, higher scores represent better care co-ordination.

Source: (OECD/The Health Foundation, 2025^[129]; Luengo-Fernandez et al., 2023^[107]); Bulgaria (OECD/European Observatory on Health Systems and Policies, 2023^[131]; Dimova et al., 2018^[132]); Croatia (OECD/European Observatory on Health Systems and Policies, 2023^[133]; Džakula et al., 2021^[134]); Cyprus (Theodorou, Charalambous and Williams, 2024^[135]); Malta (OECD/European Observatory on Health Systems and Policies, 2023^[136]); Romania (OECD/European Observatory on Health Systems and Policies, 2023^[137]).

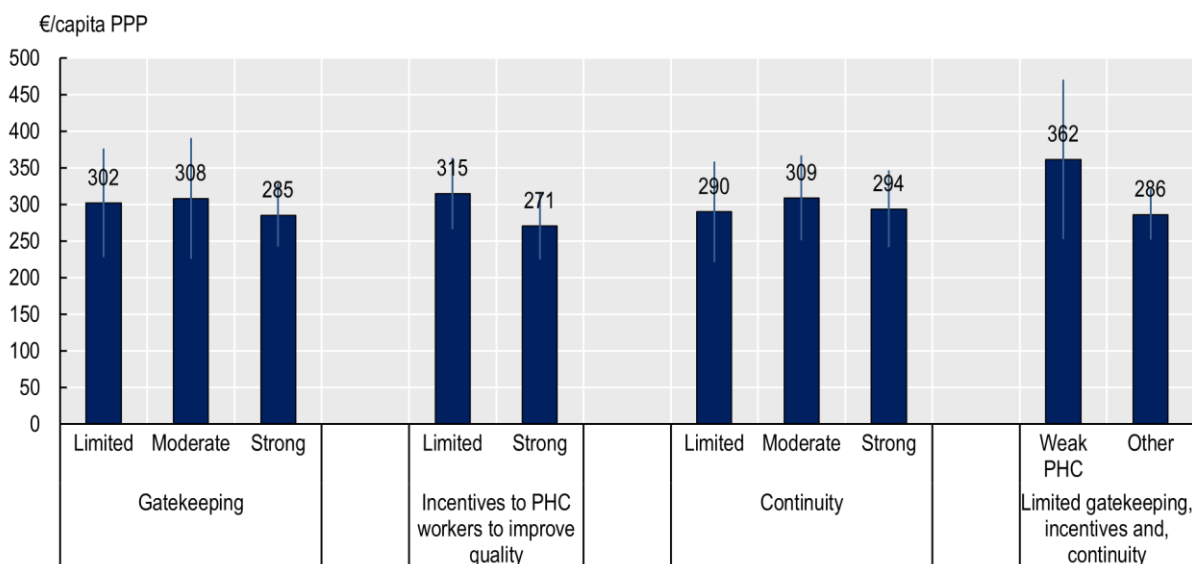
A pattern emerges in which weaker PHC systems are associated with higher CVD spending, although the relationship remains modest and not statistically significant. For instance, countries with limited first-contact reported an average CVD spending of EUR 302 per capita, compared to EUR 285 in those with strong gatekeeping. Similarly, countries with limited comprehensiveness spent EUR 315 per capita on average, versus EUR 271 in countries with strong incentives – a notable difference of EUR 44. In terms of continuity of care, countries classified as having moderate continuity spent the most (EUR 309), followed by strong continuity (EUR 294) and limited continuity (EUR 290), although this dimension showed less variation.

When combining these three features, countries with limited gatekeeping, weak incentives, and low continuity exhibited the highest average CVD expenditure, at EUR 362 per capita. In contrast, countries with one strong or moderate characteristic across these dimensions reported significantly lower spending,

averaging EUR 286. This substantial difference highlights the importance of primary healthcare system design in managing cardiovascular conditions. It suggests that weaknesses across multiple dimensions of PHC can compound one another, driving up healthcare costs by limiting the system's ability to manage cardiovascular conditions proactively and efficiently at the primary care level.

Annex Figure 0.1. Though weak, there is an association between weaker PHC and higher CVD costs

Average and 95% confidence interval of €/capita PPP spent on CVD in 2021



Source: (OECD/The Health Foundation, 2025^[129]; Luengo-Fernandez et al., 2023^[107]); Bulgaria (OECD/European Observatory on Health Systems and Policies, 2023^[131]; Dimova et al., 2018^[132]); Croatia (OECD/European Observatory on Health Systems and Policies, 2023^[133]; Džakula et al., 2021^[134]), Cyprus (Theodorou, Charalambous and Williams, 2024^[135]), Malta (OECD/European Observatory on Health Systems and Policies, 2023^[136]), Romania (OECD/European Observatory on Health Systems and Policies, 2023^[137]).

To address the higher costs associated with weak primary healthcare (PHC) systems and improve cardiovascular disease (CVD) outcomes, several policy recommendations can be considered. Implementing or reinforcing gatekeeping mechanisms that position primary care providers as the first point of contact in the health system. This approach ensures better care co-ordination, prevents unnecessary specialist referrals, and promotes early detection and management of CVD risk factors. Second, design provider payment models to reward quality, continuity, and prevention rather than volume of services. For example, adopting blended payment systems that include capitation, pay-for-performance, or bundled payments can encourage primary care teams to manage chronic conditions more effectively and reduce costly hospital-based care. Third, promote long-term patient-provider relationships by supporting team-based care, integrated electronic health records, and patient enrolment with primary care practices. Continuity fosters trust, improves adherence to treatment plans, and allows for better tracking and control of chronic diseases like CVD. Fourth, expand and upskill the primary care workforce to meet growing chronic care demands. This includes training in CVD risk assessment and management, team-based approaches, and culturally competent care to address diverse population needs.

These measures can reinforce the foundation of PHC, leading to better health outcomes, more sustainable healthcare spending, and a more resilient system capable of addressing the rising burden of cardiovascular diseases.

Notes

¹ i.e. Some deaths from COVID-19 reduced the population at risk of CVD death (competing risks).

² Disability-Adjusted Life Years (DALYs) are a widely used summary measure of population health that combine years of life lost due to premature mortality and years lived with disability. While DALYs provide a comprehensive picture of overall disease burden, we focus on PYLL in this report to specifically underscore premature mortality and highlight prevention opportunities.

³ 9 201 753. Data from Austria, Belgium, Bulgaria, Croatia, Czechia, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain and Sweden.

⁴ Index of Multiple Deprivation (IMD): IMD is the official measure of relative deprivation in England and is part of a suite of outputs that form the Indices of Deprivation (IoD). It follows an established methodological framework in defining deprivation to encompass a wide range of an individual's living conditions. People may be considered to be living in poverty if they lack financial resources to meet their needs, whereas people can be regarded as deprived if they lack any kind of resources, not just income. The IMD2 019 is a composite comprising seven domains of deprivation which, when combined and appropriately weighted, form the IMD2 019. They are: – Income (22.5%) – Employment (22.5%) – Health Deprivation and Disability (13.5%) – Education, Skills Training (13.5%) – Crime (9.3%) – Barriers to Housing and Services (9.3%) – Living Environment (9.3%). For further details, see https://assets.publishing.service.gov.uk/media/5d8e26f6ed915d5570c6cc55/IoD2019_Statistical_Release.pdf.

⁵ Germany's national CVD cost estimates may differ due to methodological variations, as they account only for ongoing healthcare expenditures.

⁶ Gatekeeping refers to whether primary care physicians act as the initial point of contact and control access to specialist care.

⁷ The proportion of the population with a regular doctor or usual source of care.

3

Preventing and identifying CVD: Targeting key risk factors

Cardiovascular disease (CVD) remains the leading cause of mortality in the European Union, yet 74% of its burden can be attributed to modifiable risk factors. This chapter examines metabolic, behavioural, and environmental determinants of CVD, highlighting trends and policy implications. Metabolic risks – particularly hypertension, diabetes, obesity, and dyslipidaemia – are the largest contributors, accounting for two-thirds of CVD-related disability. Behavioural factors such as tobacco use, harmful alcohol consumption, poor diet, physical inactivity, and inadequate sleep persist despite some improvements, while vaping and cannabis use are rising among younger populations. Environmental stressors, including air pollution and extreme temperatures, compound risks, especially for vulnerable groups. Non-modifiable factors like ageing and sex-specific risks also play a contributing role. Despite established clinical guidelines, gaps in prevention, screening, and lifestyle counselling remain.

In Brief

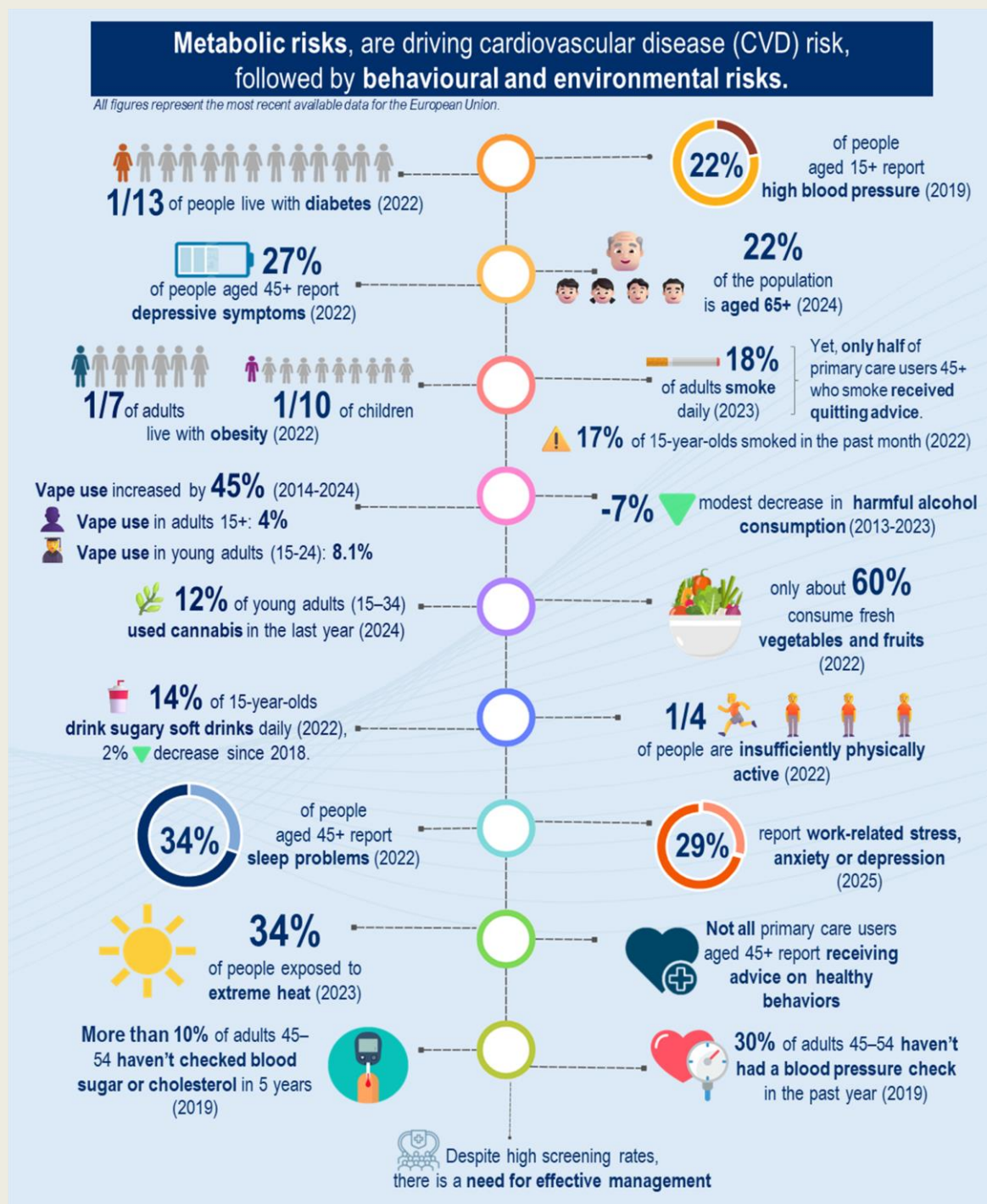
- **Metabolic risks, along with behavioural and environmental risks, are driving cardiovascular disease (CVD).** While exposure to many risk factors, such as tobacco use, harmful alcohol consumption, depressive symptoms, and exposure to air pollution have been trending down – others, including, diabetes, high blood pressure, vaping, work-related stress, respiratory infections, and exposure to extreme heat are increasing in most EU countries.
- In the EU, **74% of Disability-Adjusted Life-Years (DALYs) due to CVD are attributable to modifiable risk factors**, nearly double the proportion of DALYs due to all causes combined attributable to risk factors (38%). This underscores the need to tackle risk factors to minimise the burden of CVD.
- Diabetes significantly increases the risk of CVD. **Currently, one out of every 13 people in the EU lives with diabetes** – a rate that has **more than doubled** since 1990. Women with diabetes are 2.5 times more likely to have acute coronary syndrome compared to those without diabetes, while for men with diabetes the risk is 1.7 times higher compared to those without diabetes. Outcomes are also worse in individuals with diabetes, who face a 50-60% higher risk of heart failure following a myocardial infarction compared to those without diabetes.
- Hypertension is one of the most important and prevalent modifiable risk factors for CVD. Across the EU, **one-in-five (22%) people 15 years and older report having high blood pressure**. For every 10-mm Hg increase in systolic blood pressure, there is a 53% higher risk for atherosclerotic CVD. Hypertension has been attributed to approximately 60% of cases of ischaemic and haemorrhagic stroke.
- Obesity is a major risk factor for CVD and a critical driver of the global burden of noncommunicable disease. At EU level in 2022, **51% of adults lived with overweight and 15% lived with obesity**. Childhood overweight and obesity remain a major concern in Europe, with 9% of children aged 5 to 19 in EU27 countries living with obesity and 25% living with overweight, underscoring the need for early prevention. Between 2017 and 2022, obesity rates in the EU showed minimal change, declining slightly from 14.9% to 14.8%. Across all EU countries, men consistently report higher rates of overweight and obesity than women.
- While mental illness can increase the risk of developing CVD, evidence also shows that CVD itself is a risk factor for depression. **In 2022, almost one-in-three Europeans (27%) aged 45 and older reported depressive symptoms**. Rates of depressive symptoms are higher in people with CVD and related risk factors (31% vs. 20%), higher in women than men (32% vs. 20%), and rising in several EU countries.
- At EU level in 2025, **almost one-in-three workers (29%) report work-related stress, depression or anxiety – up from 27% in 2022**. Country and gender differences are pronounced, with rates varying more than two-fold across EU countries, from 19% in Denmark to over 40% in Spain, Cyprus, Poland, Finland and Greece, and higher among women than men.
- Lifestyle factors contribute significantly to CVD risk. Approximately 21% of deaths due to coronary heart diseases are attributable to tobacco use and exposure to second-hand smoke. **In 2023, an average of 18% of adults smoked daily across EU countries**. The use of E-cigarettes and recreational drugs (particularly cannabis) is increasingly linked to adverse cardiovascular outcomes – particularly among younger people. **Trends in vaping have shown a 45% increase** between 2016 and 2024 and approximately **12% (11.8 million) of individuals**

aged 15 to 34 in EU countries reported cannabis use in the last year. The average alcohol consumption in the EU has been declining modestly (-7%) between 2010 and 2022. However, notable changes have occurred in several countries, with 11 EU countries reporting a decrease of at least 10% in their average consumption per capita.

- Physical activity, healthy dietary habits (increasing consumption of vegetables and fruits and reducing consumption of sugar, saturated fats and salt), and good sleep hygiene reduce the risk of CVD. Yet, more than **one-in-four adults in the 27 EU Member States are insufficiently physically active**. For people between 60 and 79 years old, CVD accounts for 40% of all diseases due to insufficient physical activity, and nearly three-quarters of the burden for people over 80 years old. Only about **60% of adults in the EU consume fresh vegetables and fruits at least once a day and most EU countries report having a salt intake above the WHO recommended level**. In 2022, **sleep problems were widespread in Europe**, affecting 34% of Europeans aged 45 and over. Sleep problems are more common among people with CVD and related clinical risk factors than those without (37% vs. 27%), more frequent among women than men (39% vs. 26%), and rising in several EU countries.
- Environmental risk factors also drive a portion of CVD risk. While air pollution has improved, extreme temperatures pose a rising risk for cardiovascular events. **In 2023, one-in-three Europeans (34%) experienced at least one hot day (>35°C) and two in three Europeans (67%) experienced at least one icy day (<0°C)**.
- Older adults are especially vulnerable to CVD. Structural and functional changes – such as increased arterial stiffness and reduced cardiac efficiency – make older adults more susceptible to CVD. As populations age, the number of individuals at higher risk will grow: **the share of adults aged 65 and over rose from 18% to 22% between 2000 and 2024, and is projected to reach 29% by 2050**.
- **Multimorbidity further increases cardiovascular risk in older adults**. Age-related risk factors – such as diabetes, obesity and metabolic syndrome, reduced physical activity, cognitive decline, depression and chronic kidney disease – further contribute to the burden of CVD in older adults.
- While the burden of CVD is higher in men in earlier life, women experience similar or greater rates from midlife onwards. **A range of sex-specific risks across the life course contribute to women's elevated cardiac risk**, including early and late menarche, polycystic ovary syndrome (PCOS), infertility, hypertension during pregnancy or preeclampsia, assisted reproductive technology, adverse pregnancy outcomes, hormonal contraceptives and menopause.
- Clinical practice guidelines call for clinicians to encourage lifestyle changes and support adherence to drug therapy, yet **in the EU, few healthcare users aged 45 and over report receiving advice on healthy behaviours** (49% on physical activity, 34% on healthy eating, 28% on the risks of tobacco, and only 13% on alcohol consumption). Addressing behavioural and lifestyle risk factors in primary care by screening and advising on them are key tools in primary care to identify and prevent cardiovascular conditions in Europe. School health to detect obesity, physical inactivity and mental disorders is not universally available.
- Early detection and management of modifiable risk factors can reduce risk of CVD. A CVD risk assessment is recommended for individuals with at least one vascular risk factor (i.e. family history of premature CVD, familial hypercholesterolemia, CVD risk factors such as smoking, arterial hypertension, diabetes mellitus, raised lipid level, obesity, or comorbidities increasing CVD risk) or men 40 years and older and women 50 years and older. **Screening rates for diabetes, high cholesterol and high blood pressure are already relatively high, but more can be done** – on average, only 68% of people aged 45 to 55 report having had a blood pressure check in the past year, and 94% in the past five years. In this same age group over 85% have had cholesterol or

glucose measurements in the past five years. Insufficient monitoring of modifiable risks can increase CVD risk by delaying detection and treatment. **Ensuring continuity of care through effective, sustained management is therefore critical** – an issue explored in greater detail in Chapter 4 of this report.

Infographic 3.1. Preventing and identifying CVD: Targeting key risk factors

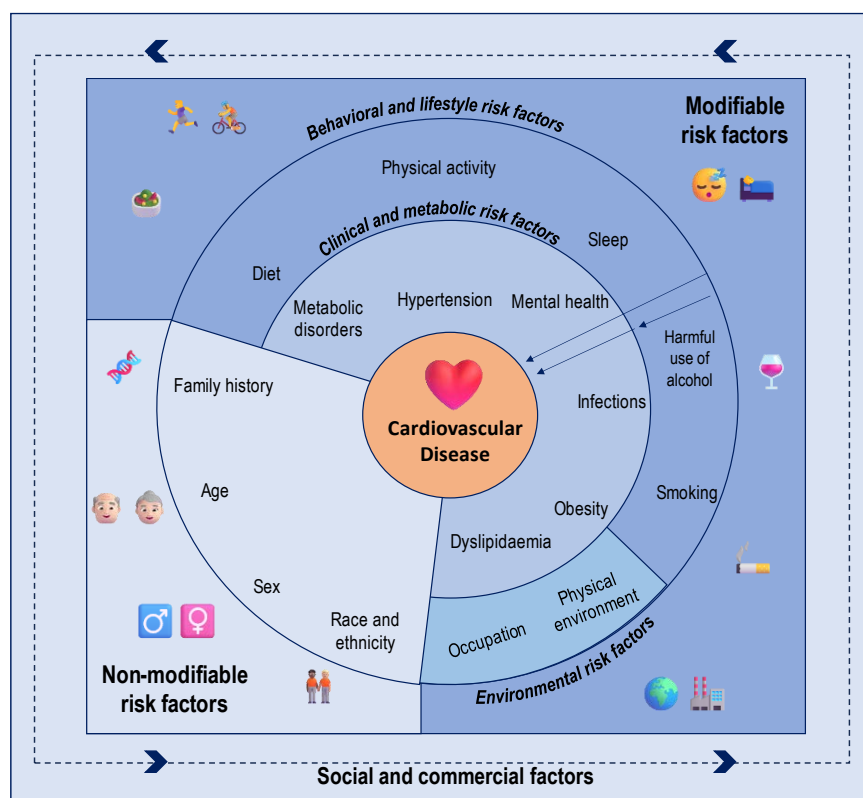


Cardiovascular disease (CVD) remains the leading cause of mortality in the European Union (EU) and worldwide. Given the substantial burden of CVD in the EU (Chapter 2), a focus is warranted on the significant portion of CVD mortality and morbidity that could be mitigated by addressing related risk factors.

Cardiovascular conditions are impacted by a range of non-modifiable and modifiable risk factors. Non-modifiable risk factors – such as sex, age, family history, and ethnicity and race – are inherent characteristics that may increase the risk of developing a cardiovascular condition. Modifiable risk factors include clinical and metabolic risks, lifestyle and behavioural risks, as well as environmental risks (Figure 3.1). The main causal risk factors are the clinical and metabolic risks which include dyslipidaemia (e.g. high low-density lipoprotein (LDL) cholesterol), high blood pressure (i.e. hypertension), diabetes mellitus, obesity, respiratory infections, and mental ill health. Smoking is one of the main behavioural and lifestyle risk factors for CVD, alongside unhealthy diet, sedentary lifestyle, harmful use of alcohol, and poor sleep. Environmental risks relate to the physical environment – such as air pollution and extreme heat and cold exposure – as well as occupational hazards. These risk factors are shaped by broader social and commercial factors of health, including for example education, income, migration status and labour market conditions, which interact with all risk factors to either protect against or further compound overall CVD risk. See Chapter 2 for more detail on the socio-economic inequalities in CVD.

Figure 3.1. Cardiovascular conditions are impacted by a range of lifestyle, clinical, environmental and individual factors

A number of intermediate clinical risk factors are influenced by the same risk factors that also influence CVD more directly

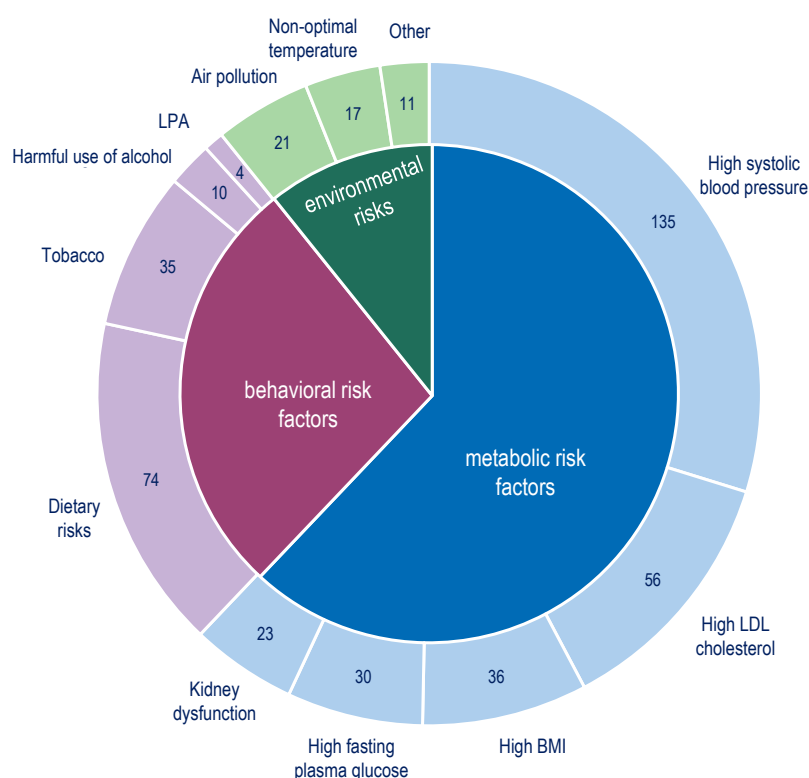


CVD burden can be estimated by using attributable disability-adjusted life-years (DALYs), available for the main risk factor groups presented in Figure 3.2. One DALY represents the loss of the equivalent of one year of full health (see Annex 3.A for more details). As such, DALYs go beyond measures of mortality to include poor health, providing insight into the impact of each risk factor on the population by considering both deaths and the experience of those living with CVD. In the EU, 74% of DALYs due to CVD are attributable to modifiable risk factors, nearly double the proportion of DALYs due to all causes combined attributable to risk factors (38%). This underscores the need to tackle risk factors to minimise the burden of CVD.

High-level risk factor categories include metabolic, behavioural, and environmental or occupational factors (IHME, 2021^[1]). Metabolic risks are the risk factors that contribute the most CVD DALYs (65%), with CVD 135 million DALYs attributable to high systolic blood pressure, the predominant risk factor in this group. Behavioural risk factors account for 39% of CVD DALYs, dietary risks – having a low fruit and vegetable diet, high sodium intake, among others – predominate in this category, accounting for CVD 74 million DALYs. Environmental or occupational risk factors account for 17% of CVD DALYs, air pollution being the predominant risk factor in this group. These risk factors are not mutually exclusive and do not only affect cardiovascular conditions, but also conditions such as diabetes, kidney disease, cancer, and respiratory conditions.

Figure 3.2. Metabolic risk factors are the main contributor to cardiovascular disease DALYs in the EU

Cardiovascular disease DALYs per 100 000 attributable to risk factors in the EU, 2021



Note: DALYs can be attributed to several risk factors at once and are not summative. Environmental risks refer to environmental or occupational risk factors. LDL: Low-density lipoprotein; BMI: Body Mass Index; LPA: Low physical activity.

Source: IHME (2021^[1]), GBD Compare, <https://healthdata-digex.healthdata.org/data-tools-practices/interactive-data-visuals>.

Globally, 83% of all deaths due to CVD in 2021 were attributable to modifiable risk factors, and in the EU this figure falls to 76%. Metabolic risk factors are the predominant group, accounting for 70% and 68% of CVD deaths globally and in the EU, respectively. Behavioural risks are the second largest group accounting for 42% of the CVD deaths globally and 37% in the EU. Environmental risk factors account for 33% of CVD deaths globally, and 18% in the EU. On average, in the EU, risk factors account for a smaller proportion of deaths due to CVD compared to the global average (IHME, 2021^[1]). Deaths can be attributed to several risk factors at once and are not summative.

Recent trends in cardiovascular risk factors across Europe reveal several growing public health challenges (see Table 3.1). Concerningly, many metabolic and clinical risks have been increasing or remain at high levels. Between 2012 and 2022, among adults aged 18 and over, age-standardised diabetes prevalence rose to 7.8% in the EU, a 22% increase. Hypertension prevalence among people aged 15 and over increased by 1% between 2014 and 2019, reaching 22%. Obesity among adults aged 18 and over reduced to 15%, a 1% reduction between 2017 and 2022. Depressive symptoms among adults aged 45 and over declined by 9% but still affects nearly a third of this population group (27%). This increased exposure to metabolic and clinical risks is, at least in part, driven by population ageing; the proportion of adults aged 65 and over has surged by 23% since 2000, reaching 22% in 2024.

Lifestyle or behavioural risk factors show mixed progress. Tobacco use among people aged 15 and over has dropped by 16% over the past decade, now at 18%, and harmful alcohol consumption in the same age group declined slightly by 7% to 9.6 litres per person. However, vaping among people aged 15 and over in the EU surged by 45%, reaching 4% in 2024, raising concerns about emerging nicotine habits. Between 2017 and 2022, daily fruit consumption among the total population decreased by 4% to 61%, and vegetable intake declined by 6%, to 60%. Insufficient physical activity among adults aged 18 and over decreased by 3% yet still affects almost a third of the population (28%). Sleep problems among adults aged 45 and over also declined slightly (by 5%) but remain prevalent at 34%. Work-related stress increased by 7% among employed workers aged 16 and over, now impacting about a third (29%) of this group, reflecting growing mental health pressures in the workplace. Finally, indicators on exposure to environmental factors show varied outcomes: exposure to extreme heat (at least one day above 35°C) increased to 34%, a 9% increase, while population-weighted exposure to air pollution dropped significantly by 30% to 11 µg/m³. Lifestyle and behavioural risk factor profile also differ between men and women, for 25 EU countries, men report higher rates of smoking daily (22%) than women (14%). On the other hand, women report higher levels of physical inactivity (28%) than men (25%).

Table 3.1. Dashboard on cardiovascular risk factors: Metabolic, clinical and non-modifiable risk factors

	Diabetes (%)		Hypertension (%)		Obesity (%)		Depressive symptoms (%)		Adults aged 65 and over (%)	
	2022	% change (2012-2022)	2019	% change (2014-2019)	2022	% change (2017-2022)	2022	% change (2012-2022)	2024	% change (2000-2024)
EU average	7.8	22 ↑	22	1 ↑	15	-1 ↓	27	-9 ↓	22	23 ↑
Austria	5.2	3 ↑	22	3 ↑	18	18 ↑	22	7 ↑	20	32 ↑
Belgium	6.7	46 ↑	17	5 ↑	16	7 ↑	32	6 ↑	20	17 ↑
Bulgaria	10.8	37 ↑	30	0 →	12	-17 ↓	26	NA	24	48 ↑
Croatia	9.1	31 ↑	37	52 ↑	17	-8 ↓	26	NA	23	44 ↑
Cyprus	7.3	0 →	19	9 ↑	14	-8 ↓	19	NA	18	61 ↑
Czechia	7.7	18 ↑	26	11 ↑	18	-13 ↓	28	10 ↑	21	47 ↑
Denmark	2.3	-14 ↓	19	7 ↑	19	8 ↑	20	23 ↑	21	38 ↑
Estonia	8.8	40 ↑	23	2 ↑	22	5 ↑	35	-13 ↓	20	36 ↑
Finland	7.4	30 ↑	27	10 ↑	22	6 ↑	26	NA	23	56 ↑
France	2.7	-35 ↓	17	15 ↑	15	-1 ↓	32	-6 ↓	21	34 ↑
Germany	6.6	-2 ↓	26	-8 ↓	19	-4 ↓	27	16 ↑	22	40 ↑
Greece	7.2	1 ↑	20	-6 ↓	12	3 ↑	18	NA	23	37 ↑
Hungary	11.2	30 ↑	32	-1 ↓	22	11 ↑	21	-44 ↓	21	38 ↑
Ireland	7.8	42 ↑	12	-25 ↓	20	30 ↑	12	NA	15	41 ↑
Italy	7.2	19 ↑	20	-1 ↓	7	20 ↑	31	-2 ↓	24	35 ↑
Latvia	9.3	36 ↑	32	8 ↑	23	8 ↑	23	NA	21	42 ↑
Lithuania	11.2	27 ↑	30	6 ↑	21	18 ↑	40	NA	20	45 ↑
Luxembourg	5.9	6 ↑	16	-6 ↓	17	6 ↑	28	-2 ↓	15	0 →
Malta	9.6	5 ↑	18	-15 ↓	26	2 ↑	35	NA	18	53 ↑
Netherlands	6.4	18 ↑	16	-4 ↓	14	6 ↑	20	6 ↑	20	46 ↑
Poland	10.8	50 ↑	27	15 ↑	19	10 ↑	30	-26 ↓	20	71 ↑
Portugal	7.4	14 ↑	27	5 ↑	16	1 ↑	41	2 ↑	24	51 ↑
Romania	13.3	91 ↑	16	-8 ↓	10	-1 ↓	33	NA	20	54 ↑
Slovak Republic	8.9	37 ↑	28	10 ↑	17	19 ↑	14	NA	18	67 ↑
Slovenia	10.8	37 ↑	25	2 ↑	18	3 ↑	22	-13 ↓	22	56 ↑
Spain	3.6	-40 ↓	19	3 ↑	15	6 ↑	31	-12 ↓	20	20 ↑
Sweden	5.1	18 ↑	18	12 ↑	17	-1 ↓	25	23 ↑	21	21 ↑
Iceland ¹	5.4	22 ↑	25	26 ↑	21	0 →	NA	NA	16	30 ↑
Norway ¹	5.6	8 ↑	15	19 ↑	17	22 ↑	NA	NA	19	24 ↑

1. non-EU European Economic Area countries. Dark blue: Lower than the 25th percentile; Light blue: Between the 25th and 50th percentile; Light red: Between the 50th and 75th percentile; Dark red: Above the 75th percentile.

Diabetes: Percentage of people aged 18 years and over with fasting plasma glucose ≥ 126 mg/dl, or glycated haemoglobin $\geq 6.5\%$, or on glucose-lowering medication for diabetes. Age-standardised to the WHO world population, therefore crude rates and percentage change from national sources may differ.

Source: WHO Global Health Observatory (2024).

Hypertension refers to the percentage of people aged 15 and over with high blood pressure.

Obesity refers to the percentage of people aged 18 and over with a BMI ≥ 30 kg/m². For Iceland, 2017 data was used instead of 2022. For Germany, data was obtained from different studies: 2017 data from Schienkiewicz et al. (2017^[2]), and Starker et al (2025^[3]).

Depressive symptoms are derived from the percentage of adults aged 45 and older who report at least 4 symptoms on the EURO-D scale. Where 2012 data was unavailable, the closest year available was used: 2011 data for Austria, Belgium, Czechia, Denmark, Estonia, France, Hungary, Italy, the Netherlands, Portugal, Slovenia, Spain and Sweden; and 2013 data for Luxembourg.

Age refers to the percentage of people aged 65 and over.

Source: Diabetes: Eurostat (hlth_ehis_cd1e, 2021); Obesity: Eurostat (ilc_hch10, 2024), from (Schienkiewicz et al., 2017^[2]), "Overweight and obesity among adults in Germany", <https://doi.org/10.17886/rki-gbe-2017-038> and 2022 data from Starker et al (2025^[3]), "Prevalence of obesity and smoking among adults in Germany - trends from 2003 to 2023", <https://doi.org/10.25646/13038>; Depressive symptoms: Source: SHARE-ERIC (2024) and The Irish Longitudinal Study on Ageing (TILDA) 2025; Age: Eurostat (demo_pjangroup, 2025).

Table 3.2. Dashboard on cardiovascular risk factors: Behavioural and lifestyle risk factors

Country	Tobacco consumption (%)		Vaping use (%)		Alcohol consumption (L/person)		Fruit consumption (%)		Vegetable consumption (%)	
	2023	% change (2013-2023)	2024	% change (2014-2024)	2023	% change (2013-2023)	2022	% change (2017-2022)	2022	% change (2017-2022)
EU average	18	-16 ↓	4.0	45 ↑	9.6	-7 ↓	61	-4 ↓	60	-6 ↓
Austria	21	-15 ↓	0.7	NA	11.3	-5 ↓	56	-7 ↓	55	-2 ↓
Belgium	15	-19 ↓	4.1	NA	8.4	-18 ↓	61	-3 ↓	80	-5 ↓
Bulgaria	29	3 ↑	0.6	NA	11.1	6 ↑	34	-6 ↓	43	-5 ↓
Croatia	22	-12 ↓	0.8	NA	9.0	-15 ↓	53	16 ↑	57	4 ↑
Cyprus	NA	NA	NA	NA	NA	NA	68	-1 ↓	65	2 ↑
Czechia	16	-28 ↓	11.1	113 ↑	11.2	-3 ↓	52	-9 ↓	50	-1 ↓
Denmark	11	-35 ↓	6.0	140 ↑	7.5	-25 ↓	48	-12 ↓	55	-5 ↓
Estonia	13	-40 ↓	11.8	883 ↑	10.9	-8 ↓	49	-12 ↓	50	-17 ↓
Finland	11	-28 ↓	2.4	-63 ↓	7.4	-19 ↓	50	-8 ↓	61	-8 ↓
France	23	-19 ↓	6.1	110 ↑	10.4	-10 ↓	58	-7 ↓	65	-8 ↓
Germany	15	-30 ↓	3.3	NA	10.7	-4 ↓	NA	NA	NA	NA
Greece	25	-9 ↓	1.8	NA	5.3	-30 ↓	55	9 ↑	59	-1 ↓
Hungary	25	-3 ↓	2.0	233 ↑	10.3	-3 ↓	41	4 ↑	33	8 ↑
Ireland	14	-26 ↓	8.0	167 ↑	9.4	-11 ↓	65	-13 ↓	72	-14 ↓
Italy	20	-8 ↓	4.8	220 ↑	6.6	-12 ↓	84	-1 ↓	76	-6 ↓
Latvia	23	-8 ↓	3.0	NA	11.7	13 ↑	36	2 ↑	43	-3 ↓
Lithuania	19	-7 ↓	1.6	NA	11.0	-24 ↓	37	-2 ↓	43	-4 ↓
Luxembourg	15	-4 ↓	12.3	NA	10.4	-9 ↓	55	-23 ↓	58	-22 ↓
Malta	NA	NA	NA	NA	NA	NA	62	-12 ↓	44	-13 ↓
Netherlands	13	-29 ↓	4.1	17 ↑	7.8	-10 ↓	64	11 ↑	71	21 ↑
Poland	17	-25 ↓	NA	NA	10.0	-7 ↓	56	-3 ↓	59	-2 ↓
Portugal	14	-15 ↓	1.6	60 ↑	8.6	-12 ↓	80	0 ↓	63	-19 ↓
Romania	19	-6 ↓	1.7	NA	12.3	28 ↑	38	-9 ↓	37	-11 ↓
Slovak Republic	21	-8 ↓	1.2	NA	9.4	-5 ↓	51	-5 ↓	48	-8 ↓
Slovenia	17	-8 ↓	1.7	NA	9.7	2 ↑	68	-1 ↓	70	0 ↑
Spain	20	-14 ↓	4.6	NA	11.1	21 ↑	67	-13 ↓	51	-21 ↓
Sweden	9	-21 ↓	1.7	NA	7.4	1 ↑	48	-20 ↓	59	-17 ↓
Iceland ¹	6	-51 ↓	5.0	79 ↑	7.7	10 ↑	NA	NA	NA	NA
Norway ¹	8	-47 ↓	5.0	25 ↑	6.2	0 →	56	-12 ↓	65	-4 ↓

1. non-EU European Economic Area countries. Dark blue: Lower than the 25th percentile; Light blue: Between the 25th and 50th percentile; Light red: Between the 50th and 75th percentile; Dark red: Above the 75th percentile. (inverse colour coding for fruit and vegetable consumption).

Tobacco consumption refers to the share of the population aged 15 and over who are daily tobacco smokers except for Luxembourg (16+). Where 2023 data was unavailable, the closest year available was used: 2024 data for: Denmark, Estonia, Ireland, Luxembourg, Iceland, Norway; 2022 data for: Finland; 2021 data for: Germany; 2020 data for: Spain, Ukraine; 2019 data for: Austria, Bulgaria, Croatia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, the Slovak Republic, Slovenia; 2018 data for: Belgium. Where 2013 data was unavailable, the closest year available was used: 2014 data for: Austria, Bulgaria, Croatia, Estonia, France, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain; and 2015 data for: Ireland.

Vaping use refers to the share of the population aged 15 and over who are regular vaping product users except for Luxembourg (16+). Where 2024 data was unavailable, the closest year available was used: 2018 data for: Belgium; 2019 data for: Austria, Bulgaria, Croatia, Germany, Greece, Hungary, Latvia, Lithuania, Portugal, Romania, the Slovak Republic and Slovenia; 2022 data for: Finland and Sweden; 2023 data for: Czechia, France, Italy, and the Netherlands. Where 2014 data was unavailable, the closest year available was used: 2012 data for: Estonia; 2015 data for: Ireland and Norway; 2016 data for: Finland, the Netherlands, and Iceland; 2017 data for: Czechia and Denmark.

Source: OECD (2025).

Alcohol consumption is measured in litres per person among individuals aged 15 and over. Where 2023 data was unavailable, the closest year available was used: 2024 data for: Ireland and Norway; 2020 data for: Belgium, Bulgaria, Croatia, Germany, Greece, Italy, Luxembourg, and Portugal.

Fruit and vegetable consumption refers to the share of the total population who consume fruits/vegetables at least daily.

Source: Fruit and vegetable consumption: Eurostat (ilc_hch11, 2024); Tobacco consumption: OECD (2025), <https://data-explorer.oecd.org/s/3kk>; Vaping use: OECD (2025), <https://data-explorer.oecd.org/s/3kj>; Alcohol consumption: OECD (2025), <https://data-explorer.oecd.org/s/3kl>.

Table 3.3. Dashboard on cardiovascular risk factors: Behavioural and lifestyle risk factors (continued) and environmental risk factors

	Insufficient physical activity (%)		Sleep problems (%)		Work-related stress, depression, anxiety (%)		Heat exposure (%)		Air pollution (µg/m³)	
	2022	% change (2012-2022)	2022	% change (2012-2022)	2025	% change (2022-2025)	2023	% change (2000-2023)	2020	% change (2010-2020)
EU average	28	-3 ↓	34	-5 ↓	29	7 ↑	34	9 ↑	11	-30 ↓
Austria	23	-26 ↓	35	13 ↑	25	4 ↑	48	21 ↑	11	-32 ↓
Belgium	29	-31 ↓	39	3 ↑	32	7 ↑	0	0% →	11	-34 ↓
Bulgaria	37	29 ↑	27	NA	21	11 ↑	66	-31 ↓	17	-25 ↓
Croatia	33	53 ↑	30	NA	32	14 ↑	72	-2 ↓	16	-25 ↓
Cyprus	43	-4 ↓	22	NA	41	3 ↑	90	2 ↑	13	-27 ↓
Czechia	27	1 ↑	39	7 ↑	24	0 →	35	207 ↑	14	-32 ↓
Denmark	14	-37 ↓	33	15 ↑	19	6 ↑	0	0% →	9	-31 ↓
Estonia	20	12 ↑	47	1 ↑	35	17 ↑	0	0% →	6	-31 ↓
Finland	12	-46 ↓	34	NA	45	7 ↑	0	0% →	5	-30 ↓
France	27	-28 ↓	39	0 →	25	0 →	40	469 ↑	9	-30 ↓
Germany	15	-28 ↓	43	43 ↑	20	11 ↑	15	74 ↑	10	-36 ↓
Greece	40	10 ↑	15	NA	49	32 ↑	90	0 ↓	14	-29 ↓
Hungary	33	30 ↑	27	-30 ↓	32	10 ↑	86	-14 ↓	14	-31 ↓
Ireland	24	-30 ↓	36	NA	27	0 →	0	0% →	8	-21 ↓
Italy	45	-6 ↓	29	-3 ↓	29	-3 ↓	82	128 ↑	14	-27 ↓
Latvia	18	-19 ↓	36	NA	32	19 ↑	0	0% →	12	-35 ↓
Lithuania	24	-9 ↓	45	NA	27	-4 ↓	0	0% →	9	-33 ↓
Luxembourg	15	-33 ↓	37	0 →	29	0 →	0	0% →	9	-33 ↓
Malta	44	-17 ↓	30	NA	23	0 →	0	0% →	12	-31 ↓
Netherlands	11	-36 ↓	28	8 ↑	30	7 ↑	0	0% →	11	-33 ↓
Poland	40	31 ↑	36	-19 ↓	41	11 ↑	8	-64 ↓	18	-33 ↓
Portugal	56	11 ↑	50	22 ↑	34	3 ↑	87	142 ↑	8	-21 ↓
Romania	40	44 ↑	39	NA	24	26 ↑	77	-12 ↓	14	-30 ↓
Slovak Republic	26	-6 ↓	19	NA	28	17 ↑	29	-49 ↓	15	-28 ↓
Slovenia	23	1 ↑	33	-16 ↓	21	-16 ↓	9	-73 ↓	14	-25 ↓
Spain	25	-33 ↓	36	1 ↑	40	8 ↑	80	49 ↑	10	-22 ↓
Sweden	11	-53 ↓	32	12 ↑	30	-6 ↓	0	0% →	6	-28 ↓
Iceland ¹	28	-12 ↓	NA	NA	32	7 ↑	0	0% →	5	-22 ↓
Norway ¹	38	4 ↑	NA	NA	24	0 →	0	0% →	6	-23 ↓

1. non-EU European Economic Area countries. Dark blue: Lower than the 25th percentile; Light blue: Between the 25th and 50th percentile; Light red: Between the 50th and 75th percentile; Dark red: Above the 75th percentile.

Insufficient physical activity (crude estimate) is the per cent of adults aged 18+ years attaining less than 150 minutes of moderate-intensity physical activity per week, or less than 75 minutes of vigorous-intensity physical activity per week, or equivalent.

Sleep problems are derived from the percentage of adults aged 45 and older who report trouble sleeping. Where 2012 data was unavailable, the closest year available was used: 2011 data for Austria, Belgium, Czechia, Denmark, Estonia, France, Hungary, Italy, the Netherlands, Portugal, Slovenia, Spain and Sweden; and 2013 data for Luxembourg.

Work-related stress, depression or anxiety refers to the percentage of employed workers (employees and self-employed) aged 16 and over who reported experiencing stress, depression, or anxiety in the past 12 months that was caused or made worse by their work.

Extreme heat refers to the percentage of people who are exposed to at least one hot day (>35°C).

Air pollution refers to the mean population-weighted exposure to fine particulate matter (PM_{2.5}), measured in microgrammes per cubic metre (µg/m³).

Source: Insufficient physical activity: WHO (2024), WHO Global Health Observatory 2024, [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-\(crude-estimate\)-\(-\);](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-(crude-estimate)-(-);) Sleep problems: SHARE-ERIC (2024); Healthy Ireland Survey 2024; Work-related stress, depression or anxiety: OSH Pulse 2025; Air pollution: OECD (2025), <https://data-explorer.oecd.org/s/3kz>, Extreme heat: OECD (2025), <https://data-explorer.oecd.org/s/3l0>.

3.1. Clinical and intermediate factors are driving cardiovascular burden

3.1.1. Diabetes prevalence in Europe has been steadily increasing over the past decades

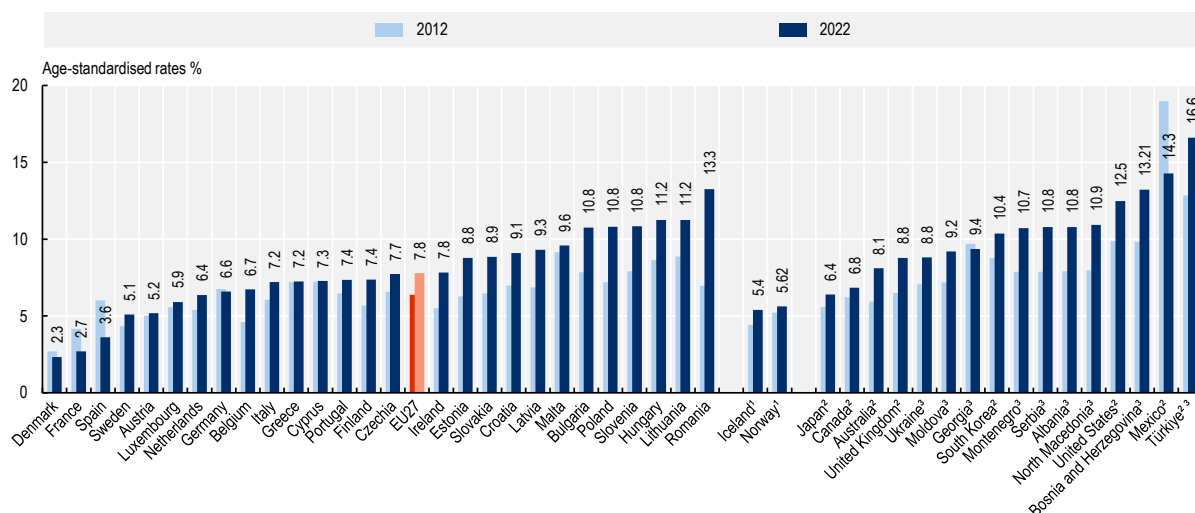
Diabetes mellitus is a common condition worldwide, involving the abnormal glucose metabolism. The most common types are Type 1 diabetes, which develops at an early age is highly linked to genetic and non-modifiable factors, and Type 2 diabetes, which predominates in adults and is linked to lifestyle and behavioural risk factors. Less common types include gestational diabetes, medically-induced diabetes, among others. In 2022, almost one-in-ten adults had diabetes in the EU, totalling to 45.4 million affected adults (WHO Global Health Observatory, 2024^[4]). Symptoms suggestive of diabetes include frequent urination (i.e. polyuria), excessive thirst (i.e. polydipsia), fatigue, blurry vision, unintended weight loss, slow-healing wounds, and recurring infections. Yet in 40% of adults worldwide, diabetes can go unnoticed, silently damaging organs such as the heart, the kidneys, and the eyes (ESC Guidelines, 2023^[5]). In the absence of symptoms, diabetes can be detected by screening for fasting blood glucose, a repeated measure of 126mg/dL or greater (≥ 7.0 mmol/L) confirms the diagnosis of diabetes (ESC Guidelines, 2023^[5]).

In the EU, the prevalence of diabetes in adults aged 18 years and over has increased by 22% from 6.4% in 2012 to 7.8% in 2022 (Figure 3.3), and it is estimated to rise to 8.6% in 2050 (IDF, 2025^[6]). Within the EU in 2022, the prevalence rate varied from as low as 2.3% in Denmark to 10% or higher in Bulgaria, Poland, Slovenia, Hungary, Lithuania and Romania; among non-EU countries, such as Bosnia and Herzegovina, Mexico and Türkiye, the prevalence surpasses 13%. Within the EU, between 2012 and 2022, the prevalence decreased or remained similar in Denmark, France, Spain and Germany, while it almost doubled in Romania. Among non-EU countries between 2012 and 2022, the prevalence increased by more than 35% in Australia, Albania, Montenegro, Serbia and North Macedonia. Most EU countries (23 out of 27) between 2012 and 2022 have increased the prevalence of diabetes (Figure 3.3). The burden of diabetes-related CVD in Europe is substantial with CVD 30 million DALYs attributable to this condition in the EU (IHME, 2024^[7]).

Diabetes mellitus is a major risk factor for CVD, including coronary artery disease, stroke and heart failure. Diabetes is not only associated with high blood glucose levels but also with elevated insulin levels and insulin resistance, which induce and promote the progression of atherosclerosis – the leading cause of cardiovascular conditions such as heart attack and stroke (Dal Canto et al., 2019^[8]). This atherosclerotic process can progress faster and earlier in people with diabetes and can even generate “silent” damage to the heart. In a study of adults without established heart disease, high-grade atherosclerosis was found in nearly 75% of those with diabetes or diabetes-related conditions (such as elevated blood glucose, impaired glucose tolerance, or a history of diabetic nephropathy), compared with 55% of those without diabetes (Goraya et al., 2002^[9]).

Figure 3.3. Diabetes prevalence among adults has increased by 22% in the EU, 2012 and 2022

Type I and II diabetes prevalence



Note: Percentage of people aged 18 years and over with fasting plasma glucose ≥ 126 mg/dl, or glycated haemoglobin $\geq 6.5\%$, or on glucose-lowering medication for diabetes. EU27 average is unweighted. Age-standardisation to WHO world population, therefore crude rates and percentage change from national sources may differ. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries.

Source: WHO Global Health Observatory 2024.

Cardiovascular conditions are the main cause of morbidity and mortality in patients with diabetes, accounting for 44% of deaths in individuals with type 1 diabetes and 52% in those with type 2 diabetes (Siam et al., 2024^[10]). Patients with diabetes have a two- to four-fold increased risk of CVD compared with patients without diabetes (Siam et al., 2024^[10]; Dal Canto et al., 2019^[8]). The increased cardiovascular risk is present even at glucose levels below the diagnostic threshold for diabetes, with a continuous relationship between glycemia and CVD incidence.

Diabetes significantly increases the risk of CVD in both men and women, but the risk is greater in women. Women with diabetes are 2.5 times more likely to have acute coronary syndrome compared to those without diabetes, while for men with diabetes the risk is 1.7 compared to those without diabetes (Dong et al., 2017^[11]). Similarly, diabetes increases the risk of stroke by 2.3 in women and 1.8 in men compared to people without diabetes, even after adjusting for other cardiovascular risk factors such as blood pressure, smoking status, body mass index and total cholesterol (multiple-risk adjusted model: RR 2.45 in women, and 1.96 in men) (Peters, Huxley and Woodward, 2014^[12]). Furthermore, following an initial myocardial infarction, the risks of subsequent myocardial infarction, heart failure, and early and late death are higher in people with diabetes than in those without diabetes (Peterson, McKenzie and Schaffer, 2012^[13]). Diabetes increases the risk of heart failure after a myocardial infarction by 50-60% compared to those without diabetes (Ritsinger et al., 2020^[14]). Detection and treatment of prediabetes and insulin resistance remains a true challenge.

Results from PaRIS, the international survey of people living with chronic conditions, demonstrate that gender and socio-economic status impact diabetes rates. Among primary care users 45 years and over men (23%) report higher rates of diabetes than women (15%), and lower educated patients report higher rates of both diabetes and CVD compared to those with higher education (see Chapter 2). Ethnicity also plays a role, people from South Asia have a higher risk of developing diabetes and CVD compared to other ethnic groups (see Chapter 2). Both CVD and diabetes can go unnoticed in people with high blood glucose levels. This underscores the need for early detection – both of diabetes and of CVD in people with

established diabetes (see Section 3.5 on prevention) – for effective management of lifestyle and behavioural risk factors that can lead to both diabetes and CVD (see Section 3.2), and for care that is tailored to the sociodemographic and clinical profile of the patient (see Chapter 4).

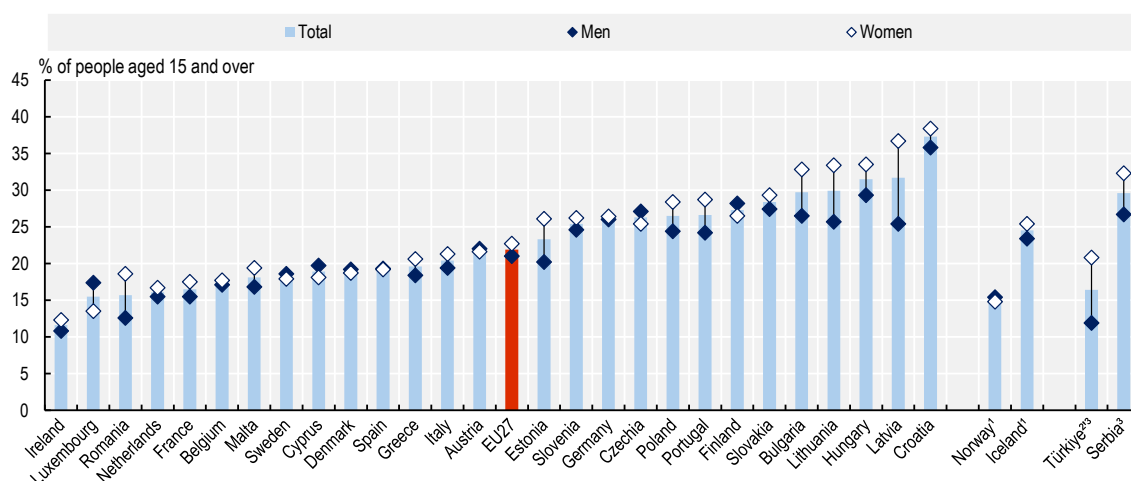
3.1.2. Hypertension has stabilised in most countries – but still impacts a significant proportion of the population

Blood pressure results from the combination of environmental, behavioural, genetic and hormonal factors interacting with multiple organ such as the kidneys, heart, blood vessels, and brain (ESC, 2024^[15]). Maintaining an adequate blood pressure keeps organs well-functioning. When blood pressure is not adequately regulated it can lead to hypertension – defined as a sustained elevation in arterial blood pressure ($\geq 140/90$ mmHg) – which can damage the heart, kidneys and brain (ESC, 2024^[15]).

Behavioural factors that can increase blood pressure include high salt intake, low vegetable and fruit consumption, sedentary behaviour, harmful alcohol consumption, obesity and the use of drugs or substances that increase blood pressure (ESC, 2024^[15]). This makes hypertension, or high blood pressure, one of the most important and prevalent modifiable risk factors for CVD worldwide. It is a major contributor to ischaemic heart disease, stroke, heart failure, peripheral artery disease, and chronic kidney disease (Forouzanfar et al., 2017^[16]). Cardiovascular risk associated with hypertension is continuous and log-linear, meaning there is higher risk of CVD as systolic blood pressure rises (Lawes et al., 2004^[17]). For every 10-mm Hg increase in systolic blood pressure, there was a 53% higher risk for atherosclerotic CVD (Whelton et al., 2020^[18]).

Across the EU, 22% of people 15 years and older, on average, report having high blood pressure (Figure 3.4). Over 30% of people report having high blood pressure in Hungary, Latvia and Croatia, while less than 15% report having high blood pressure in Ireland. Differences in the prevalence of high blood pressure by gender tend to become more pronounced among countries reporting higher levels of high blood pressure overall. In Bulgaria, Lithuania and Latvia, there is more than a 6 percentage point (p.p.) difference in reported levels of high blood pressure between men and women, with higher levels observed in women partially linked to the higher screening rates among women compared to men in these countries.¹ Early detection and treatment of hypertension can reduce complications to the heart, brain, kidneys, eyes and vessels, thus prevent premature deaths and improve quality of life (ESC, 2024^[15]).

Figure 3.4. 22% of people 15 years and older in the EU have high blood pressure, 2019

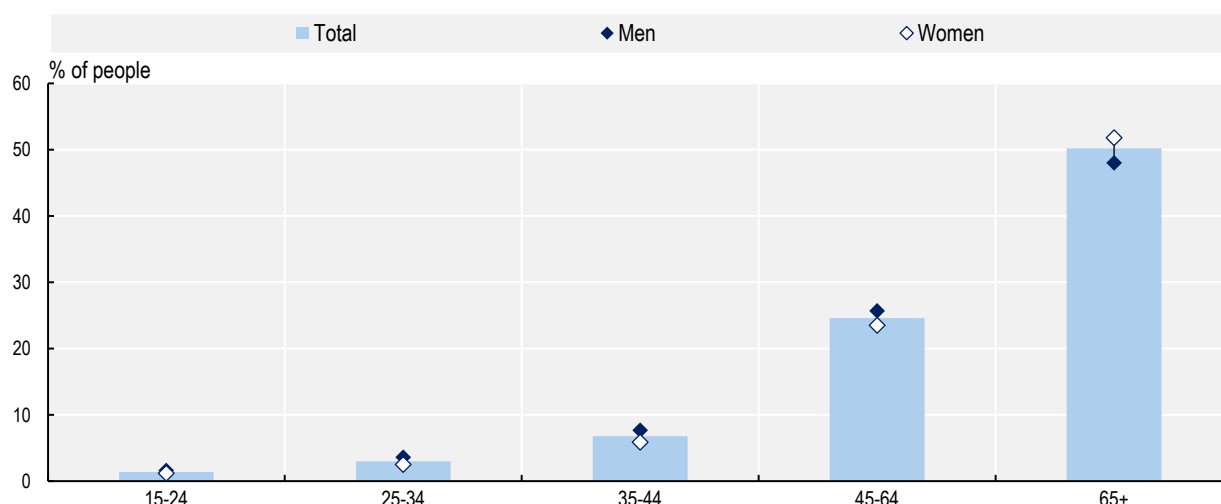


Note: EU27 average is weighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries.
Source: Eurostat (2021), Persons reporting a chronic disease, by disease, sex, age and educational attainment level (hlth_ehis_cd1e), https://ec.europa.eu/eurostat/web/products-datasets/-/hlth_ehis_cd1e (accessed 8, July 2025).

The prevalence of high blood pressure is age dependent. In the EU, on average, half of the people aged 65 or older have high blood pressure compared to less than 10% in those 44 or younger. In younger age groups women tend to have slightly lower prevalence rates than men, but in the age group 65 and over, this pattern reverses, with higher rates women than men (Figure 3.5).

Figure 3.5. High blood pressure predominates in people 65+ in the EU, the group in which the women to men ratio inverts, 2019

EU27 average of people with high blood pressure by age group



Note: EU is the weighted average of the 27 EU countries.

Source: Eurostat (2021), Persons reporting a chronic disease, by disease, sex, age and educational attainment level (hlth_ehis_cd1e), Persons reporting a chronic disease, by disease, sex, age and educational attainment level, https://ec.europa.eu/eurostat/web/products-datasets/-/hlth_ehis_cd1e (accessed 8, July 2025).

Hypertension is the primary risk factor for ischaemic and haemorrhagic stroke – and has been attributed to approximately 60% of cases (Silva et al., 2024^[19]). Antihypertensive pharmacologic treatment within the first 24-hours of onset of acute CVD events has been found to reduce mortality in as little as 10 days (Perez, Musini and Wright, 2009^[20]; Galea et al., 2025^[21]). Meta-analyses show that lowering blood pressure decreases the risk of stroke by approximately 40%, with even modest reductions of 5 mmHg (Law, Morris and Wald, 2009^[22]). Moreover, poorly controlled blood pressure after an initial cerebrovascular event is strongly associated with recurrence and mortality (Lindley, 2018^[23]). Hypertension is also a major cause of heart failure and it precedes its onset in up to 91% of people, particularly in older adults (Vasan et al., 2001^[24]). In the EU, countries with the highest prevalence of high blood pressure among people aged 65 and over tend to have higher age-adjusted mortality rates due to ischaemic heart disease compared with younger people (Annex Figure 3.B.1).

My experience with preventive medicine has been limited and largely unsatisfactory. Despite leading a generally healthy lifestyle – without significant addictions and with a strong commitment to self-care – I received very little information or guidance on prevention throughout my adult life. Most of the medical attention I received was reactive, focussed on managing symptoms rather than preventing the progression or onset of disease.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Globally, raised blood pressure is the leading contributor to DALYs from non-communicable diseases. In 2019, raised blood pressure was responsible for an estimated 10.8 million deaths and 235 million DALYs (IHME, 2024^[7]). In the EU27, ischaemic heart disease and stroke – the two primary outcomes of uncontrolled hypertension – rank among the top causes of DALYs and premature mortality. The mechanisms underlying the development of hypertension shed light on addressing modifiable risk factors – such as targeting lifestyle and behaviour – to prevent the development of hypertension and its cardiovascular complications. Section 3.2 gives more insight into the behavioural and lifestyle factors, and Section 3.5 on early detection and management of hypertension.

3.1.3. There has been a significant decline in the prevalence of high cholesterol, but recent data suggest a plateau

Dyslipidaemia, typically defined by elevated low-density lipoprotein cholesterol (LDL-C), reduced high-density lipoprotein cholesterol (HDL-C), and/or elevated triglycerides, is a primary modifiable risk factor for atherosclerotic CVD, including coronary artery disease, stroke and peripheral arterial disease. Abnormal lipid profiles are responsible for a substantial proportion of global cardiovascular morbidity and mortality.² It is estimated to contribute to over 50% of coronary heart disease cases globally (Ference et al., 2017^[25]) and in 2021, high levels of LDL-C were estimated to have contributed to 3.8 million cardiovascular deaths worldwide (IHME, 2024^[7]).

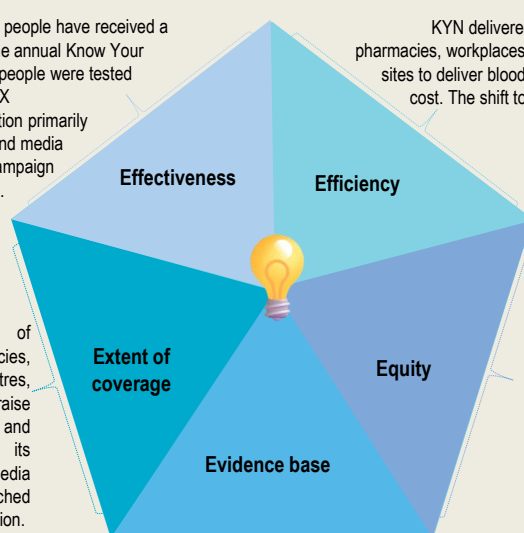
Box 3.1. Best practices for advancing cardiovascular health: Know Your Numbers!

Description: Know Your Numbers! (KYN) is a UK-based public health campaign that raises awareness of high blood pressure and encourages adults to check their blood pressure. The strategy focusses primarily on partnerships and extensive media engagement (radio, print and TV). One of its central activities is the Know Your Numbers! Week, an annual event each September during which KYN kits are sent to pharmacies, workplaces, schools, sport centres, car parks and supermarkets to offer blood pressure checks in public spaces. Initially, the campaign received significant funding, including from Public Health England, NHS and charities; however, the KYN kit has since become chargeable for all participants wishing to set up a blood pressure testing station. Resource packs to run a pressure station now range in cost from GBP 17.50 plus VAT (suitable to test up to 50 people) to GBP 135 plus VAT (for up to 800 people).

Best practice assessment:

Since its launch in 2001, 1.5 million people have received a free blood pressure check during the annual Know Your Numbers! Week. In 2024, 600,000 people were tested and the campaign was trending on X (formerly Twitter). While the evaluation primarily focused on blood pressure tests and media reach, evidence suggests that the campaign has led to increases in GP referrals.

KYN is a nationwide campaign across the UK that provides kits and resources to a wide range of partners (including pharmacies, workplaces, schools, sport centres, supermarkets, parks) to raise awareness of high blood pressure and carry out testing. Through its partnership and strong media engagement, the campaign reached large segments of the adult population.



KYN delivered by a small team and uses partnerships with pharmacies, workplaces, schools, sport centres and other community sites to deliver blood pressure checks at relatively low operational cost. The shift to paid model for KYN kits has ensured financial sustainability but may limit participation in disadvantaged, high-need areas.

The shift in funding model from free to paid, may create barriers to incentivize new partners to host Pressure Stations in disadvantaged areas, thereby limiting access to blood pressure checks for lower socioeconomic groups. However, the campaign working towards a stronger focus on community-based actions and targeting areas such as Muslim centres to improve equity in access to blood pressure checks.

KYN collects data on age and region data during blood pressure tests and media engagement. The absence of health literacy questionnaire to structure the campaign and lack of follow-up data limits evidence on the campaign's impact on improved health literacy, behavior change in self-monitoring and treatment uptake.

Enhancement options: To enhance effectiveness, KYN could expand data collection to include socioeconomic status, clinical and behaviour risk factors (e.g. diabetes, obesity, high blood sugar, smoking) as well as health literacy indicators. Establishing follow-up for individuals with high blood pressure would enable assessment of improvements in health literacy, changes in self-monitoring behaviours, and treatment uptake.

Transferability: Campaigns encouraging blood pressure checks have been implemented in other countries, including Ireland (Know your Numbers and Farmers Have Hearts), Australia (Biggest Blood Pressure Check and Know Your Numbers) and the global May Measurement Month (MMM). It is currently being piloted in France as part of JACARDI. KYN's approach of using partnerships, community settings, and media to raise awareness and offer testing is highly transferable to other countries aiming to increase blood pressure monitoring and awareness.

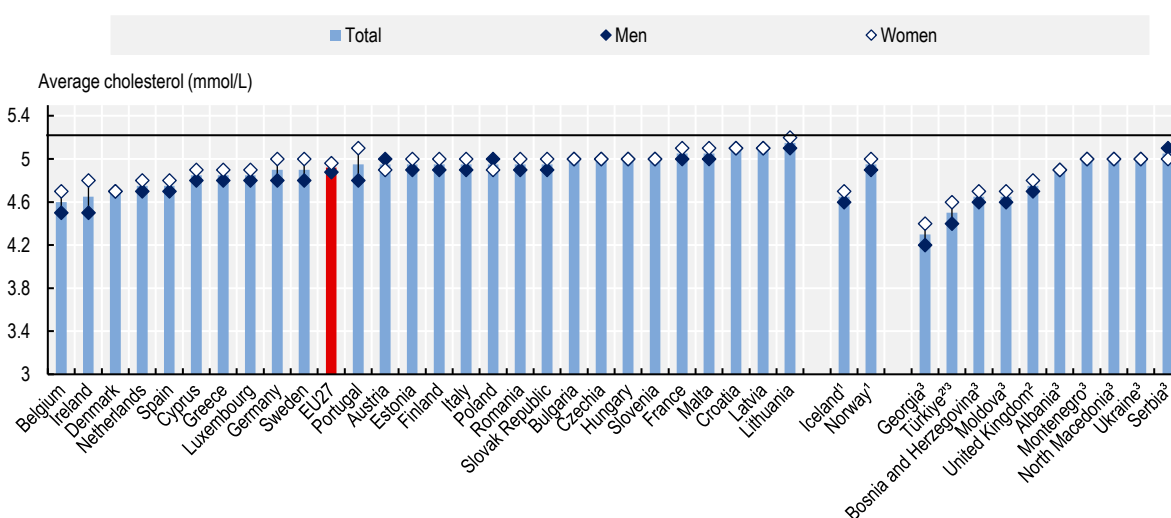
Conclusion: KYN shows that community-based partnerships and accessible testing can increase public awareness of high blood pressure and promote early detection. Its wide reach and sustained delivery over more than 20 years positions it as a strong example of best practice in raising awareness and encouraging blood pressure testing.

Source: (Blood Pressure UK^[26]; NHS Gloucestershire, 2024^[27]; NHS England, 2025^[28]).

Total cholesterol is a measure that includes “bad” (e.g. LDL-C) and “good” cholesterol (HDL-C) in the blood. A level lower than 5.17 mmol/L (i.e. 200mg/dL) is considered desirable for adults, although lower targets may apply for patients with higher CVD risk. In the EU, 14% of adults report having been diagnosed with high blood lipids cholesterol (Eurostat, 2021^[29]). Although the references for diagnosing dyslipidaemia have changed over time – which may influence the assessment of trends in diagnosed high blood lipids – non-HDL and total cholesterol levels have markedly decreased in high-income European countries. This trend is mainly attributed to dietary improvements and expanded use of statins from the late 1990s onward (NCD-RisC, 2020^[30]). However, regional disparities persist, with countries like Latvia, Lithuania and Serbia showing higher than optimal average cholesterol levels, which are associated with higher mortality rates due to ischaemic heart disease (Annex Figure 3.B.1). Total cholesterol measures also vary slightly between countries in Europe, with values ranging from 4.6 mmol/L to 5.2 mmol/L (the desirable cutoff is 5.17 mmol/L) (Figure 3.6).

The risk of cardiovascular events is strongly linked to LDL-C. Individuals with familial hypercholesterolemia, whose LDL-C level is double those of their unaffected siblings, face a ten-fold increased risk of premature coronary events (Drouin-Chartier et al., 2021^[31]; ESC/EAS, 2011^[32]). Conversely, reducing LDL-C substantially lowers the risk of cardiovascular events, with a 22% reduction in risk for every 1 mmol/L decrease in LDL-C (Patel and Giugliano, 2020^[33]). The treatment goal of LDL-C for cardiovascular prevention is less than 3.0 mmol/L (<116 mg/L) in people at low risk, less than 2.6 mmol/L (<100mg/L) for people at moderate risk, less than 1.8 mmol/L (<70 mg/dL) for people at high risk, and less than 1.4 mmol/L (<55 mg/dL) for people at very high risk (ESC, 2019^[34]).

Figure 3.6. Average total cholesterol varies within European countries, 2018



Note: EU27 average is unweighted. Desirable total cholesterol below 5.17 mmol/L. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries.

Source: NCD RisC 2018a.

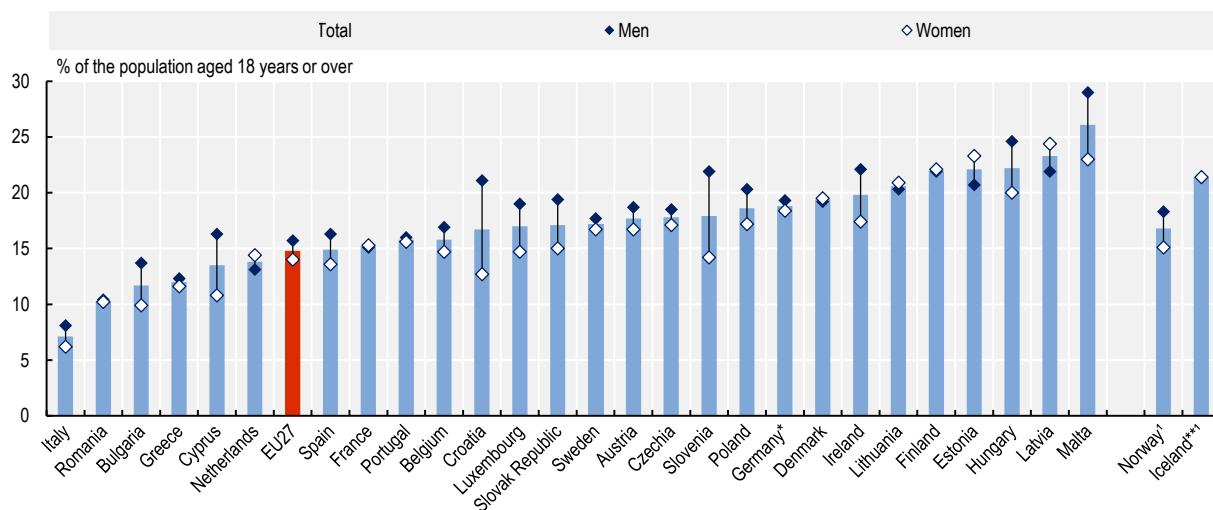
Timely diagnosis and adequate management of dyslipidaemia with pharmacologic therapy along with healthy diet and exercise are key to preventing CVD. See Section 3.2 for more insight into the behavioural and lifestyle factors, and Section 3.5 on early detection and management of dyslipidaemia.

3.1.4. Obesity prevalence is high and continues to pose a challenge for cardiovascular health

Obesity, particularly central or visceral obesity, is a major independent risk factor for CVD and a critical driver of the global burden of noncommunicable diseases. Defined by a body mass index (BMI) ≥ 30 kg/m², obesity is associated with increased risk of cardiovascular events such as heart failure (HF), arrhythmias, stroke and myocardial infarction (American Heart Association, 2021^[35]). Excess weight in childhood further increases the risk of AMI in early adulthood (Chrissini and Panagiotakos, 2022^[36]; WHF, 2025^[37]). One study found that children with a high BMI are 40% more likely to have CVD in midlife than those with a low BMI (WHF, 2025^[37]). Recent evidence also highlights the added value of incorporating metrics of abdominal adiposity (waist circumference, waist-to-height ratio, waist-to-hip ratio) to refine cardiometabolic risk stratification beyond BMI. However, these metrics are not routinely measured in clinical practice (Ross et al., 2020^[38]).

Obesity and overweight are widespread across Europe. In 2022, 51% of adults aged 18 and over were overweight (BMI ≥ 25 kg/m²) and 15% were obese (BMI ≥ 30 kg/m²) (Figure 3.7). Prevalence rates in obesity vary significantly across Europe, ranging from 7% in Italy to above 20% in Lithuania, Finland, Estonia, Hungary, Latvia and Malta. Men consistently show higher rates of obesity than women. On average, 16% of men live with obesity in the EU compared to 14% of women. Lower socio-economic groups – and in particular women with low income – are more likely to live with obesity. On average, women with high income are 41% less likely to live with obesity than women with low income, while men with high income are 16% less likely to do so (WHO Global Health Observatory, 2025^[39]). Childhood overweight and obesity remain a major concern in Europe, with around one-in-ten children (9%) aged 5 to 19 living with obesity across EU countries and one-in-four (25%) living with overweight (WHO Global Health Observatory, 2025^[40]).

Figure 3.7. Nearly one-in-seven adults were living with obesity in 2022, with rates consistently higher among men than women



Notes: EU27 average is weighted. Data for Germany are based on a different study (Starker et al., 2025^[3]). 2017 data is used for Iceland.
1. Non-EU European Economic Area countries.

Source: Eurostat (2024), Person distribution by body mass index, educational attainment level, sex and age (ilc_hch10), https://ec.europa.eu/eurostat/databrowser/view/ilc_hch10/default/table?lang=en (accessed 10, July 2025).

The prevalence of obesity in Europe remained stable in recent years. Between 2017 and 2022, obesity rates among adults aged 18 and over in the EU decreased slightly from 14.9% to 14.8%. However, projections indicate that by 2050, more than half of the population in all EU countries will be overweight or obese (Ng et al., 2025^[41]). Particularly high rates are expected in Croatia, Hungary, Latvia, Lithuania and Slovenia.

While obesity rates remain high in Europe, progress in obesity prevention has been limited. In this context, Glucagon-Like Reptide-1 Receptor Antagonists (GLP-1 RAs) have gained attention as an effective therapy for weight reduction. Evidence indicates that GLP-1 RAs significantly reduces BMI in the short term (Moiz et al., 2025^[42]; Gudzone and Kushner, 2024^[43]), and reduce the risk of cardiovascular events (Badve et al., 2025^[44]; Xie, Choi and Al-Aly, 2025^[45]). Despite reducing bodyweight and comorbidities in the short term, evidence indicates that patients tend to regain weight when treatment is stopped. Furthermore, access to GLP-1RAs is limited due to high prices, limited public insurance coverage, frequent shortages, and strict eligibility criteria (such as age and BMI thresholds). Ensuring long-term efficacy, availability, generous coverage for low-income groups, and accompanying treatment with behavioural and lifestyle changes will be critical for improving the effectiveness of GLP-1 RAs obesity treatments (Mathieu-Bolh, forthcoming^[46]).

Meanwhile, evidence-based prevention strategies remain central to tackling obesity at the population level. Legislative measures on food advertising, nutrition labelling, and fiscal policies to discourage the consumption of high-fat, high-salt and high-sugar products, together with interventions to reduce calorie intake and increase physical activity, are key components of prevention. School- and nursery-based initiatives – including teaching healthy cooking, promoting physical activity, providing nutritious meals, and involving families in fostering healthy habits – are important targets for early detection and sustainable lifestyle change. Public procurement also offers an important policy lever for promoting healthy diets. The JRC's criteria for Sustainable Public Procurement (SPP) for food encompass the three dimensions of sustainability – environmental, social and economic – and identify nutrition as a crucial component, as healthier food choices help prevent obesity, especially among children and people in vulnerable situation (Garcia Herrero et al., 2025^[47]). Results from the SWEDEHEART registry show that at 1-year follow-up after a myocardial infarction, central obesity increased from 51% to 57%, as did diabetes (18% to 27%) and insufficient physical activity (57% to 62%) in the cohort (Leosdottir et al., 2023^[48]). Management of obesity and clinical risk factors is necessary even after having had a CVD event to prevent further CVD events and complications.

3.1.5. Metabolic syndrome prevalence in Europe has been increasing, with significant variation between countries

Metabolic syndrome (MetS) is usually defined as a cluster of interconnected metabolic abnormalities that increase the risk of CVD, type 2 diabetes mellitus, and all-cause mortality. Various criteria have been proposed to define this syndrome, but no general consensus on the specific markers and the respective cut-offs has been achieved yet. It can commonly be defined by the presence of at least three of the following components: abdominal obesity, elevated blood pressure, hyperglycaemia, high triglycerides, and low high-density lipoprotein cholesterol (HDL-C).

MetS significantly increases the risk of cardiovascular events. It has been found that MetS was associated with a twofold increase in risk for CVD and cardiovascular mortality and strongly associated with the development of heart failure, ischaemic stroke and transient ischaemic attack (Mottillo et al., 2010^[49]). The global prevalence of MetS is estimated at around 30% of the global population (Zila-Velasque et al., 2024^[50]) and at around 25% in Europe (for the Metabolic Syndrome and Arteries Research (MARE) Consortium, 2014^[51]). The increasing burden of obesity and sedentary lifestyles has led to a steady rise in MetS prevalence, particularly among older adults and socio-economically disadvantaged groups (Rus et al., 2023^[52]).

3.1.6. Depressive symptoms are prevalent, and highly associated with CVD

Mental illness is a leading cause of ill health and disability in Europe, and a key risk factor for CVD. Depression and severe mental illness – including schizophrenia or bipolar disorder – are associated with increased risk of myocardial infarction, stroke, angina and coronary heart disease (Honigberg et al., 2022^[53]; Kwapong et al., 2023^[54]; Emerging Risk Factors Collaboration, 2020^[55]; Nielsen, Banner and Jensen, 2020^[56]). This link is partly explained by the physiological changes associated with depression – including elevated cortisol and adrenaline levels that raise the blood pressure, glucose and heart – as well as the higher level of socio-economic disadvantage and unhealthy behaviours among people with mental illness – such as smoking, diets high in calories, salt and saturated fats, lack of exercise, and lower medication compliance (Nielsen, Banner and Jensen, 2020^[56]; Chaddha et al., 2016^[57]; Kwapong et al., 2023^[54]; Henking, Reeves and Chrisinger, 2023^[58]). Some psychotropic medications, particularly first-generation antipsychotics and high-dose prescriptions, also pose cardiac risks, including obesity and QTc prolongation with risk of ventricular tachyarrhythmia (Nielsen, Banner and Jensen, 2020^[56]).

I've been medicated for anxiety and depression since my stroke... I stopped working (I was a journalist), had to learn how to do everything only with one side of my body (I have hemiparesis) and it's very difficult to manage my self-esteem.

Diana, 48, stroke survivor.

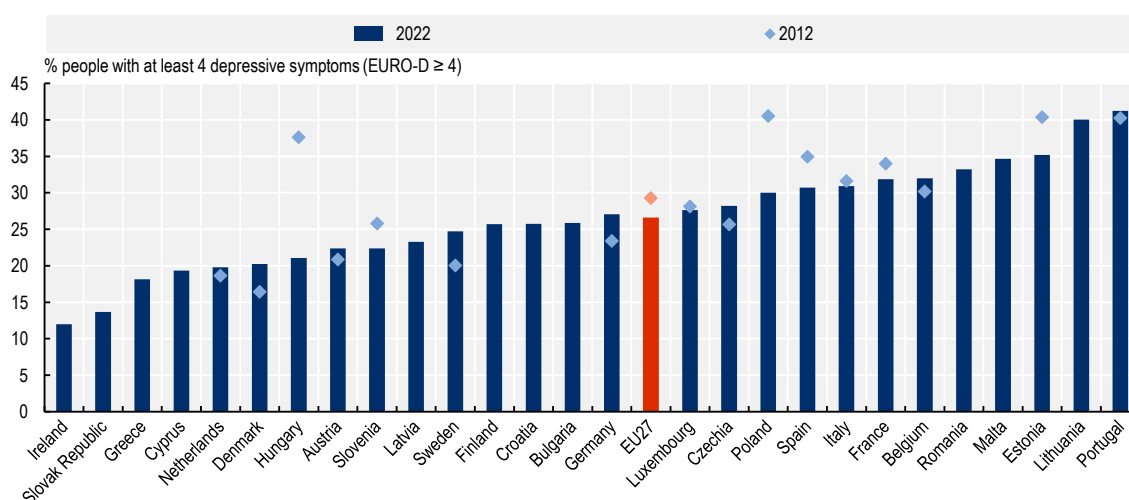
Depression is widespread in Europe. In 2022, 27% of adults aged 45 and over reported at least four depressive symptoms on the EURO-D scale (Figure 3.8). Women consistently report higher rates of depressive symptoms than men (32% and 20% respectively) (see Annex 3.E). The higher burden of reported depressive symptoms among women may be explained by hormonal changes, caregiving responsibilities, socio-economic disadvantage and gender-based violence (Kwapong et al., 2023^[59]; Karami et al., 2023^[60]). Further, under-diagnosis and lower help-seeking behaviour among men may lead to an underestimation of their symptom prevalence, thereby contributing to the observed gender gap (Kwapong et al., 2023^[54]; Buffel, Van de Velde and Bracke, 2014^[61]).

While depressive symptoms among older adults declined on average across the EU between 2012 and 2022, they remain high across Europe. In many countries, depressive symptoms have increased among older adults, including the Netherlands, Denmark, Austria, Sweden, Germany, Czechia, Belgium and Portugal (Figure 3.8). One contributing factor has been the pandemic, which drove up depression rates by increasing social isolation, loneliness, uncertainty, bereavement and financial stress (Frankenthal, Keinan-Boker and Bromberg, 2022^[62]). Further drivers include rising chronic disease burdens, inequality, social media use, and loneliness, as well as increased public awareness and improved diagnosis of mental health conditions (Hidaka, 2012^[63]; Twenge et al., 2018^[64]).

Living with congenital heart disease has had a significant impact on my physical and mental wellbeing. There have been times of anxiety and stress related to health uncertainties and hospitalizations. Physically, my activity is limited compared to before diagnosis, and fatigue can be a challenge. Workwise, I have had to adapt my responsibilities and pace, while maintaining a sense of purpose. Socially, I strive to stay connected, but sometimes health issues reduce my participation in social events. Overall, I have learned resilience and the importance of strong support networks.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Figure 3.8. Nearly one-in-three Europeans report depressive symptoms, with rates rising in several EU countries, 2012 and 2022 (or nearest year)



Note: Respondents aged 45 and older. The EURO-D depression scale is a composite index of 12 items (depressed mood, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness). The scale ranges from 0 “not depressed” to 12 “very depressed”. Ireland was excluded due to data availability. 2011 data (instead of 2012 data) was used for Austria, Belgium, Czechia, Denmark, Estonia, France, Hungary, Italy, the Netherlands, Portugal, Slovenia, Spain and Sweden; and 2013 data (instead of 2012 data) was used for Luxembourg.

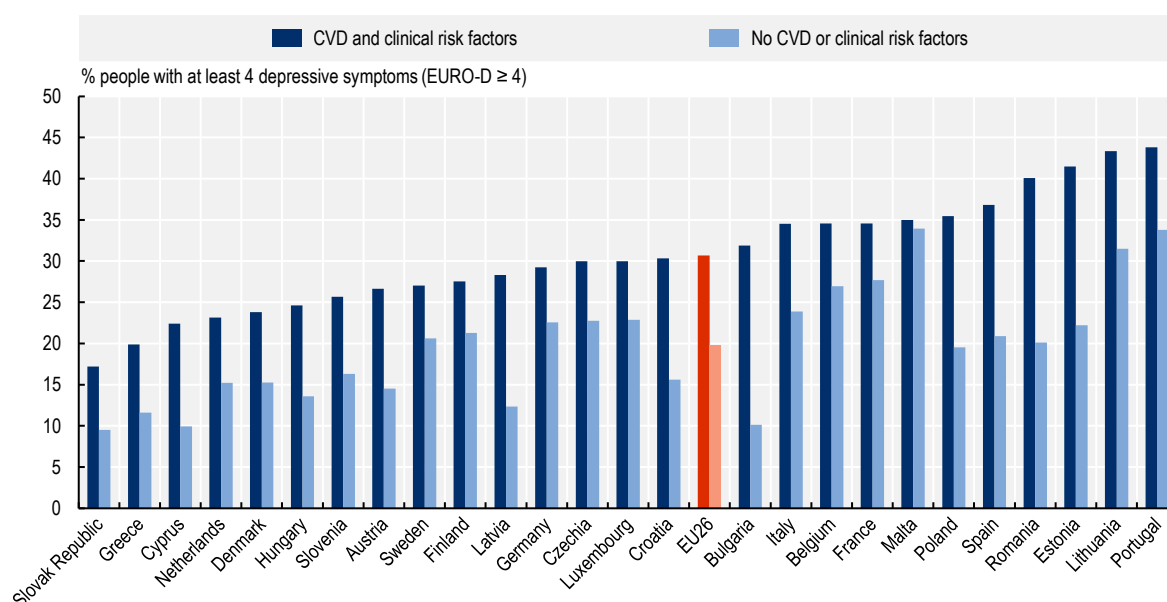
Source: SHARE-ERIC (2024); The Irish Longitudinal Study on Ageing (TILDA) 2025.

Mental health problems are common among people with cardiovascular conditions. In 2022, 31% of people with CVD and related clinical risk factors (including high blood pressure, hypertension, high blood cholesterol, diabetes and high blood sugar) reported depressive symptoms, compared to 20% of those without (Figure 3.9). Previous OECD analysis found that stroke survivors faced a 23% higher risk of depression (Everard et al., 2025^[65]). This elevated risk may reflect both the physical and psychological burden of living with CVD. Symptoms such as pain, fatigue and sleep disturbance can limit daily functioning and reduce social and economic participation, contributing to isolation and poorer quality of life. At the same time, fear of disease progression, disability or death can have a direct impact on anxiety and depression (Karami et al., 2023^[60]).

Cardiovascular disease has profoundly impacted every aspect of my life. Initially, it left me physically incapacitated, unable to walk or see properly, and struggling with panic attacks. Mentally, the fear of another cardiac event weighed heavily on me, requiring significant emotional resilience. Socially, my ability to engage in daily activities and connect with others was limited. However, this experience also inspired me to channel my energy into helping others, both through my professional work and patient advocacy. It has been a journey of rebuilding not just my health, but also my confidence and purpose.

Caius, artist, researcher, patient advocate, and heart attack survivor.

Figure 3.9. People with CVD and related clinical risk factors report more depressive symptoms than those without in all EU countries (2022)



Note: Respondents aged 45 and older. The EURO-D depression scale is a composite index of 12 items (depressed mood, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness). The scale ranges from 0 “not depressed” to 12 “very depressed”. CVD includes heart attack, stroke and cerebral vascular disease. Clinical risk factors include high blood pressure, hypertension, high blood cholesterol, diabetes and high blood sugar. Ireland is excluded due to data availability.

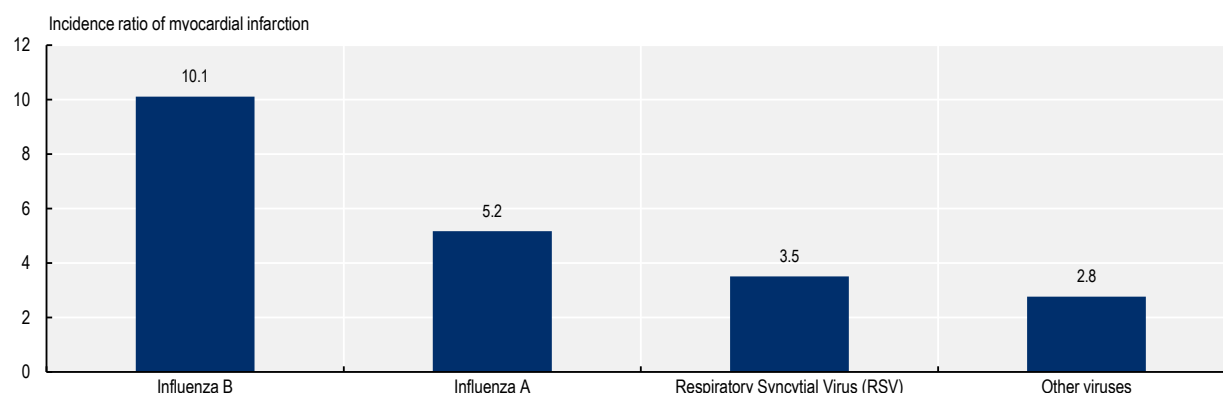
Source: SHARE-ERIC (2024).

3.1.7. Viral infections can increase the risk of cardiac events

Seasonal influenza epidemics and respiratory tract infections have been associated with acute myocardial infarction and excess CVD mortality (Kwong et al., 2018^[66]; de Boer et al., 2024^[67]). For example, Kwong et al. (2018) found that within 7 days of infection, incidence ratios for acute myocardial infarction were 10.1 (95% CI, 4.4 to 23.4) for influenza B, 5.2 (95% CI, 3.0 to 8.8) for influenza A, 3.5 (95% CI, 1.1 to 11.1) for respiratory syncytial virus, and 2.8 (95% CI, 1.2 to 6.2) for other viruses (such as adenovirus or

metapneumovirus) (Figure 3.10). Several mechanisms link respiratory infections to cardiovascular events, including inflammation, endothelial dysfunction, increased plasma viscosity, dehydration and psychological distress (Golabchi, 2010^[68]).

Figure 3.10. Respiratory viruses increase the risk of myocardial infarction



Source: Kwong et al. (2018^[66]), "Acute Myocardial Infarction after Laboratory-Confirmed Influenza Infection", <https://doi.org/10.1056/nejmoa1702090>.

There is growing evidence that acute illness from pandemic viruses, such as H1N1 influenza and COVID-19, is linked to myocardial infarction, stroke and cardiac death. H1N1 infections have been associated with acute myocarditis, myocardial inflammation and cardiomyopathy (Bratincsák et al., 2010^[69]; Ananth et al., 2024^[70]). More recently, studies on the COVID-19 pandemic have identified a wide range of cardiovascular complications associated with acute COVID-19 illness, including acute myocardial injury, myocarditis, stress cardiomyopathy, myocardial infarction, stroke, deep vein thrombosis, pulmonary embolism, vasospasm, arrhythmias and heart failure (Chilazi et al., 2021^[71]; Hendren et al., 2020^[72]; Vassiliou et al., 2025^[73]). Acute cardiac injury is the most commonly reported cardiovascular complication, affecting approximately 8-12% of COVID-19 patients (Li et al., 2020^[74]; Lippi and Plebani, 2020^[75]; Bansal, 2020^[76]). In addition to acute COVID-19 illness, a growing body of research suggests that Long COVID condition can have lasting effects on cardiovascular health (Box 3.2).

Vaccinations provide cardioprotective benefits against respiratory viral infections. A recent clinical consensus statement, developed by associations of the European Society of Cardiology (ESC), emphasises that COVID-19 vaccinations are a cornerstone of prevention, reducing the cardiac risks of acute COVID-19 illness and lowering the risk of developing Long COVID and its cardiac complications (Vassiliou et al., 2025^[73]). In line with this, a retrospective cohort study of hospitalised COVID-19 patients found that patients who had received a COVID-19 vaccine experienced fewer acute cardiac events (17%) compared to non-vaccinated patients (29%), and had a significantly reduced relative risk for acute cardiac events (RR: 0.3, 95% CI [0.1; 0.8]) (Figure 3.11) (Madrid et al., 2024^[77]). While this study does not establish a causal relationship, it does report a significant association between vaccination and lower risk of cardiac events, after controlling for confounders, including age, type 2 diabetes, hypertension, cardiac, and pulmonary diseases. Similarly, influenza vaccinations have been associated with a 26% lower risk of CVD, an 18% lower risk in respiratory disease, and a 43% lower risk for all-cause mortality (Cheng et al., 2020^[78]). This suggests that vaccinations not only protect against acute infections but also reduce the risk of cardiovascular events, including stroke, myocardial infarction, acute coronary syndrome, heart failure, ischaemic heart disease, major adverse cardiovascular events, and cardiovascular mortality (Omidi et al., 2023^[79]; Behrouzi et al., 2022^[80]; Cheng et al., 2020^[78]).

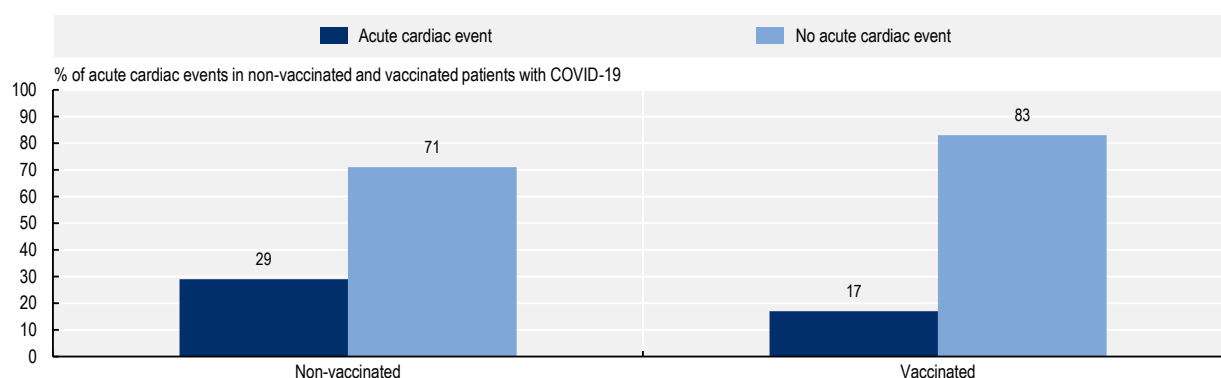
Box 3.2. Post COVID-19 condition (Long COVID) and cardiovascular health

Long COVID is defined as the continuation or development of new symptoms three months after SARS-CoV-2 infection, persisting for over two months with no alternative explanation (WHO, 2022^[81]). Emerging evidence suggests that Long COVID has lasting effects on cardiovascular health. Reported cardiac symptoms include chest pain, palpitations, dyspnoea (shortness of breath) and postural orthostatic tachycardia syndrome (POTS) (Vassiliou et al., 2025^[73]; Tsampasian et al., 2024^[82]). Long COVID has been associated with the development of CVD events (e.g. heart failure, cardiac arrest and cardiogenic shock). Estimates indicate that one-in-five patients with Long COVID experience cardiac symptoms, and around 2-5% of all individuals with COVID-19 illness develop cardiac Long COVID (Vassiliou et al., 2025^[73]).

A recent clinical consensus statement from the ESC provides a comprehensive overview of CVD prevention and management strategies for Long COVID (Vassiliou et al., 2025^[73]). Key recommendations include early patient education after acute COVID-19 illness on potential cardiac symptoms to support timely reporting and early diagnosis, as well as lifestyle interventions such as healthy nutrition, regular physical activity and smoking cessation. COVID-19 vaccination and boosters are also highlighted as important preventive measures, reducing the risk of developing both Long COVID and COVID-19 related cardiovascular complications (Xie, Choi and Al-Aly, 2024^[83]; ECDC, 2022^[84]). For cardiac Long COVID patients, recommendations emphasise evidence-based pharmacotherapy, timely identification and close follow-up of high-risk individuals, and access to individualised cardiac rehabilitation programmes tailored to the needs of COVID-19 survivors.

To strengthen the evidence base on Long COVID, the OECD is jointly leading the initiative of the EC on Long COVID “Supporting Long-COVID patients: insights and action”. This work includes preparing a policy paper using data from the Patient-Reported Indicator Survey (PaRIS) on the prevalence and health impacts of Long COVID, developing training for healthcare workers to improve knowledge, recognition and management of the condition, and modelling economic costs (OECD, 2025^[85]).

Figure 3.11. Vaccinations have cardio-protective benefits for hospitalised COVID-19 patients



Source: Madrid et al. (2024^[77]), “Cardioprotective effects of vaccination in hospitalized patients with COVID-19”, <https://doi.org/10.1007/s10238-024-01367-3>.

3.2. Trends in many behavioural and lifestyle factors impacting cardiovascular health have been showing signs of improvement

3.2.1. Tobacco smoking is decreasing in most EU +2 countries

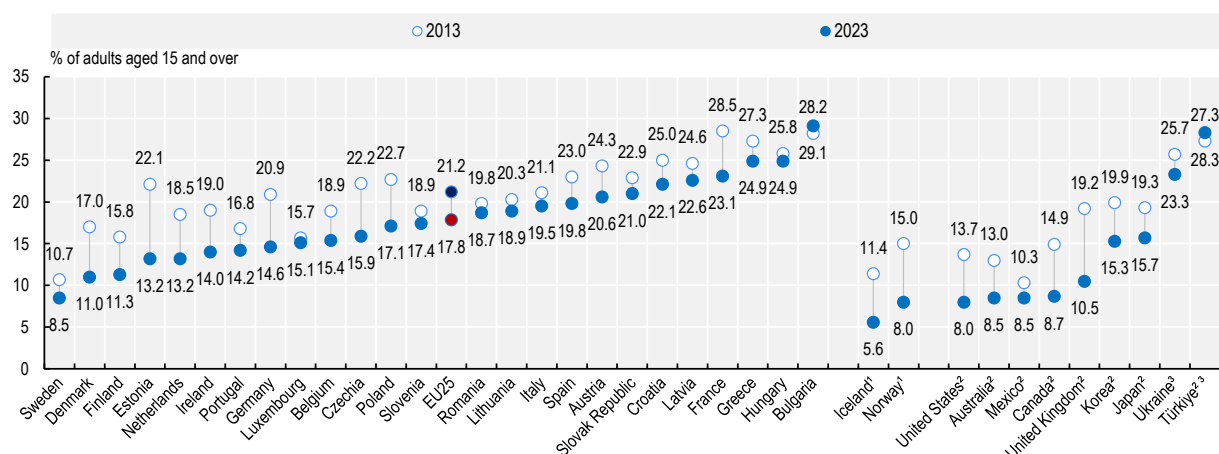
Smoking is a major cause of CVD and the leading cause of preventable mortality in the EU in 2021 (Brauer et al., 2024^[86]). Every year, approximately 21% of the deaths due to coronary heart diseases are attributable to tobacco use and exposure to second-hand smoke (WHO, 2020^[87]). This behaviour has multiple implications in the human body such as raising the triglycerides, lowering HDL cholesterol, modifying key characteristics of the blood that can lead to higher blood pressure, heart rate and reduced blood flow from the heart (notably to the brain), and ultimately lead to adverse cardiovascular outcomes (U.S. Department of Health and Human Services, 2010^[88]). The harmful effects of tobacco use extend beyond the individual, placing a significant burden on healthcare systems and society, with the cost of smoking-attributable diseases estimated at 2.5% of Europe's annual GDP (Goodchild, Nargis and Tursan d'Espaignet, 2017^[89]). In France, a study showed that 21% of the hospital stays related to CVD could be attributable to smoking (Santé Publique France, 2022^[90]).

In 2023, an average of 17.8% of adults aged 15 and over smoked daily across EU countries (Figure 3.12). The proportion of daily smokers varied more than three-fold, ranging from 23% or more in Bulgaria, Greece, Hungary and France to below 12% in Denmark, Finland and Sweden (Figure 3.12). Over the last decade, smoking rates declined in all EU countries except Bulgaria, with an average 16% reduction since 2013. Progress, however, has been uneven, with the largest reductions observed in Denmark, Estonia and Germany (over 6 p.p.), and slight increases seen in Bulgaria (about 1 p.p.) (Figure 3.12) (OECD/European Commission, 2024^[91]).

The implementation of more stringent tobacco control policies at the national level, such as smoke-free environments and tax increases, has contributed to the reduction of smoking rates across many EU countries. These efforts have been supported and complemented by the Tobacco Products Directive 2014/40/EU, the Tobacco Advertising Directive 2003/33/EC and the Tobacco Taxation Directive 2011/64/EU, which introduced EU-wide measures concerning the manufacture, presentation, advertising, sale, and taxation of tobacco products. These measures include combined health warnings, a ban on characterising flavours, advertising and sponsorship bans, and a requirement for a minimum rate of excise duties on tobacco products (European Commission, 2021^[92]), see Chapter 6 on designing and implementing effective policies for CVD prevention and control.

It has also been shown that smoking fewer cigarettes per day for longer duration is more dangerous than smoking more cigarettes per day for shorter duration (Lubin et al., 2016^[93]). These observations strengthen the need for smoking cessation rather than smoking reduction. While tobacco smoking among adolescents has continued to decline in most EU countries in the last decade, too many adolescents still smoke. On average in EU countries, more than one-in-six (17%) 15-year-olds reported smoking cigarettes at least once in the past month in 2022. This proportion reached more than one-in-four in Bulgaria, Hungary, Italy and Croatia, whereas less than one-in-ten reported to have smoked cigarettes in the past month in Ireland, Portugal and Malta. It has been found that tobacco smoking from age 10 to 24 years was associated with 33% to 52% odds of premature structural and functional cardiac injury, causing early and lasting damage to the heart (Agbaje, 2025^[94]).

Figure 3.12. Changes in daily smoking rates among adults aged 15 and over, 2013 and 2023 (or nearest years)



Note: The EU25 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. Tobacco consumption refers to the share of the population aged 15 and over who are daily tobacco smokers except for Luxembourg (16+). Where 2023 data was unavailable, the closest year available was used: 2024 data for: Denmark, Estonia, Ireland, Luxembourg, Iceland, Norway; 2022 data for: Finland, Australia, Türkiye; 2021 data for: Germany; 2020 data for: Spain, Ukraine; 2019 data for: Austria, Bulgaria, Croatia, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, the Slovak Republic, Slovenia; 2018 data for: Belgium. Where 2013 data was unavailable, the closest year available was used: 2014 data for Austria, Bulgaria, Croatia, Estonia, France, Greece, Hungary, Latvia, Lithuania, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Türkiye; and 2015 data for Ireland and Ukraine; 2011 data for Mexico.

Source: OECD (2025), Tobacco consumption (database), OECD Data Explorer, <http://data-explorer.oecd.org/s/2hb> (accessed 8, July 2025).

Only half of the people who currently smoke report having received advice on quitting

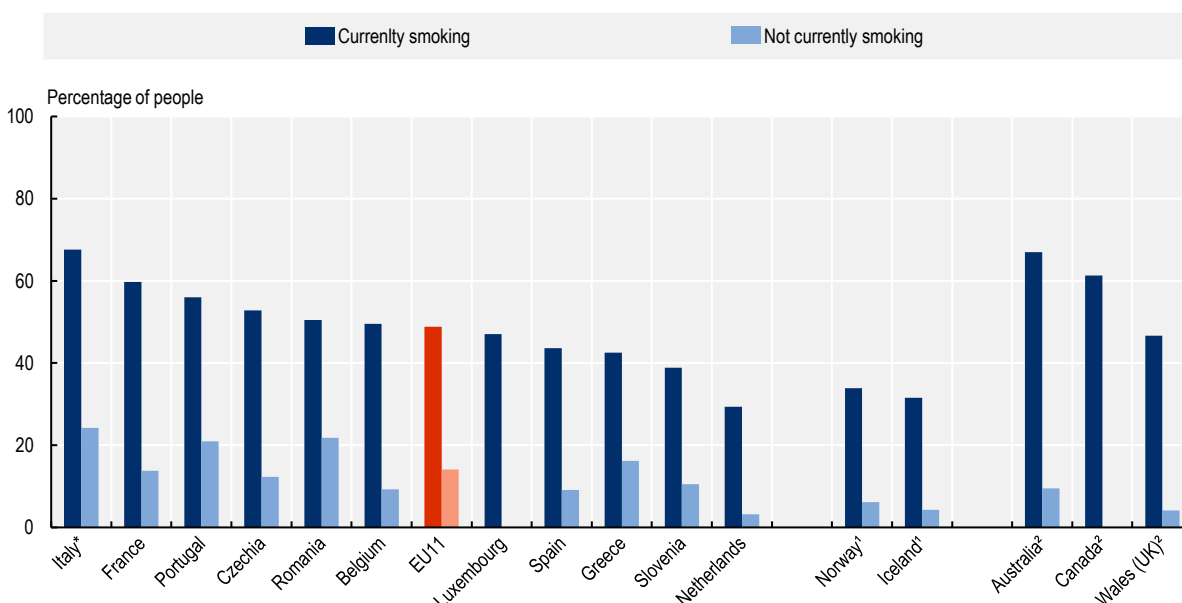
Tobacco use is often cited as one of the most modifiable behavioural interventions, and reducing it can substantially lower the risk of CVD and other health conditions (OECD, 2024^[95]). According to OECD PaRIS survey results,³ over one-in-ten (15%) of healthcare users aged 45 and older report currently smoking, and one-in-ten (10%) report smoking daily (see Annex 3.D). Among people who report having a cardiovascular condition, 15% report currently smoking and 10% report smoking daily. Although primary care users are expected to be more exposed to more and promotion interventions, surprisingly, their smoking rate is only slightly lower than the 18% rate reported for adults in 2022 for the EU (see Section 3.2.1). The provision of counselling by primary healthcare providers on the risks associated with tobacco smoking and sharing information regarding cessation methods has been found to reduce tobacco use. Yet, PaRIS data show that less than a third (28%) of healthcare users 45 and older who previously or currently smoke report that a healthcare professional talked to them about the health risks of smoking or using tobacco and ways to quit; however, this figure goes up to 35% among those reporting CVD. Among healthcare users that report currently smoking, only about half (49%) report that a healthcare professional talked to them about the health risks of smoking and ways to quit – ranging from 29% in the Netherlands to 68% in Italy (Figure 3.13). Surprisingly, in Greece, where 22% of healthcare users report currently smoking, only 43% of them received advice on quitting.

I stopped smoking after my stroke, but no one asked me if I needed help to quit. It wasn't easy, but I felt that I had no option! I have high cholesterol, the medication interferes with my muscle tension, and it has not been easy to deal with this and with the spasticity (a sequel of the stroke) ... Health professionals are more present in the acute phase, but in the chronic phase I've felt a little bit abandoned.

Diana, 48, stroke survivor.

Figure 3.13. Only half of the people who currently smoke report having received advice on quitting

Percentage of primary care user aged 45 and older who self-reported having received advice on the risks of smoking by smoking status



Note: The EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Smoking status is based on the questions: "Do you smoke any tobacco products (excluding electronic cigarettes or similar electronic devices)?" Yes, daily and yes, occasionally compared to No. Having received advice on tobacco refers to those that currently smoke or have previously smoked daily and responded "yes" to the question: "In the past 12 months has any healthcare professional talked with you about health risks of smoking or using tobacco and ways to quit". * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions.

Source: OECD PaRIS 2024 Database.

Second hand smoke exposure has seen notable shifts

Tobacco smoke contains many dangerous chemicals that affect air quality and for which there is no safe level of exposure. Cardiovascular problems caused by second-hand smoke in adults who do not smoke include coronary artery disease and stroke (Fischer and Kraemer, 2015^[96]). Second-hand smoke can increase the risk of ischaemic heart disease and stroke by at least 8% and 5%, respectively (Flor et al., 2024^[97]), this association is dose dependent and can increase up to 30% for stroke (Oono, Mackay and Pell, 2011^[98]; U.S. Dept of Health and Human Services, 2014^[99]). In 2019, second-hand smoke accounted

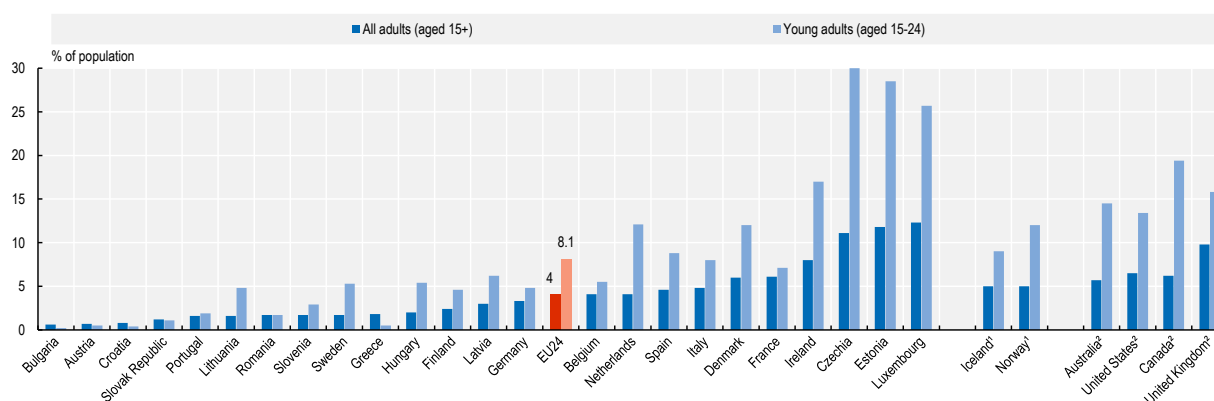
for 1.30 million deaths and 37.0 million DALYs globally, with 11.2% of the burden seen among children under the age of 5 years (The Lancet, 2020^[100]).

Data from the Global Youth Tobacco Survey (GYTS) from 2010 to 2018, show that in Europe out of 24 countries included, 11 had downward trend in second-hand smoke exposure, 8 had no change, and 5 had upward change such as Italy and Ukraine (Ma et al., 2021^[101]). Multivariate analysis showed that nicotine concentrations from second-hand smoke are higher in countries with greater smoking prevalence and less comprehensive tobacco control policies (Henderson et al., 2021^[102]).

The use of e-cigarettes is on the rise

Electronic cigarettes – handheld electronic vaping devices which produce an aerosol by heating a liquid, usually nicotine and other potentially toxic chemicals, but not tobacco – were introduced in the market in the early 2000s and their consumption has increased globally since⁴ (Feeney, Rossetti and Terrien, 2022^[103]) (WHO Europe, 2024^[104]). Information from the Global Tobacco Surveillance System shows that current e-cigarette used by children aged 13-15 years old often exceeds those of older age groups (WHO, 2023^[105]). Likewise, vaping product consumption remains high at the ages 15-24 compared with the overall population (Figure 3.14). In 2024, 4% of individuals aged over 15 were regular users of vaping products across EU countries. Luxembourg, Estonia and Czechia reported the highest vaping rates (over 10%), while Bulgaria, Austria and Croatia had the lowest (less than 1%). Among young adults, the average vaping rate was 8.1% in 2024 – ages 15-24 in most countries, and ages 16-24 in Luxembourg – with particularly high rates in Czechia (30%), Estonia (28%) and Luxembourg (26%). Countries are increasingly documenting higher rates of e-cigarette use than of cigarette smoking among young people. In Estonia, for example, 28% of young adults use vaping products – almost double the share of the adult population smoking tobacco in Estonia.

Figure 3.14. Regular use of vaping products, by age group, 2024 (or nearest year)



Note: The EU24 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Vaping consumption refers to the share of the population aged 15 and over who are regular vaping product users. Where 2024 data was unavailable, the closest year available was used: 2018 data for Belgium; 2019 data for Austria, Bulgaria, Croatia, Germany, Greece, Hungary, Latvia, Lithuania, Portugal, Romania, the Slovak Republic and Slovenia; 2022 data for Australia and Sweden; 2023 data for Canada, Czechia, France, Italy, the Netherlands, the United Kingdom and the United States. For Finland, the percentage of all adults using vapes is based on 2022 EHIS data, while the figure for young adults comes from the 2019. For young adults in Luxembourg, the age range is 16-24.

Source: OECD (2025), Use of vaping products (database), OECD Data Explorer, <http://data-explorer.oecd.org/s/2hd> (accessed 8, July 2025).

Before diagnosis, preventive advice on lifestyle was limited; after diagnosis, I received more detailed guidance about managing heart disease risk factors. Healthcare professionals encouraged me to quit smoking and adopt a healthier diet, but support for sustained behavioral change could be improved. I felt more supported in managing medications than in lifestyle counseling, which often depended on the provider and setting.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

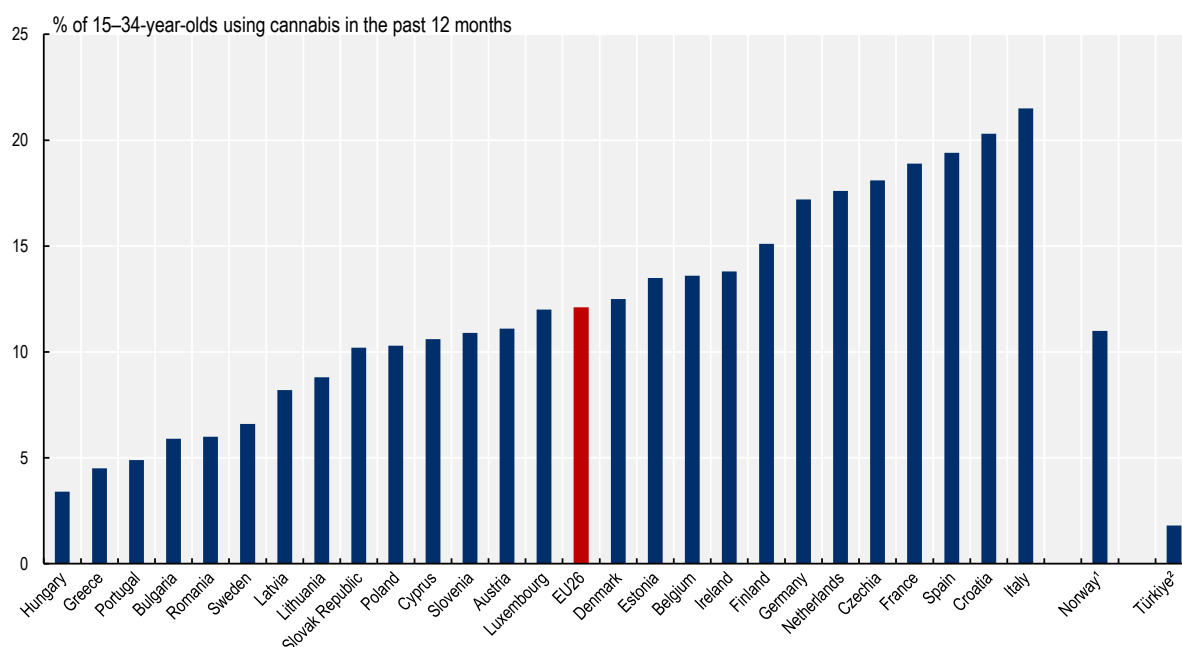
E-cigarette use has been linked to significant increases in heart rate, systolic and diastolic blood pressure, and mean arterial pressure (Izquierdo-Condoy et al., 2024^[106]). Nevertheless, an acute decrease in systolic blood pressure and resting heart rate was observed in tobacco users that switched to e-cigarettes (D’Ruiz et al., 2017^[107]), though this effect was not observed beyond one month (Veldheer et al., 2019^[108]). Evidence suggests that long-term e-cigarette use may impair endothelial function (Biondi-Zoccai et al., 2019^[109]), which is a precursor to CVD, but no available evidence exists on whether e-cigarettes increase the risk of heart attacks, strokes, or cardiovascular mortality in the long term (Banks et al., 2023^[110]). Furthermore, the switch from tobacco to e-cigarettes may have the opposite effect, with studies finding improved arterial stiffness in this population (George et al., 2019^[111]), but insufficient evidence on whether switching from smoking to e-cigarettes reduces overall CVD risk (Banks et al., 2023^[110]). The impact of e-cigarette exposure on non-users is also unclear. There is conclusive evidence that vaping increases airborne particulate matter indoors, which may pose respiratory risks, though the extent of harm remains uncertain (Banks et al., 2023^[110]). Nicotine is a toxic and highly addictive substance that poses serious health and safety risks, evidence shows that flavours in e-cigarettes contribute to their attractiveness and initiation, and nicotine in e-cigarettes can generate dependence, becoming a gateway for non-smokers who use e-cigarettes to start smoking (SCHEER, 2021^[112]) (Banks et al., 2023^[110]).

Substance use also increases CVD risk

Recreational drug use, particularly cannabis, has been increasingly linked to adverse cardiovascular outcomes – especially among younger people (Sebastian et al., 2025^[113]; Jouanjus et al., 2017^[114]; CDC, 2024^[115]). Cannabis is the most commonly used recreational drug among young adults in Europe, with approximately 12% (11.8 million) of individuals aged 15 to 34 in EU countries reporting cannabis use in the last year. The highest rates of cannabis consumption are found in Italy and Croatia, where 20% or more of people in this age group have used cannabis in the past year (Figure 3.15). It is estimated that around 1.3% of European adults – primarily males under 35 years old – are daily or almost daily cannabis users.

Cannabis can lead to arrhythmias and impact blood pressure – and recent large-scale studies have shown that individuals under 50 who use cannabis are over six times more likely to experience a heart attack compared to non-users (Kamel et al., 2025^[116]; Paulraj et al., 2025^[117]; Chandy, Jimenez-Tellez and Wu, 2025^[118]). Additionally, cannabis use has been associated with over 40% higher odds of stroke (Anderer, 2024^[119]). Recent metanalysis found that cannabis use is associated with a two-fold increase in the risk of death from CVD (Storck et al., 2025^[120]).

Figure 3.15. Cannabis use over last 12 months among people aged 15 to 34, 2024 (or nearest year)



Source: EMCCDA (2025), https://www.euda.europa.eu/media-library/prevalence-cannabis-use-europe-2023-or-most-recent-data_en.

Note: The EU26 average is unweighted 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Where 2024 data were unavailable, the closest year available was used: 2015 data for Greece; 2017 data for Türkiye; 2018 data for Belgium; 2019 data for Croatia, Ireland, Luxembourg, Romania and Hungary; 2020 data for Austria, Latvia and Bulgaria; 2021 data for Germany and Lithuania; 2022 data for Italy, Finland, Cyprus, Sweden and Portugal; 2023 data for France, Czechia, the Netherlands, Denmark, Estonia, Slovenia, the Slovak Republic and Norway; 2024 data for Spain and Poland.

3.2.2. Harmful alcohol consumption is falling across EU countries

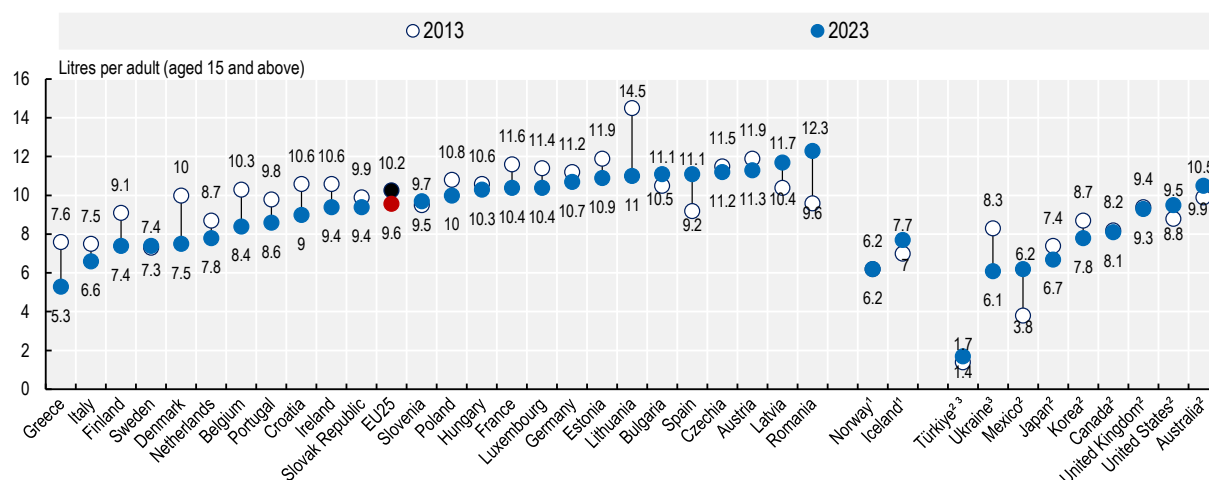
Harmful alcohol consumption is a major public health concern in the EU, contributing to premature mortality and disability, being a causal factor for various chronic diseases including CVD (WHO, 2024^[121]). Harmful use of alcohol increases the risk for hypertensive heart disease, cardiomyopathy, atrial fibrillation, flutter and strokes. Harmful alcohol consumption (100g/ week)⁵ is linearly associated with a higher risk of stroke, heart failure, fatal hypertensive disease and fatal aortic aneurysm, and has a borderline elevation in the risk of coronary heart disease, as compared to those consuming between 0-25g/ week (Wood et al., 2018^[122]).

OECD modelling estimates that between 2020 and 2050, harmful alcohol consumption exceeding one drink per day for women and 1.5 drinks per day for men will lead to over 125 000 premature deaths annually in the EU. Between 2020 and 2050, the mortality impact of harmful alcohol consumption is projected to reduce average life expectancy in the EU by one year compared to what it would have been without such consumption. The economic burden of harmful alcohol consumption is also large, with estimates for EU countries for which data are available ranging between 0.4% and 1.5% of GDP, see Annex 3.C (OECD, 2021^[123]).

Alcohol consumption levels vary considerably across EU countries, with significant differences in drinking patterns. Measured through sales data, overall alcohol consumption averaged 10.0 litres per adult aged 15 and over across EU countries in 2022 (Figure 3.16). The average alcohol consumption in the EU saw a modest decline of 0.3 litres (-3%) between 2010 and 2022. Notable changes have occurred in several countries, with nine EU countries reporting a decrease of at least 10% in their average consumption per capita, having achieved the target from the European framework for action on alcohol 2022-2025 of a

relative reduction in alcohol per capita consumption of 10% by 2025 compared to 2010 (WHO, 2022^[124]). In 2023, heavy episodic drinking – the share of people aged 15 and over who reported consuming ≥ 48 g of alcohol for women and ≥ 64 g for men (about 5+ drinks for women and 6+ for men) on one single occasion at least monthly in the past year – was reported higher in men (34%) than women (18%) in the EU (ESS, 2025^[125]).

Figure 3.16. Overall alcohol consumption among the population aged 15 and over, 2013 and 2023



Note: The EU25 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Alcohol consumption is measured in litres per person among individuals aged 15 and over. Where 2023 data were unavailable, the closest year available was used: 2024 data for Ireland, Norway, and Mexico; 2022 data for Australia, Canada, and the United States; 2020 data for Belgium, Bulgaria, Croatia, Germany, Greece, Italy, Luxembourg, Portugal, and Ukraine. In Spain the source of information on annual wine sales varied between 2010 and 2023, which affects the time-trend comparison, see country-specific sources at <https://data-explorer.oecd.org/s/32f>.

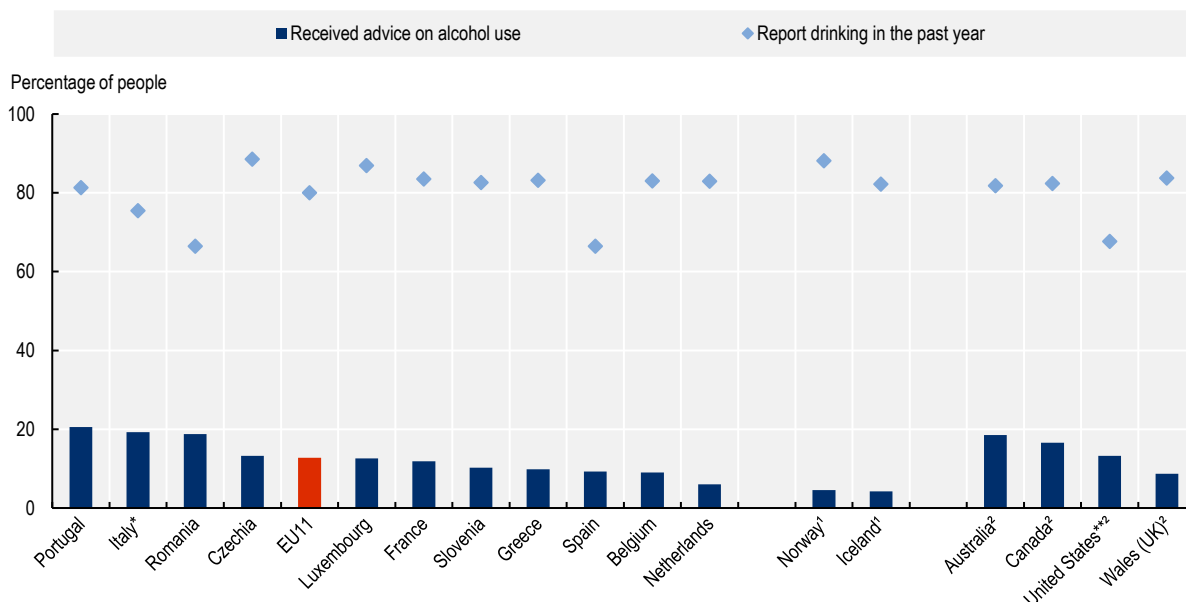
Source: OECD Health Statistics 2025.

Only 13% of healthcare users aged 45 and over report having received advice on alcohol although most report drinking alcohol

In EU countries that participated in PaRIS, most (80%) healthcare users aged 45 and over report drinking alcohol – including more than three out of four (76%) of those that report cardiovascular conditions. However, counselling on alcohol use is uncommon and falls below that of tobacco use – with only about a tenth (13%) of PaRIS respondents reporting that a healthcare professional consulted them in the past 12 months on alcohol use (Figure 3.17). This figure rises to 17% among people who report living with CVD.

Figure 3.17. Less than one-in-five people aged 45 and older received advice on alcohol use

Percentage of primary care user aged 45 and older that self-reported having received advice on alcohol use



Note: The EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Having received advice on alcohol use refers to those that have drunk in the past 12 months or no longer drink alcohol and responded “yes” to the question: “In the past 12 months has any healthcare professional talked with you about alcohol use”. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions.

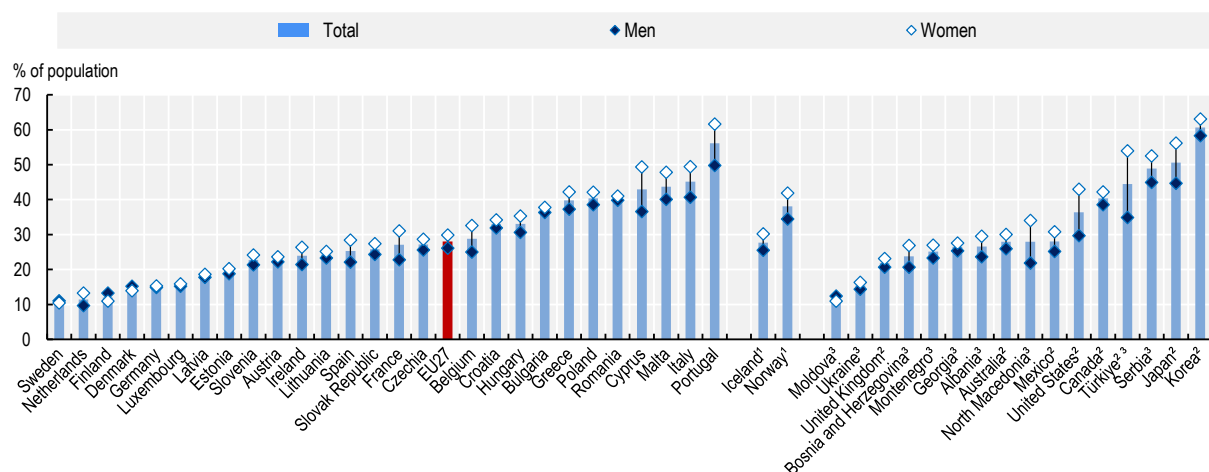
Source: OECD PaRIS 2024 Database.

3.2.3. Physical activity remains below recommended levels in most of Europe

Although the benefits of maintaining an active lifestyle are well-documented, many adults and children across Europe still do not engage in enough physical activity. Physical activity can significantly reduce systolic blood pressure, one of the predominant risk factors for CVD, by a minimum of 3 mmHg depending on the frequency and duration of the physical activity (Masmoum et al., 2024^[126]). Higher sedentary rates (median of 10h/day or more) are associated with higher mortality (Ekelund et al., 2020^[127]). In 2022, over one-in-four adults (28.0%) across EU countries were not sufficiently active, not meeting the WHO’s recommended activity levels of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week for adults (Figure 3.18) (OECD/WHO, 2023^[128]). Rates of inactivity were especially high in several Southern European countries, while Nordic countries reported comparatively lower levels. Strategies to promote physical activity are most effective when they start early in life, at school and at home, and are adapted to the context and needs of the individual.

Figure 3.18. More than one-in-four adults in the 27 EU Member States are insufficiently active, 2022

Prevalence of insufficient physical activity among adults aged 18+ years (crude estimate) (%)



Note: The EU27 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Insufficient physical activity is defined as not meeting the WHO's recommended activity levels for adults: 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week.

Source: WHO Global Health Observatory 2024, [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-\(crude-estimate\)-\(-\);](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-insufficient-physical-activity-among-adults-aged-18-years-(crude-estimate)-(-);) OECD/WHO (2023^[128]), *Step Up! Tackling the Burden of Insufficient Physical Activity in Europe*, <https://doi.org/10.1787/500a9601-en>.

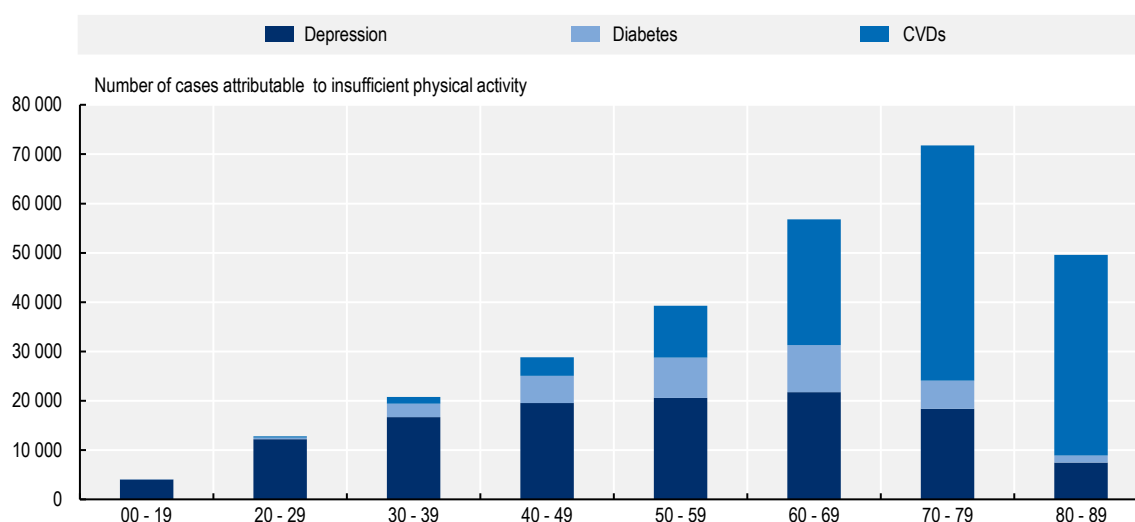
The physical limitations associated with these illnesses prevent me from engaging in regular physical activity due to the constant fear of stroke or cardiac events. I also experience chronic leg swelling and fatigue, making it impossible to sit for extended periods or work full-time in a traditional office setting... These constraints have significantly reduced my professional capacity and limited my social participation, often leading to isolation. The cumulative effect of these challenges has contributed to clinical anxiety and depression, further impacting my quality of life. Managing such a complex health profile requires ongoing medical care and personal adaptation, and has deeply affected my mental, emotional, and social wellbeing as I am always thinking about my health and worrying that I am not doing enough to help myself.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Lack of physical activity contributes to almost 130 000 new cases of CVD in Europe annually (Figure 3.19). For people between 60 and 79 years old, CVD accounts for 40% of all diseases due to insufficient physical activity, and nearly three-quarters of the burden for people over 80 years old (OECD/WHO, 2023^[128]). Analysis from the OECD finds that if everyone were to meet the WHO recommended activity levels for adults – 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week – more than 10 000 premature deaths per year (among people aged 30 to 70) could be prevented; and EU member states could save, on average, 0.6% of their healthcare budget (OECD/WHO, 2023^[128]).

Figure 3.19. Lack of physical activity leads to CVD directly, but also to CVD risk factors – including diabetes and depression

Number of new disease cases per year by age group due to insufficient physical activity (defined as less than the WHO recommended activity levels for adults: 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week), averaged over 2022-2050 and covering all the 27 EU Member States



Source: OECD/WHO (2023^[128]), *Step Up! Tackling the Burden of Insufficient Physical Activity in Europe*, <https://doi.org/10.1787/500a9601-en>.

Less than half of healthcare users aged 45 and over report having talked with a healthcare professional about physical activity

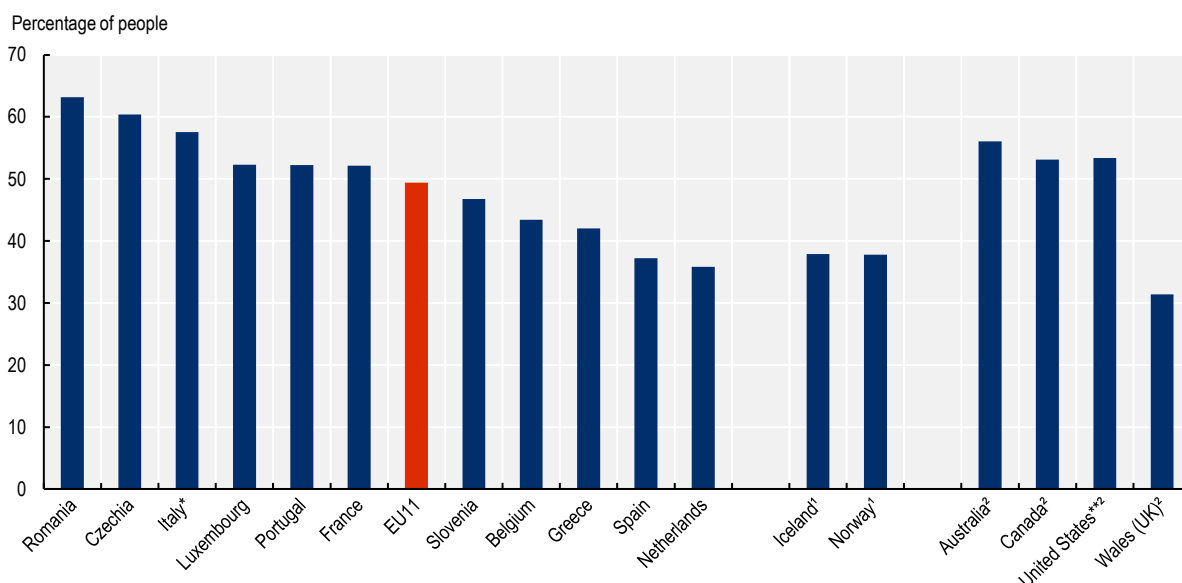
Among OECD PaRIS survey respondents, less than half (45%) of healthcare users aged 45 and over reported engaging in moderate-vigorous exercise for at least 30 minutes three or more times a week (≥ 90 min a week), and only one-quarter (25%) reported doing physical activity for at least 30 minutes five or more times a week (≥ 150 min a week) (Annex Figure 3.D.2). Physical activity counselling in primary care has been found to be a cost-effective intervention to reduce the impact of CVD – and can demonstrate effects in as little as four weeks (Galea et al., 2025^[129]). Less than half (49%) of healthcare users aged 45 and over report that a healthcare professional talked to them about their physical activity according to data from the OECD PaRIS survey (Figure 3.20). The rate is slightly higher (58%) among people reporting CVD (see Chapter 4).

I notice that when I do exercise and follow a good diet my symptoms get better. On the other side, when I spend too much time sitting down and eat too much, they get worse. When I was first diagnosed, I was told to avoid high impact sports, but I wasn't guided very well in what I was and what I was not allowed to do.

Francesca, 34, female living with hypertrophic cardiomyopathy and an implantable cardioverter-defibrillator.

Figure 3.20. Only about half of people aged 45 and older received advice on physical activity

Percentage of primary care user aged 45 and older that self-reported having received advice on physical activity



Note: The EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Having received advice on physical activity refers to those that responded “yes” to the question: “In the past 12 months, has any healthcare professional talked with you about your physical activity?”. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.
Source: OECD PaRIS 2024 Database.

3.2.4. Dietary risk factors are prevalent among adults and adolescents in EU countries

Healthy dietary habits – including high intakes of vegetables, fruits, legumes, wholegrains and lean protein sources (i.e. fish and poultry) and low intakes of sugar, saturated fats and salt – promote cardiovascular health by reducing key metabolic risk factors such as diabetes, hypertension, dyslipidaemia and obesity (Diab et al., 2023^[130]). A Mediterranean diet – characterised by high intakes of vegetables, fruits, wholegrains, pulses, nuts, extra-virgin olive oil and fish and low intakes of (red) meats, sweets and saturated fats – has cardioprotective benefits and is recommended by the ESC guidelines on CVD prevention and clinical practice (ESC, 2021^[131]). Diets high in sodium and low in wholegrains, fruits, nuts and seeds, vegetables and omega-3 fatty acids are the leading diet-related causes of CVD deaths (Afshin et al, 2019^[132]).

Only about 60% of adults in the EU consume fresh vegetables and fruits daily

Fruit and vegetables are important components of a healthy diet, supplying important vitamins, minerals, and antioxidants. Consuming them regularly has been linked to a lower risk of chronic illnesses, including cardiovascular and metabolic diseases. A DASH (Dietary Approaches to Stop Hypertension) diet and a fruit and vegetable diet can reduce the 10-year CVD risk by about 10% in over 8 weeks (Jeong et al., 2023^[133]). Additionally, their low-calorie density, high water content, and fibre contribute to weight management by enhancing satiety and regulating overall calorie intake – reducing obesity. However, people in the EU struggle to access quality meals, including fruit and vegetables, due to financial limitations. The number of people in the EU who cannot afford a proper meal every other day has risen from 33 million in 2018 to nearly 43 million in 2023, meaning that almost one-in-ten individuals in the EU are unable to access nutritious meals regularly (Eurostat, 2024^[134]).

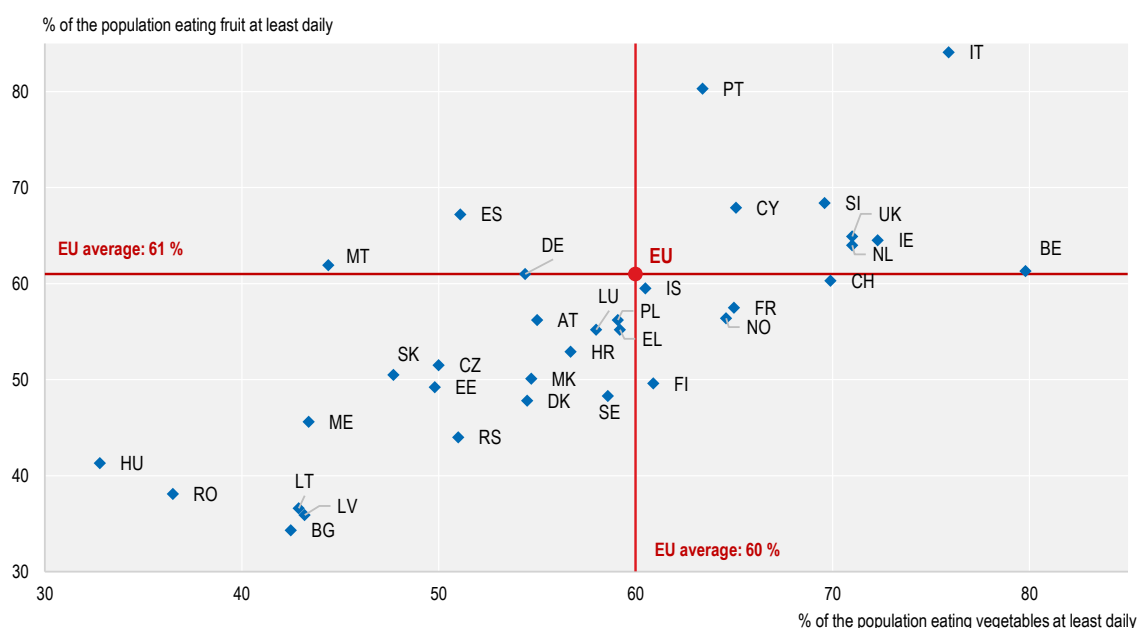
Box 3.3. Policy to promote healthy and sustainable eating in educational settings: An example from Spain

Spain's Royal Decree 315/2025, issued on 15 April, sets out the regulatory framework for implementing Law 17/2011 on Food Safety and Nutrition, with a specific focus on promoting healthy and sustainable eating in schools. It applies to all types of educational institutions – both public and private – covering early childhood, primary, secondary, and vocational education. The decree establishes minimum nutritional standards for school meals, emphasising the inclusion of fresh, seasonal, and locally sourced foods while limiting processed items high in sugar, salt, and saturated fats. The decree explicitly prohibits the sale of foods with high salt content in school environments (i.e. more than 0.5 grammes of salt (0.2 grammes of sodium) per packaged portion) and provides standards for the reduction of the use of iodised salt in school cafeterias. More broadly, it integrates sustainability principles, such as reducing food and packaging waste and encouraging short supply chains, in line with Spain's climate and circular economy goals.

Source: (Ministerio de la Presidencia, Justicia y Relaciones con las Cortes, 2025^[135]).

On average, across the EU in 2022, 60% of the population consumed fresh vegetables and 61% consumed fresh fruit at least daily. Belgium and Italy led in fresh vegetable consumption, with over three-quarters of their adult populations consuming vegetables daily. Italy and Portugal lead in fruit consumption, with over 80% of adults consuming them daily. In contrast, daily fresh vegetable consumption is below 40% in Hungary and Romania, and daily fresh fruit consumption is lowest in Bulgaria, Latvia, Lithuania and Romania (Figure 3.21).

Figure 3.21. Share of population reporting daily consumption of fruit and vegetables, 2022



Note: The EU average is weighted. Data for Germany, Iceland, the United Kingdom and North Macedonia pertain to 2017. Low data reliability for the United Kingdom.

Source: Eurostat (2024), Persons eating fruit, vegetables or salad by educational attainment level, risk of poverty threshold, most frequent activity status and sex (ilc_hch11), https://ec.europa.eu/eurostat/web/products-datasets/-/ilc_hch11 (accessed 8, July 2025).

Between 2017 and 2022, the percentage of adults in the EU who consumed fruit and vegetables at least daily dropped by 4% and 6% respectively. This decrease in 2022 may be partly linked to rising prices. During the early and final months of the year, vegetable prices in the EU surged beyond the overall increase in the food price index, potentially prompting consumers to reduce their purchases or opt for more affordable alternatives (Eurostat, 2024^[136]). Socio-economic status has a significant impact on people's eating habits. In 2022, 67% of adults with higher education levels in the EU reported regular consumption of fruits or vegetables daily, compared to 60% among those with lower education levels. OECD analysis has also shown that countries with lower overall consumption of fruit and vegetables also typically see larger differences in healthy diets across socio-economic groups (OECD/European Commission, 2024^[137]).

Most EU countries report having a salt intake above the WHO recommended level

Excess salt consumption raises the risk of hypertension, which, in turn, increases the likelihood of heart attacks, strokes and heart failure. Reducing salt intake helps lower blood pressure, improving overall cardiovascular health. A study of average salt intake found that 96% of EU countries reported salt intake above WHO recommended maximum levels, and that the average salt intake in EU countries was approximately 9.2 g per day – almost double the value of salt consumption that the WHO recommends not to reach or exceed⁶ (Kwong et al., 2022^[138]; WHO, 2025^[139]). Population average daily salt intake in Czechia and Romania exceed 12 g per day, almost two and a half times the daily recommended maximum (Figure 3.22).

Studies suggests that a 25% reduction in salt intake through public health policies could prevent up to 900 000 deaths from CVD in the WHO European Region⁷ (WHO, 2025^[140]). To achieve this, countries need better data on dietary habits and the nutritional content of processed foods, which account for over 70% of salt intake (*ibid.*). Effective strategies include international collaboration to share best practices for overcoming barriers such as limited will to implement regulatory salt reduction measures and using public food procurement to promote healthy food consumption.

Box 3.4. Best practices for advancing cardiovascular health: Activa Tu Salud

Description: Programa Activa Tu Salud (formerly “Activa Murcia”) is a community-based initiative in a Spanish region aimed at promoting physical activity among sedentary individuals with chronic conditions. The programme targets patients with cardiovascular risk factors such as high cholesterol and overweight/obesity, type 2 diabetes and pre-diabetes, and mental health conditions. Launched as part of the 2010-2015 Health Plan, the programme includes the prescription of physical exercise by a primary care professional, with a duration of 6 months, in one of the community sport centres. It involves sports science experts and is conducted in co-ordination with the Departments of Sports and Health of the municipalities. Its primary goal is to foster healthy lifestyles and improve the physical and psychological well-being of participants through structured exercise regimens. The regional government subsidises the programme, notably recently offering activities within the framework of the Youth Plan “Opportunities” 2024-2027.

Best practice assessment:

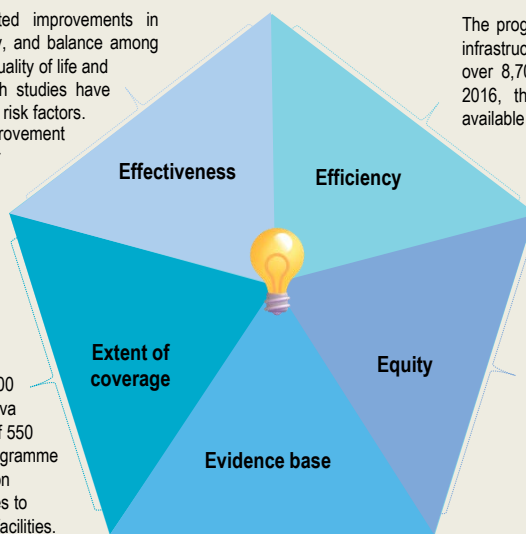
The programme has demonstrated improvements in aerobic capacity strength, flexibility, and balance among participants, as well as enhanced quality of life and psychological well-being. Research studies have shown reductions in cardiovascular risk factors. Older women have shown less improvement in quality of life than people of other age groups. (Ros-Sanchez et al., 2020^[117]).

The programme uses existing health and municipal infrastructure, optimizing cost-effectiveness. With over 8,700 prescriptions and 5,300 participants by 2016, the programme achieved its goals within available resources.

Since its launch in 2010, nearly 8,000 patients have gone through the Activa programme, with the participation of 550 primary care professionals. The programme covers 73% (33) of the Murcia region municipalities. Its research continues to expand with new partnerships and facilities.

The programme targets vulnerable populations with chronic conditions, promoting inclusive health interventions. Furthermore, it is subsidized by the regional government to guarantee equal access to young people with disabilities.

The programme is based in WHO recommendations and supported by research showing reductions in cardiovascular risk factors. It includes ongoing evaluation of physical and mental health outcomes.



Enhancement options: To further enhance Activa Tu Salud expanding digital tools for virtual support could increase accessibility, especially for rural populations. Additionally, developing mechanisms to ensure and monitor whether participants continue performing physical exercise after the 6-month period of the programme could enhance the programme’s impact.

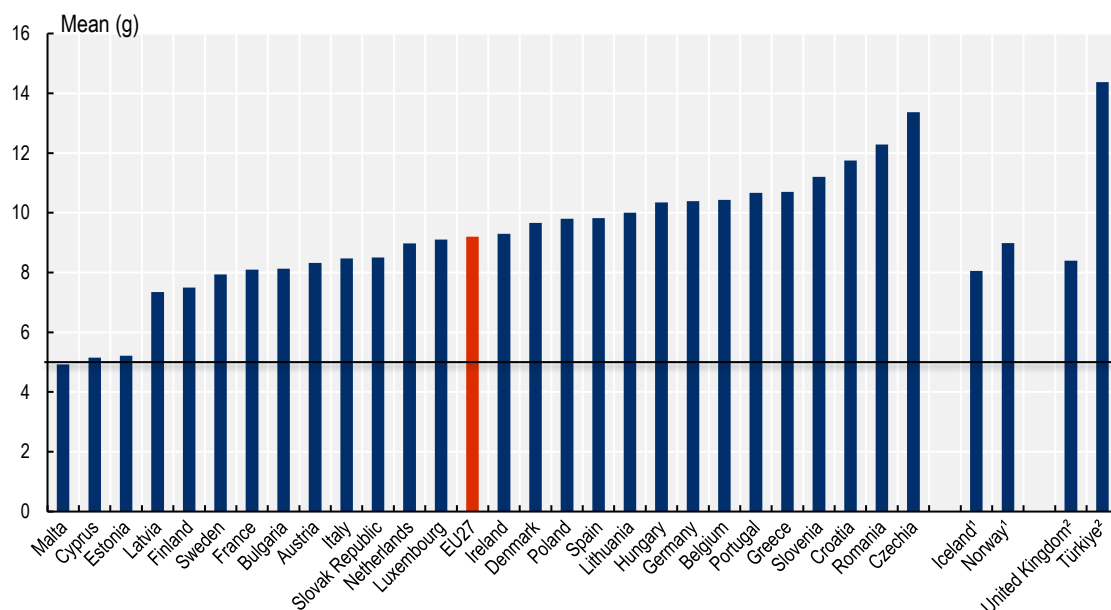
Transferability: The programme’s structured methodology, multi-sectoral collaboration, and use of existing infrastructure make it highly transferable to other regions. Its reliance on primary care and community resources allows for adaptation in diverse healthcare systems, provided there is institutional support and trained personnel.

Conclusion: Programa Activa Tu Salud exemplifies a successful, evidence-based approach to CVD prevention through community engagement, offering structured physical activity to high-risk populations. Its demonstrated outcomes and sustainable model offer valuable insights for replication in other settings. Continued investment and innovation will ensure its long-term success and broader impact.

Source: (Programa Activa^[141]; European Commission^[142]; Region de Murcia, 2025^[143]).

Figure 3.22. Daily salt intake is almost double the WHO recommendation on average in EU countries

Mean population salt intake, grammes per day, among people aged 12 years or more, most-recent salt intake data for adults between 2000-2022



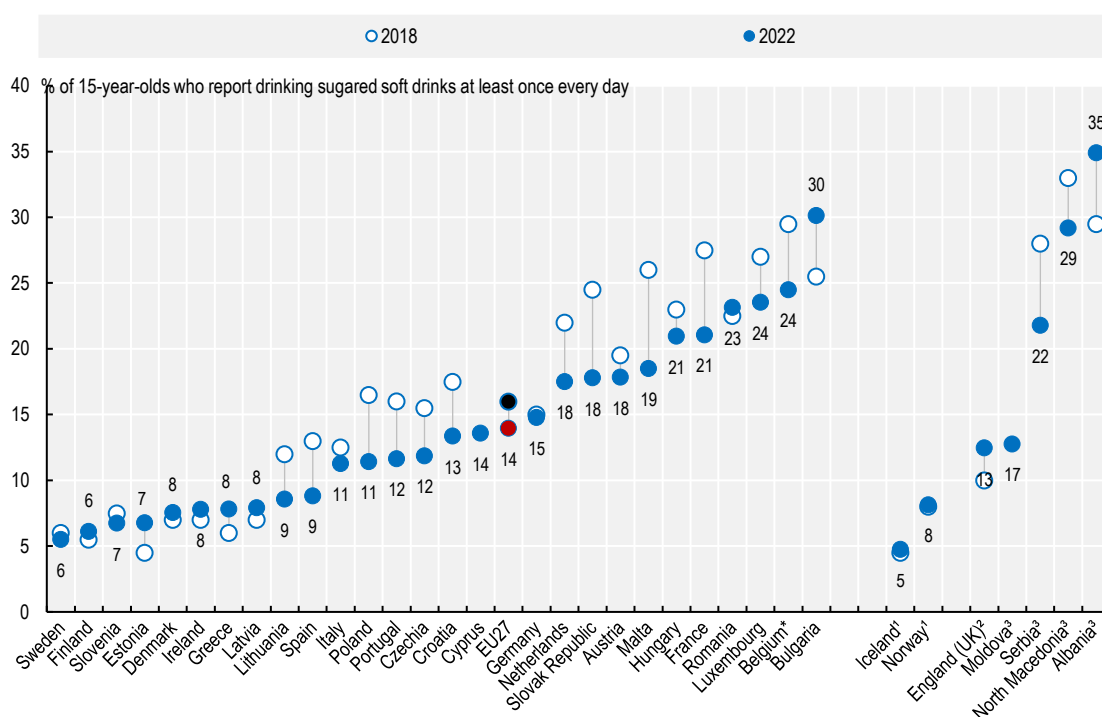
Note: The EU27 average is unweighted. The reference line at 5 g represents the WHO-recommended maximum daily salt intake (equivalent to 2 000 mg of sodium). 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries.

Source: Kwong et al. (2022^[138]), "Population-level salt intake in the WHO European Region in 2022: a systematic review", <https://doi.org/10.1017/s136898002200218x>.

About 14% of 15-year-olds drink sugared soft drinks daily

Excess sugar consumption can impact vascular function, contributing to unhealthy blood lipid levels and hypertension – and is also a concern as major risk factor for intermediate clinical risk factors for CVD such as diabetes, obesity, and other metabolic disorders. On average across EU countries, 14% of 15-year-olds reported drinking sugared soft drinks daily in 2022 (Figure 3.23). The daily consumption of sugared soft drinks among 15-year-olds declined by about 2 p.p. on average across EU countries between 2018 and 2022. The most notable reductions of above 5 p.p. were observed in Malta, the Slovak Republic, France and Poland. In contrast, Estonia and Bulgaria experienced some increases, with other countries maintaining relatively stable rates. Children's dietary behaviours are increasingly shaped by a food environment saturated with ultra-processed products, where digital marketing strategies target young audiences with persuasive, often unhealthy food messaging. Addressing the commercial factors that influence health is essential to counteract these influences and promote equitable access to nutritious, culturally appropriate food (see Chapter 6 for more on policy actions being taken in this area, including fiscal policies).

Figure 3.23. Share of people aged 15 who consume sugared soft drinks each day, 2018-2022



Note: The EU27 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. *Data for Belgium (2018) refer to the average of the Dutch-speaking and French-speaking communities; data for Belgium (2022) refer to the Dutch-speaking community only.

Source: HBSC Data Browser, <https://data-browser.hbsc.org/>.

Fat consumption has decreased in four EU countries, but further efforts are needed in other countries

Trans-fats (i.e. trans-fatty acids) and saturated fats (i.e. saturated fatty acids) contribute to the build-up of plaque in arteries by increasing LDL-C, increasing risk of dyslipidaemia and therefore increasing the risk for CVD (see Section 3.1.3). Evidence shows that reducing both trans- and saturated fat intake lowers LDL-C, which reduces the risk of all-cause mortality and CVD mortality (Reynolds et al., 2022^[144]; WHO, 2023^[145]). It is recommended to replace saturated fats with unsaturated fats to lower the risk of ischaemic heart disease and stroke (ESC, 2021^[131]). Consumption of saturated fats is recommended to remain below 10% of total daily energy intake; and 5-6% of total energy intake for patients with hypercholesterolemia (Maki, Dicklin and Kirkpatrick, 2021^[146]). Similarly, consuming 1% or less of the total energy intake as trans-fats reduces LDL-C and the risk of CVD (Reynolds et al., 2022^[144]; WHO, 2023^[145]).

Although most food products in the EU have less than 2 grammes of trans fat per 100 grammes of fat, there are products with high levels of trans fats (i.e. 40-50g/100g of fats), such as biscuits, cakes and wafers. Products with high industrial fat were mainly found in Sweden, Croatia, Poland, Bulgaria and Slovenia (EU, 2019^[147]). Data from 2021 show that saturated fat intake across EU (Belgium, Denmark, Ireland, Greece, France, Italy, Hungary, the Netherlands, Austria, Finland, Portugal, Sweden) and Norway, surpassed 10% of the total daily energy intake, with an average consumption in adults ranging from 11% of the total energy intake in Italy to more than 14% in France and Austria (EU, 2021^[148]). Trans-fatty acid intake, however, was below 1% for Belgium, Denmark, the Netherlands and Finland (EU, 2021^[149]). The goals achieved in trans-fatty acid consumption can be associated with the EC's 2019 regulation limiting

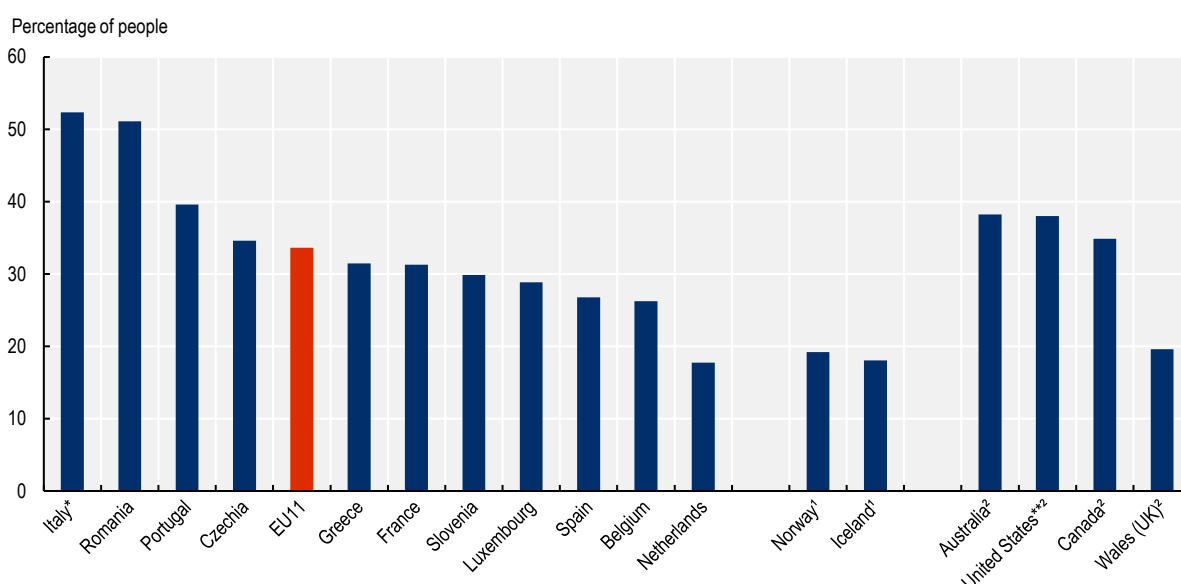
the content of trans fat, other than from animal origin, in food intended for the final consumer and to supply to retail to not exceed 2g/100g of fat (EU, 2019^[150]).

Only a third of healthcare users aged 45 and over reported receiving advice on healthy eating

A healthy diet can contribute to lowering the risk of CVD, as well as reducing the burden of clinical risk factors, such as metabolic disorders (see Section 3.2.4). The ESC Prevention Guidelines recommend a healthy diet to reduce the risk of CVD, including the daily consumption of fruits and vegetables, with 2-3 servings of each group per day (200g or more per day) (ESC, 2021^[131]). Only about one-in-five (20%) of PaRIS respondents report consuming vegetables more than once a day, and about one-in-three (29%) report fruit consumption more than once a day (see Annex 3.D). Despite generally low levels of patients reporting having a healthy diet, only (34%) of healthcare users aged 45 and over report that a healthcare professional talked to them about healthy eating – increasing to 41% among people reporting CVD (Figure 3.24).

Figure 3.24. Only a third of people in the EU aged 45 and older received advice on healthy eating

Percentage of primary care user aged 45 and older that self-reported having received advice on healthy eating



Note: The EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Having received advice on healthy eating refers to those that responded “yes” to the question: “In the past 12 months, has any healthcare professional talked with you about healthy eating?”. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS 2024 Database.

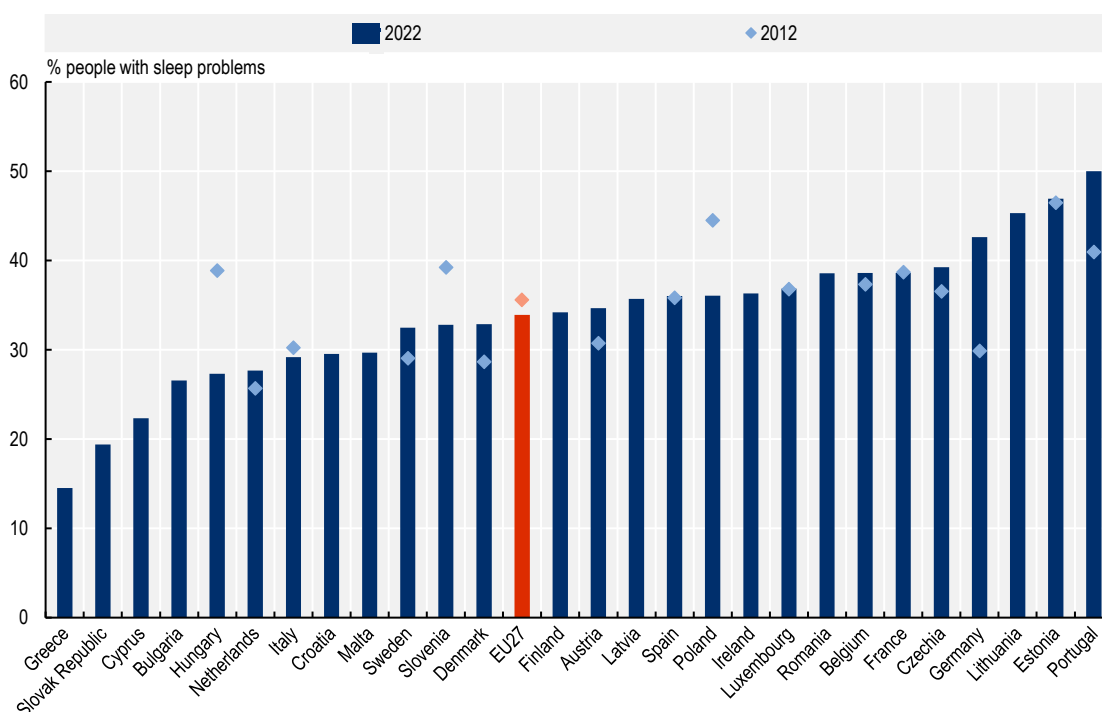
3.2.5. Sleep problems are widespread in Europe, posing a significant risk for developing CVD

Sleep is increasingly recognised as a key component of cardiovascular health (Ramar et al., 2021^[151]; Jaspan et al., 2024^[152]). In 2022, the American Heart Association added sleep to its core metrics for promoting cardiovascular health (American Heart Association, 2022^[153]). Poor sleep quality and sleep duration (both too short and too long), have been linked to higher stroke incidence (Ungvari et al., 2025^[154]).

and increased all-cause mortality (Quan, 2009^[155]; Cappuccio et al., 2010^[156]). Poor sleep quality and duration contribute to high blood pressure, inflammation, and metabolic imbalances that strain the heart and blood vessels – key pathways leading to increased CVD risk (Lao et al., 2018^[157]). Poor sleep quality and duration also worsens major clinical risk factors such as obesity, diabetes, hypertension, and mental health (Kuehn, 2019^[158]; Poon et al., 2024^[159]).

Sleep problems are widespread in Europe. In 2022, 34% of adults aged 45 and over reported sleep problems in Europe, with rates particularly high in Portugal, Estonia, Lithuania and Germany (Figure 3.25). Women are disproportionately affected: 39% of women reported sleep problems compared to 26% of men (see Annex 3.E). While sleep problems among older adults declined on average across the EU between 2012 and 2022, they remain high in Europe. In many countries, sleep problems have increased among older adults, including the Netherlands, Sweden, Denmark, Austria, Spain, Luxembourg, Belgium, Czechia, Germany, Estonia and Portugal. Contributing factors include growing use of technology, declining mental health, precarious work (those in certain roles as well as those engage in shift work) (Matricciani et al., 2017^[160]) and more recently rising temperatures due to climate change – particularly affecting older adults, people with obesity, and those living in high-humidity environments (Li et al., 2025^[161]).

Figure 3.25. One-in-three Europeans report sleep problems, with rates rising in several countries, 2012 and 2022 (or nearest years)



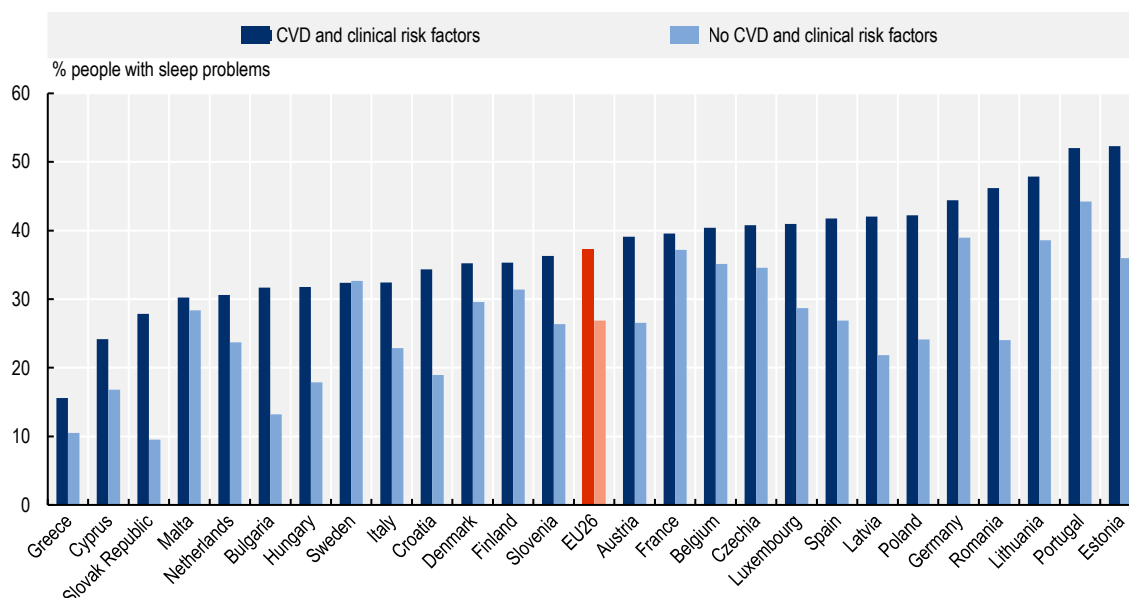
Note: Respondents aged 45 and older. Respondents were asked “Have you had trouble sleeping recently?”. Responses included “Trouble with sleep or recent change in pattern” and “No trouble sleeping”. 2011 data (instead of 2012 data) was used for Austria, Belgium, Czechia, Denmark, Estonia, France, Hungary, Italy, the Netherlands, Portugal, Slovenia, Spain and Sweden; and 2013 data (instead of 2012 data) was used for Luxembourg.

Source: SHARE-ERIC (2024); Healthy Ireland Survey 2024.

People aged 45 and over with CVD and related clinical risk factors consistently report more sleep problems across all EU countries than those without (Figure 3.26). In 2022, 37% of those with CVD reported sleep problems, compared to 27% without CVD. Poor sleep can elevate nocturnal catecholamine levels and

contribute to CVD (Nagai, Hoshida and Kario, 2010^[162]). Studies have also shown that low physical activity further exacerbate the negative association between inadequate sleep duration and all-cause and CVD mortality risk (Huang et al., 2021^[163]). Conversely, CVD can worsen sleep quality and duration. Heart failure may cause fluid buildup in the lungs, leading to breathing issues and reduced restorative sleep (Jaspan et al., 2024^[152]). In addition, the psychological burden of living with CVD and fear of future cardiac events, can also impair sleep quality and contribute to chronic insomnia (Jaspan et al., 2024^[152]).

Figure 3.26. People with CVD and related clinical risk factors report more sleep problems than those without in all EU countries (2022)



Note: Respondents aged 45 and older. Respondents were asked “Have you had trouble sleeping recently?”. Responses included “Trouble with sleep or recent change in pattern” and “No trouble sleeping”. CVD includes heart attack, stroke and cerebral vascular disease. Clinical risk factors include high blood pressure, hypertension, high blood cholesterol, diabetes and high blood sugar. Ireland is excluded due to data availability.

Source: SHARE-ERIC (2024).

3.3. Environmental and occupational risk factors

3.3.1. Work-stressors pose significant risks to cardiovascular health

While workplaces can offer important sources of social connection that help protect cardiovascular health, work-related stressors – including job strain, long working hours and job insecurity – pose significant risk factors to CVD. One meta-analysis found that individuals exposed to work stress have a 10-40% higher risk of CVD compared to those without work stress (Kivimäki and Kawachi, 2015^[164]). This is supported by further studies which have also found that work stress increases the risk of coronary heart diseases, strokes and cardiovascular mortality (Eller et al., 2009^[165]; Kivimäki et al., 2006^[166]; Dong et al., 2025^[167]; Slopen et al., 2012^[168]; Vahtera et al., 2004^[169]). Plausible mechanisms include that work stress is associated with the thickening of arterial walls, increases in blood pressure, disturbances in metabolic processes, and unhealthy behaviours such as physical inactivity and smoking, all of which contribute to cardiovascular risk (Kivimäki and Kawachi, 2015^[164]).

Fatigue and physical limitations [after returning to work after health setbacks] required workplace adaptations and flexible schedules, which were sometimes difficult to obtain. Supportive employers and understanding colleagues made a significant positive difference. Emotional stress related to balancing health and job demands is ongoing.

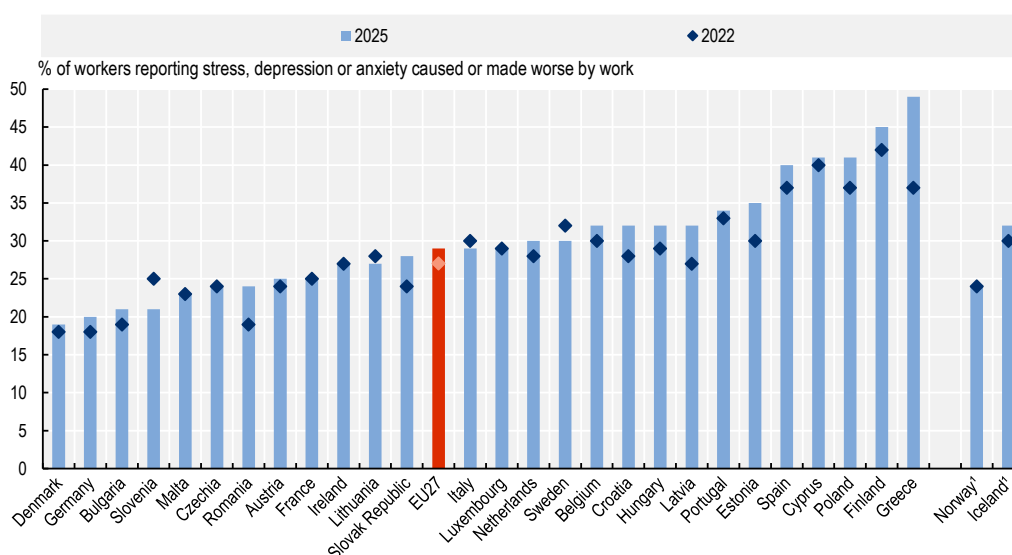
Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

The share of workers reporting work-related stress, depression or anxiety is high. According to OSH Pulse 2025 survey data, 29% of workers in the EU experienced stress, depression or anxiety caused or made worse by work in the last 12 months (Figure 3.27). Country differences are pronounced, ranging from 19% of workers in Denmark to over 40% in Spain, Cyprus, Poland, Finland and Greece. While these large variations may reflect differences in working conditions and economic structures, they may also indicate cultural differences in how people perceive their health and their willingness to report it (Eurostat, 2021a^[170]).

Returning to work after my cardiac events was both a necessity and a challenge. As a co-owner of multiple businesses, I had to balance my health with professional responsibilities. Support from my colleagues and a flexible work environment played a crucial role in my recovery. However, not all patients have access to such support, highlighting the need for workplace policies that accommodate individuals recovering from cardiovascular events.

Caius, artist, researcher, patient advocate, and heart attack survivor.

Figure 3.27. Almost one-in-three Europeans report work-related stress, depression or anxiety (2025)



1. Non-EU European Economic Area countries.

Source: OSH Pulse 2025; OSH Pulse 2023.

Work-related stress, depression or anxiety has increased in most EU countries, rising from 27% in 2022 to 29% in 2025. Exceptions include Slovenia, Lithuania, Italy and Sweden, where rates decreased over this period. These trends should be interpreted with caution, as the 2022 data were collected in April-May 2022, when the effects of the COVID-19 pandemic on working life were still significant.

According to Eurostat data, women reported higher levels of work-related stress, depression or anxiety than men (EU27 average is 1.5% among men and 2.2% among women in 2020) (Eurostat, 2023^[171]). One possible explanation is the double burden of paid and unpaid work, whereby women have increased their participation in paid employment but continue to carry a disproportionate share of family and caring responsibilities, which may contribute to higher levels of work-related stress (Mensah, 2021^[172]).

Fortunately, the Spanish healthcare and social security system allows me to receive my full salary while on medical leave, which has been essential—without it, I would not be able to support myself. However, the process to obtain official disability status is very slow and complex, even for patients with multiple chronic conditions. What makes it harder is that I don't "look" sick. People often say, "You don't look ill," which, although well-intentioned, makes me feel even worse. It invalidates my experience and adds to the emotional burden of living with invisible illnesses—conditions that are serious, but not always visible from the outside.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

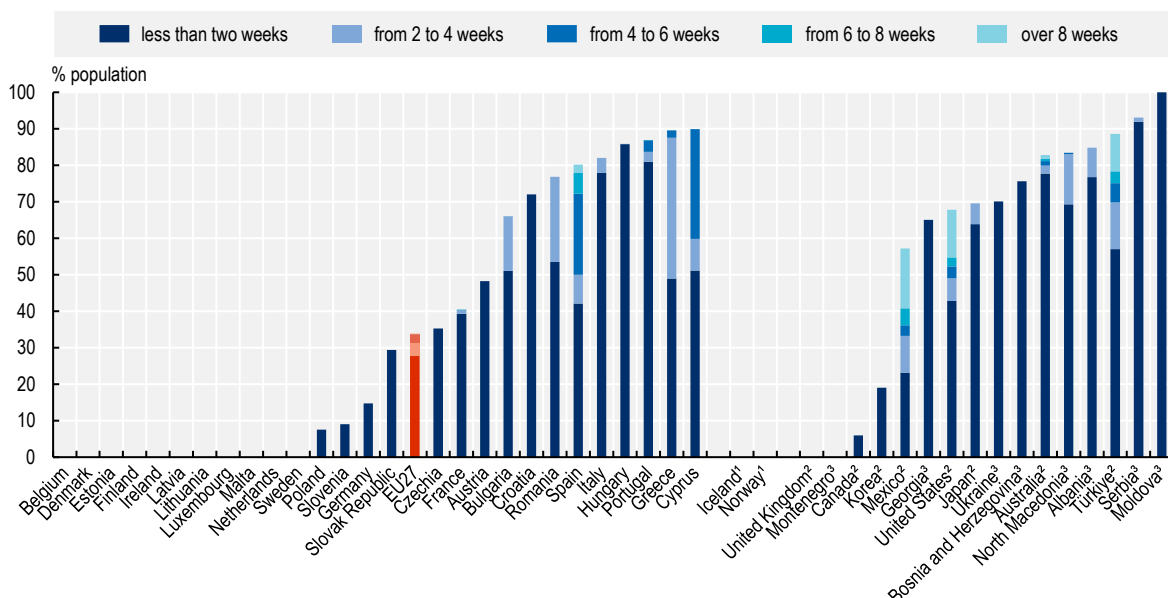
Given the well-documented impact of work-related stress on cardiovascular health and the widespread country variation in work stress across Europe, mitigating work stressors and promoting health at the workplace is crucial for the primary prevention of CVD. Workplace-based programmes – including de-stigmatising mental health issues, integrated health and employment services, return-to work programmes for employees recovering from health illness, tailored support or dialogue initiatives for employees experiencing frequent health issues, health insurance coverage and disability pensions, as well as the promotion of healthy lifestyle behaviours such as physical exercise during working hours – can support employee health. Government policies – such as occupational safety and health regulations, working hour and break regulations, preventative care services such as employee health checks, and smoking regulation – also play a key role in promoting well-being at the workplace and cardiovascular health (OECD, 2022^[173]).

3.3.2. There have been improvements on some environmental risk factors, but climate change poses an ongoing risk to cardiovascular health, particularly for lower socio-economic groups

Despite notable declines in air pollution over the last decade, it continues to be the leading environmental health risk in Europe (European Environment Agency, 2024^[174]). In 2022, 96% of the EU's urban population was exposed to levels of fine particulate matter (PM_{2.5}) above the latest WHO guideline levels (European Environment Agency, 2024^[174]). Both short and long-term exposure to PM_{2.5} are linked to increased cardiovascular risk, including myocardial infarction, stroke, heart failure, hypertension and cardiovascular mortality (Rajagopalan, Al-Kindi and Brook, 2018^[175]; Franchini and Mannucci, 2012^[176]; Sun, Hong and Wold, 2010^[177]; Krismanuel, 2025^[178]). Lower socio-economic groups are disproportionately exposed to higher pollution levels, further concentrating cardiovascular risks in lower socio-economic groups (Krismanuel, 2025^[178]). Mechanisms through which air pollution increases cardiovascular risk include oxidative stress, inflammation, endothelial dysfunction and autonomic nervous system imbalance, which increase the likelihood of cardiac events (European Environment Agency, 2023^[179]; Krismanuel, 2025^[178]). Evidence from the COVID-19 pandemic further suggests that PM_{2.5} functions as a carrier, or transport vector, for many viruses, facilitating their inhalation into the respiratory tract (Comunian et al., 2020^[180]). Higher particulate concentration may therefore drive greater infection risk and worsen respiratory and cardiovascular complications in exposed populations.

Climate change is increasing the frequency, intensity and duration of extreme temperature events, particularly heatwaves which contribute to the growing burden of CVD (Du et al., 2022^[181]). In 2023, one-in-three Europeans (34%) experienced at least one hot day (>35°C) (Figure 3.28) and two in three Europeans (67%) experienced at least one icy day (<0°C) (Annex Figure 3.G.1). While climate change is driving the rise in extreme heat, both extreme hot and cold temperatures are associated with higher cardiovascular mortality (Alahmad et al., 2023^[182]; De Vita et al., 2024^[183]; Weirhammer et al., 2021^[184]; Kazi et al., 2024^[185]). For example, Alahmad et al. (2023) found that hot days (above 97.5th percentile) and cold days (below 2.5th percentile) accounted for 2.2 (95% empirical CI [eCI], 2.1-2.3) and 9.1 (95% eCI, 8.9-9.2) excess deaths for every 1 000 cardiovascular deaths, respectively. Heat exposure can lead to vasodilation, increasing heart rate and cardiac output, thereby increasing the risk of heart attack and stroke (De Vita et al., 2024^[183]). In contrast, cold exposure can trigger vasoconstriction and activate the renin-angiotensin system, raising blood pressure and myocardial oxygen demand, thereby also increasing the risk of heart attacks and stroke (De Vita et al., 2024^[183]). The impact of extreme temperatures on cardiovascular health is particularly pronounced among lower socio-economic groups, who are more likely to live in poor-quality housing, have limited access to cooling or heating (such as fans, air conditioning and radiators), and live in neighbourhoods with urban heat islands and fewer cool public spaces (Gronlund, 2014^[186]).

Figure 3.28. Nearly one-in-three people in the EU were exposed to at least one hot day (>35°C) in 2023



Note: This indicator presents the annual percentage of population exposed to n number of hot days (above 35°C). This temperature threshold for hot days (above 35 °C) follows the IPCC AR6 definition of “hot summer days” and corresponds to levels linked with severe health impacts (Maes et al., 2022^[187]). Countries with zero values experienced no days exceeding 35 °C in 2023. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries.

Source: OECD (2025), Exposure to extreme temperature (database), OECD Data Explorer, <http://data-explorer.oecd.org/s/2f7> (accessed 8, July 2025).

Noise pollution – including road, rail and air traffic, construction public work, neighbourhood, police and emergency sirens – is an important environmental risk factor as urban populations grow (Murphy and King, 2022^[188]). According to the WHO, traffic noise accounts for at least 1.6 million healthy life years lost in Western Europe alone (WHO, 2018^[189]). Exposure to environmental noise increases the risk of cardiovascular morbidity and mortality (Münzel, Sørensen and Daiber, 2021^[190]), with exposure typically being higher in areas of greater socio-economic deprivation (Havard et al., 2011^[191]; Bocquier et al., 2012^[192]; Dale et al., 2015^[193]). Pathways through which noise pollution affect cardiovascular health include sleep duration and quality disturbances, elevated stress hormone levels, and increased oxidative stress in the vasculature and brain – all of which can contribute to vascular dysfunction, inflammation, and hypertension, thereby increasing the risk of CVD (Münzel, Sørensen and Daiber, 2021^[190]).

Despite improvements on some environmental risk factors, air pollution, extreme temperatures and noise pollution continue to pose significant risks to cardiovascular health, particularly among lower socio-economic groups. Addressing these risks through, for example, cleaner transport and energy systems, urban planning to reduce heat islands, and improved housing quality can help protect cardiovascular health while also promoting environmental sustainability.

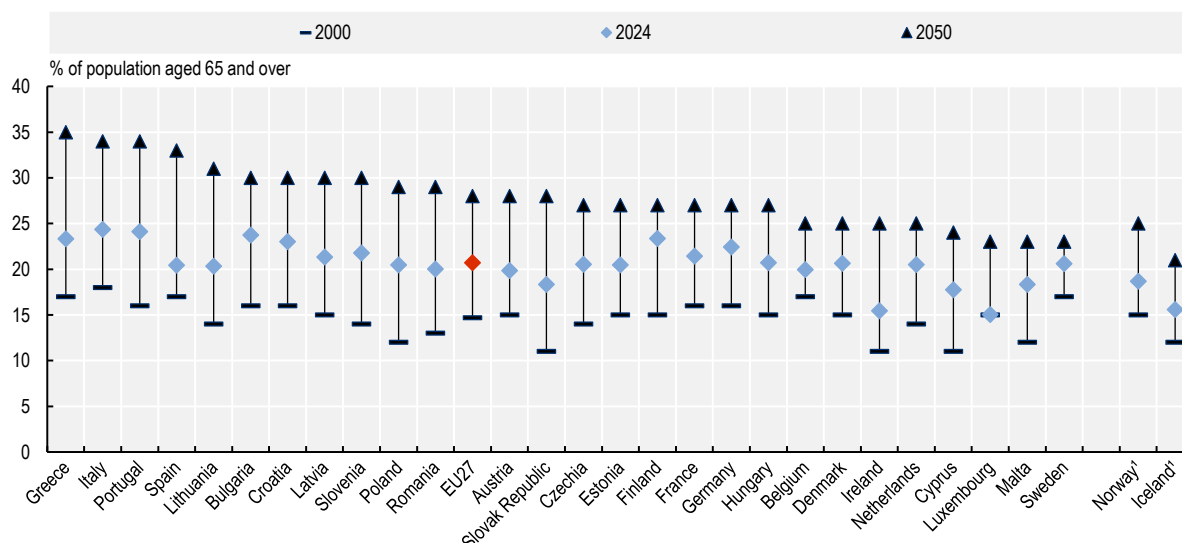
3.4. Non-modifiable risk factors can still be mitigated

3.4.1. Europe's ageing population puts people at risk

Older adults are especially vulnerable to CVD. As individuals age, the cardiovascular system undergoes structural and functional changes that increase the likelihood of CVD (Jensen, 2024^[194]). These include increased arterial stiffness, reduced elasticity, and reduced capacity of the heart to pump blood efficiently. At the same time, exposure to age-related risk factors, such as diabetes, obesity, hypertension and hyperlipidaemia, reduced physical activity, cognitive decline and depression, further contribute to the growing burden of CVD in older adults.

The share of older adults is growing, contributing to the rising burden of CVD. In the EU, between 2000 and 2024, the share of adults aged 65 and over grew from 18% to 22% of the population and is projected to reach 29% by 2050 (Figure 3.29). While all EU countries are ageing, the pace and extent differ. In 2024, Italy, Portugal and Bulgaria had the highest shares of older adults (24%), while Ireland and Luxembourg had the lowest (15%). By 2050, the highest shares of older adults are expected in Greece, Italy, Portugal, Spain, Lithuania, Bulgaria, Croatia, Latvia and Slovenia (over 30%), while the lowest shares are projected in Luxembourg, Malta, Sweden and Iceland (below 23%) (Figure 3.29). This demographic shift is expected to increase the burden of CVD, with estimates suggesting a 90% rise in CVD prevalence in Europe between 2025 and 2050 (Chong et al., 2024^[195]).

Figure 3.29. Nearly three in ten people in the EU will be over age 65 in 2050, up from two in ten in 2024



Note: EU27 average is weighted. 1. non-EU European Economic Area countries.

Source: Eurostat (2023), Population on 1 January by age, sex and type of projection (proj_23np), https://ec.europa.eu/eurostat/web/products-datasets/product?code=proj_23np (accessed 8, July 2025); Eurostat (2025), Population on 1 January by age group and sex (demo_pjangroup), https://ec.europa.eu/eurostat/en/web/products-datasets/-/DEMO_PJANGROUP (accessed 8, July 2025). Source: Eurostat (2023), Population on 1 January by age, sex and type of projection (proj_23np), https://ec.europa.eu/eurostat/web/products-datasets/product?code=proj_23np (accessed 8, July 2025); Eurostat (2025), Population on 1 January by age group and sex (demo_pjangroup), https://ec.europa.eu/eurostat/en/web/products-datasets/-/DEMO_PJANGROUP (accessed 8, July 2025).

While middle-aged and older adults are more likely to experience cardiovascular events, the incidence of CVD is increasing among younger age groups (15-39 years) (Sun et al., 2023^[196]). A key contributor is the high and rising rate of childhood obesity: in 2022, the average prevalence of obesity among children in EU

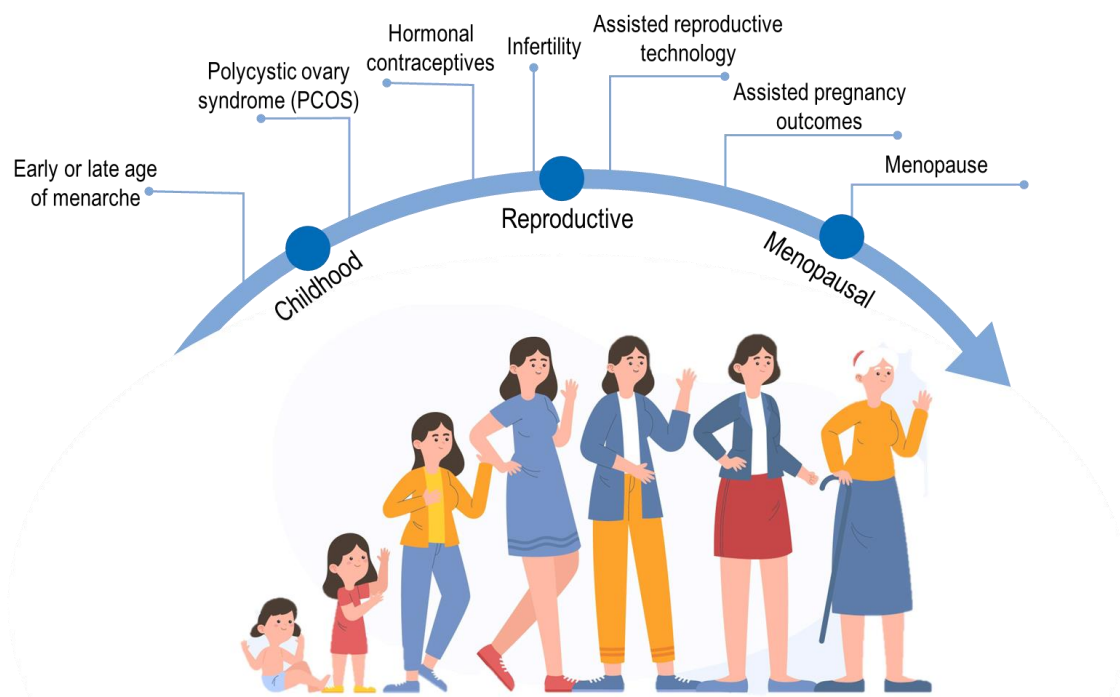
countries was 8.8% (WHO Global Health Observatory, 2025^[39]). Increased exposure to other CVD risk factors in younger people – such as diabetes, hypertension, poor diet and physical inactivity – also contribute to the growing burden in CVD in young people, especially heart failure (Andersson and Vasan, 2017^[197]). These developments underscore the need for primary prevention strategies that address cardiovascular risk factors throughout the life course.

3.4.2. Sex plays a significant role as a risk factor due to biological, hormonal, and lifestyle differences between men and women

As seen in Chapter 2, men have higher age-standardised mortality rates (ASMRs) from circulatory diseases than women – 412 per 100 000 population for men versus 289 for women. This pattern holds across most cardiovascular conditions, though the size of the sex gap varies. For instance, the difference is most pronounced in ischaemic heart disease (155 for men versus 83 for women per 100 000), while it is narrower for cerebrovascular disease (80 for men versus 64 for women per 100 000).

However, these averages mask important gender and sex-specific differences in cardiovascular risk across the life course. Currently, men are more likely to engage in unhealthy behaviours – such as smoking, harmful alcohol consumption, and poor diet – and have higher rates of obesity, all of which contribute to CVD risk. In addition, low testosterone levels represent a sex-specific cardiovascular risk in men (Hanna, Wabnitz and Grewal, 2024^[198]). Conversely, women generally have lower activity levels than men, are at higher risk of inflammatory diseases such as rheumatoid arthritis and systemic lupus erythematosus, and are exposed to a range of sex-specific risks across the life course – including early and late menarche, polycystic ovary syndrome (PCOS), infertility, assisted reproductive technology, assisted pregnancy outcomes, hormonal contraceptives and transitions to menopause – all of which increase their CVD risk (Figure 3.30) (O’Kelly et al., 2022^[199]; Vogel et al., 2021^[200]).

Figure 3.30. Cardiovascular risk factors for women across the life course



Source: Adapted from O’Kelly et al. (2022^[199]), “Pregnancy and Reproductive Risk Factors for Cardiovascular Disease in Women”, <https://doi.org/10.1161/circresaha.121.319895>.

Several early-life and reproductive health conditions are linked to increased cardiovascular risk. Studies suggest that the relationship between the age of the first menstrual period and future CVD is U-shaped, where both early menarche (before age 12) and late menarche (after age 17) are associated with increased CVD risk (Canoy et al., 2015^[201]). Genetic predisposition and elevated childhood BMI have been associated with the timing of menarche – key underlying risk factors for developing CVD (O’Kelly et al., 2022^[199]). Furthermore, polycystic ovary syndrome (PCOS), which affects 5% to 13% of women, is associated with an increased risk of developing CVD and its associated risk factors, such as BMI, dyslipidaemia, hypertension, insulin resistance and deficiencies in insulin secretion (O’Kelly et al., 2022^[199]; Okoth et al., 2020^[202]). At the same time, infertility – particularly among women whose infertility was attributed to ovulatory disorders or endometriosis – has also been associated with increased CVD risk (Farland et al., 2023^[203]).

Adverse pregnancy outcomes – such as hypertensive disorders of pregnancy, gestational diabetes mellitus, preterm births, placental abruption, low birth weight and small for gestational age – are associated with increased risk of CVD and mortality (Parikh et al., 2021^[204]; O’Kelly et al., 2022^[199]; Okoth et al., 2020^[202]). For example, studies have found a two-fold risk of CVD among women with a history of gestational hypertension or preeclampsia (O’Kelly et al., 2022^[199]). Assisted reproductive technologies (ART) have also been linked with elevated CVD risk. For example, one meta-analysis found that in vitro fertilisation (IVF) and intracytoplasmic sperm fertilisation (ICSI) pregnancies are at higher odds of hypertensive disorders of pregnancy than spontaneous conception (SC) (OR 1.70; 95% CI 1.60-1.80; $I^2 = 80\%$) (Chih et al., 2021^[205]).

Hormonal contraceptives – including oestrogen-progestin and progestin-only contraceptives – are associated with an increased risk of cardiovascular events, including ischaemic stroke and myocardial infarction (Yonis et al., 2025^[206]). Studies have shown that the presence of oestrogen and progesterone receptors throughout the vascular system increases the risk of thrombosis and hypertension, key risk factors for developing CVD (Trinh et al., 2023^[207]). Furthermore, studies show that CVD risk is mediated by type and dose of hormonal components, where lower oestrogen doses and certain progestogens appear to carry lower CVD risks (Asubiaro, 2024^[208]). Therefore, it is recommended that healthcare providers consider the type and dose of hormonal components, as well as women’s age, personal and family medical history, and lifestyle factors when prescribing hormonal contraceptives (Shufelt and Bairey Merz, 2009^[209]; Asubiaro, 2024^[208]).

The transition to menopause is a key risk factor for CVD in women. While the burden of CVD is higher in men in earlier life, women experience similar or greater self-reported rates from midlife onwards (Figure 3.31).⁸ Figure 3.31 shows men report higher rates of CVD events before the age of 54 than women. However, from age 55 onwards, the gender gap in CVD narrows and even reverses, with women reporting similar or even higher rates of CVD events than men. This pattern aligns with previous research finding that women typically experience CVD 7-10 years later than men. The increase in incidence among women after midlife is attributed largely to the loss of the cardioprotective effects of the endogenous female sex hormone oestrogen following menopause, as well as the cumulative impact of psychosocial stressors such as caregiving responsibilities during this life stage (Williams et al., 2024^[210]). Hormone replacement therapy (HRT) is used to recover the loss of endogenous oestrogen and has been suggested to improve cardiovascular health, although studies have reported conflicting results (Johansson et al., 2022^[211]).

Box 3.5. Best Practices for Advancing Cardiovascular Health: Heart Health 4 Moms (HH4M): case study overview

Description: Heart Health 4 Moms (HH4M) is an online intervention aimed at reducing cardiovascular risk in women who experienced preeclampsia, a pregnancy complication associated with increased cardiovascular risk after pregnancy. The programme targeted US women with a medically confirmed diagnosis of preeclampsia within the five past years. The intervention was co-designed with preeclampsia survivors. It provided online educational modules, personalised lifestyle coaching from a registered dietitian, a community forum to enable women to communicate with each other and the lifestyle coach, and a “toolbox” of additional resources such as meal plans, recipes, and exercise videos.

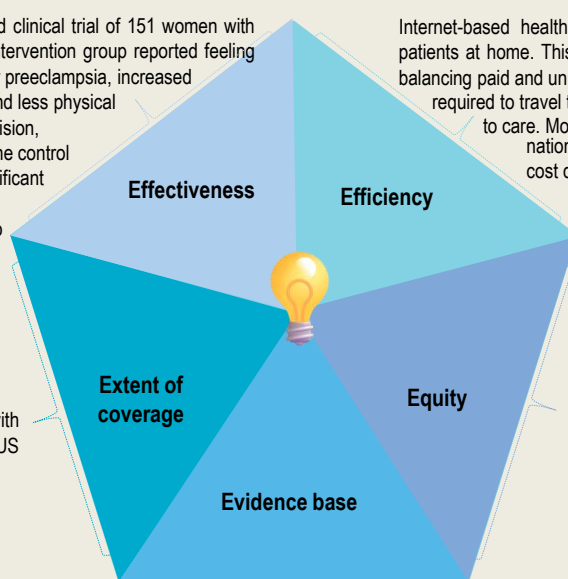
Best practice assessment:

In a 9-month randomised controlled clinical trial of 151 women with preeclampsia, participants in the intervention group reported feeling more informed about CVD risk after preeclampsia, increased self-efficacy to eat a healthy diet, and less physical inactivity (time spent watching television, reading, or on the computer) than the control group. The intervention had no significant impact on the perceived sense of control over CVD risk, adherence to the Dietary Approaches to Stop Hypertension (DASH) diet, self-efficacy for physical activity, and physical activity.

The programme reached women with recent preeclampsia across 41 US states.

Internet-based health programmes have the potential to reach patients at home. This can be especially valuable to new mothers balancing paid and unpaid work responsibilities, for whom the time required to travel to in-person appointments can pose a barrier to care. Moreover, the web-based format enables nationwide delivery without infrastructure or cost demands of face-to-face programmes.

Participants were predominantly white ($n = 124$, 82%) and university educated ($n = 106$, 70%), which limits the generalisability of results to socioeconomically disadvantaged and more ethnically diverse populations.



HH4M was evaluated through a 9-month randomised controlled trial, using a sample of women with a medically confirmed diagnosis of preeclampsia. The intervention content, website design and interpretation of results were developed with preeclampsia patients and the Preeclampsia Foundation, ensuring a patient-centred approach.

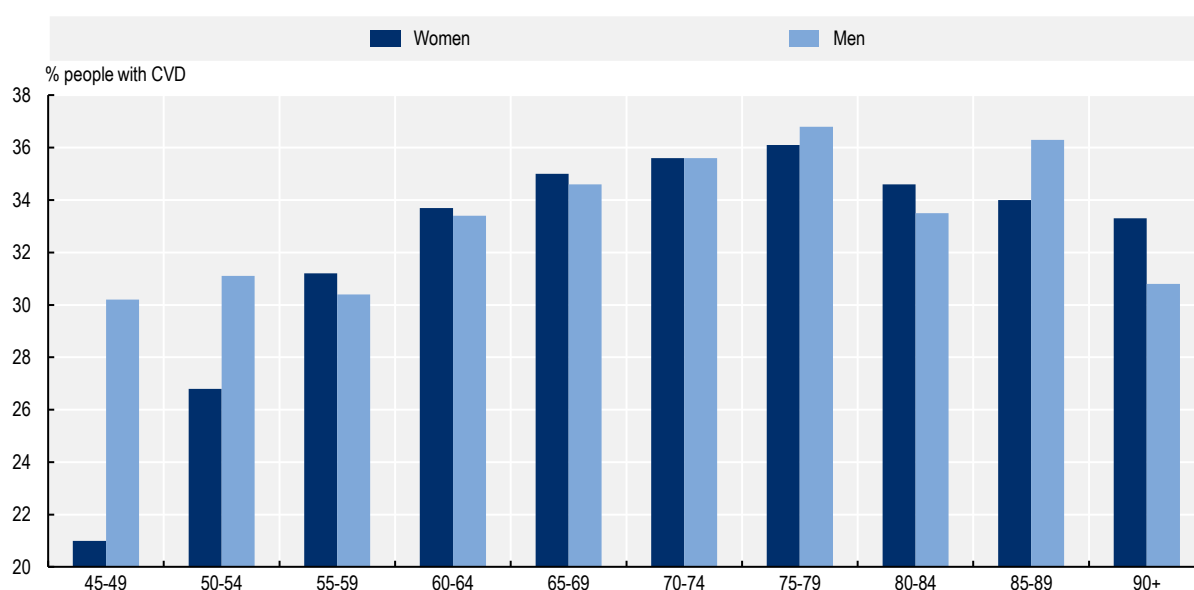
Enhancement options: To enhance effectiveness, the programme could be expanded to engage a more diverse population, particularly women from ethnic minority groups and lower socio-economic backgrounds. Engagement with HH4M could be strengthened by developing a mobile application for easier access and by integrating HH4M within clinical care systems to support sustained participation. Evaluating the long-term outcomes beyond the 9-month trial period and conducting cost-effectiveness analyses would further strengthen the evidence base for this programme.

Transferability: Similar postpartum literacy and lifestyle interventions for women who experienced preeclampsia have been tested through randomised trials in the United States and Australia, demonstrating transferability across health systems. In Europe, interventions are also in development; France is currently developing a trial to improve the health literacy of women about their increased cardiovascular risk after hypertensive disorders of pregnancy, with a particular focus on socio-economically disadvantaged women. As these interventions require few resources, they could be implemented in further maternity clinics in and become standard practice in other EU and OECD countries.

Conclusion: The HH4M web-based intervention improved the knowledge of CVD risk after preeclampsia, increased self-efficacy for healthy eating, and reduced physical inactivity. The programme placed a strong emphasis on building self-efficacy – an important strategy for effectively managing a wide spectrum of chronic diseases. Its patient-centred approach, developed in collaboration with preeclampsia survivors, ensured that the intervention was tailored to participants' needs. By combining online education, peer support and personalised counselling, HH4M lowers access barriers and offers a scalable model for secondary prevention in a high-risk population.

Source: Rich-Edwards et al. (2019^[212]), "Randomized Trial to Reduce Cardiovascular Risk in Women with Recent Preeclampsia", <https://doi.org/10.1089/jwh.2018.7523>.

Figure 3.31. The gender gap in CVD narrows and even reverses after age 55



Note: Respondents aged 45 and older. CVD includes heart attack, stroke and cerebral vascular disease.

Source: SHARE-ERIC (2024).

As a woman in menopause living with multiple chronic illnesses, I face a large gap in both medical understanding and clinical data relevant to my profile. There is little to no guidance for managing menopause in patients with complex cardiovascular, autoimmune, and metabolic conditions. Despite clear evidence that hormone replacement therapy (HRT) could potentially improve my quality of life, it remains a taboo subject. No healthcare provider has proactively discussed it with me, and when I bring it up, I'm met with vague responses like "better not," often based on assumptions rather than evidence. This reflects a broader issue: the intersection of chronic disease, menopause, and gender remains understudied and under-addressed.

The fact that I am educated and financially stable has allowed me to research options independently and pursue private or alternative care. However, this is a privilege not shared by many others in similar situations. Without health literacy or financial means, many women are left without access to appropriate support or treatment, further deepening inequalities in healthcare.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Lifestyle factors are not evenly distributed by gender. While women generally report lower levels of harmful alcohol consumption compared to men, the cardiovascular consequences of excessive drinking are more severe for women. One study found that women who exceeded the recommended weekly alcohol limit had a 43% higher risk of coronary heart disease (CHD) compared to those who drank less (adjusted hazard ratio (aHR), 1.4; 95% CI, 1.2-1.7), whereas for men, the increased risk was 19% (aHR, 1.2; 95% CI, 1.0-1.4) (Rai, 2025^[213]).

Adverse Drug Reactions (ADR) can also contribute to the differences in mortality due to poor adherence to drug treatments, yet evidence reporting sex differences is limited. A systematic review showed how only four out of eleven studies reported sex-differences in ADR for heart failure, showing in three studies higher risk of ADR in women due to angiotensin-enzyme inhibitor, one with higher mortality due to digoxin in women, and one study with higher risk of ADR in men due to mineralocorticoid receptor antagonist (Bots et al., 2019^[214]).

3.4.3. Genetics and family history require a targeted approach

Family history of premature CVD is a risk factor for CVD, and is associated with both genetic factors (i.e. CAD polygenic risk score and heterozygous familial hypercholesterolemia) and clinical factors (e.g. morbid obesity, hypertension, dyslipidaemia). Around 25% of family history of heart disease is explained by genetic factors alone, and 34% by the combined impact of genetic and clinical factors (Jowell et al., 2022^[215]; ESC, 2021^[131]). Heterozygous familial hypercholesterolemia (FH) is a significant risk factor

for CVD that can be targeted for prevention and management. Among the factors that increase the risk of CVD in patients with heterozygous familial hypercholesterolemia are: age, male sex, hypertension, diabetes, high body mass index, smoking, elevated lipoprotein a, low high-density lipoprotein cholesterol, and family history of CVD; with smoking, hypertension, and diabetes accounting for more than a quarter of the risk of CVD in people with FH (Akioyamen et al., 2019^[216]). Family history of coronary heart disease in first degree relatives, after adjusting for other risk factors, has a hazard ratio⁹ of 1.72 (95% CI: 1.69 – 1.75) in men, and 1.58 (95% CI: 1.54 – 1.61) in women (Hippisley-Cox, Coupland and Brindle, 2017^[217]).

Ethnicity, likewise, has genetic and environmental factors associated with the risk of CVD. The impact of ethnicity on CVD risk can vary by region. For instance, in the United Kingdom, immigrants from South Asia have a markedly higher CVD risk, with QRISK3 algorithm applying a 1.3-fold multiplier for individuals of Indian and Bangladeshi origin, and a 1.7-multiplier for those of Pakistani origin when estimating 10-year CVD risk (Cainzos-Achirica et al., 2019^[218]). In addition to genetic factors, the risk factor profiles – such as prevalence of physical inactivity – can vary across ethnic and racial groups, further impacting CVD risk (Cruz-Flores et al., 2011^[219]; Patel et al., 2022^[220]). See Chapter 2 for additional discussion of CVD related disparities related to race and ethnicity.

Genetic factors contribute to the development of CVD and advances have been made on polygenic risk scores for risk prediction and risk stratification (Samani et al., 2024^[221]). Adding polygenic risk scores modestly improves prediction of CVD risk, meaning it could help prevent one additional CVD event for every 5 750 individual screened, yet more evidence and economic assessment is needed to assess its clinical utility and cost-effectiveness (Sun et al., 2021^[222]). A targeted, personalised approach – now increasingly powered by AI – can analyse complex genetic data to guide early interventions and optimise treatment strategies for CVD (see Chapter 5).

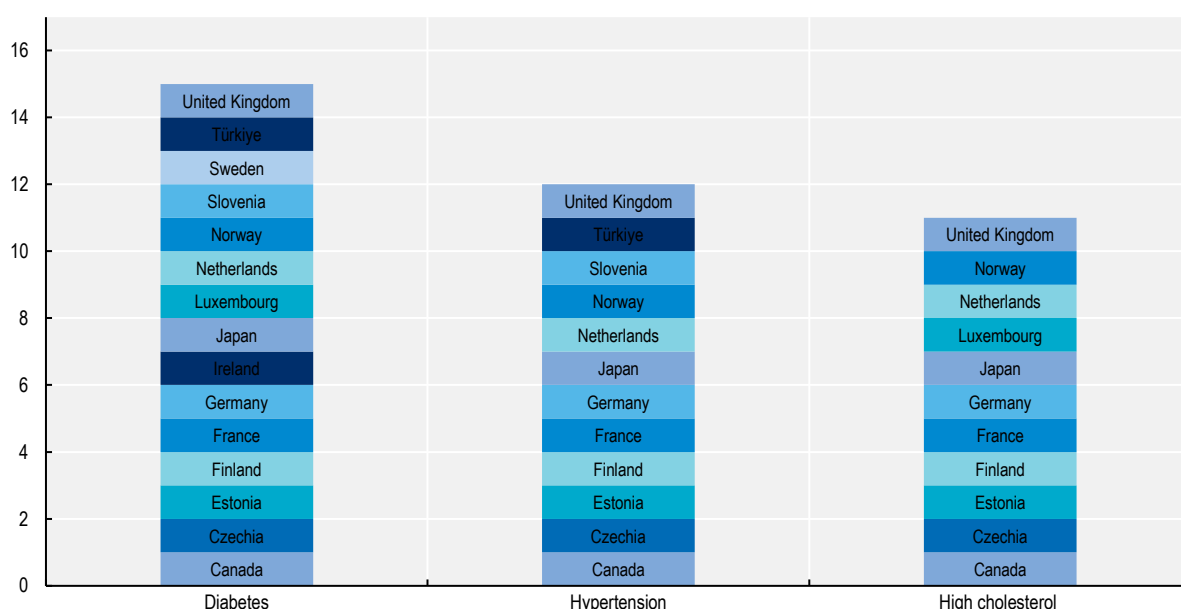
3.5. Clinical practice guidelines for CVD prevention exist, but recommendations are not entirely followed

3.5.1. Clinical practice guidelines exist, but management of risk factors is lacking

Clinical practice guidelines help healthcare professionals to standardise the diagnostic, management and follow-up process of patients based on the highest level of evidence available for a specific chronic condition (e.g. diabetes, hypertension, among others). Commonly known evidence-based clinical practice guidelines have been developed by organisations such as the European Society of Cardiology (ESC), the European Stroke Organisation (ESO) and the American Heart Association (AHA). These guidelines are commonly implemented by countries with adaptation to their national context. According to the OECD Policy and Data Questionnaire for the OECD Report on the State of Cardiovascular Health – answered by 17 countries – most countries (15) use ESC guidelines to influence their national clinical practice guidelines on CVD, followed by ESO guidelines (10) and the AHA guidelines (10). 11 out of 17 countries report adapting these clinical practice guidelines to their national context based on affordability and coverage regulations, new clinical evidence and patient or provider preferences.

Most OECD countries (15 out of 17) reported having a clinical practice guideline for the management of diabetes, followed by hypertension (12 out of 17), and high cholesterol in only 11 out of the 17 countries (Figure 3.32).

Figure 3.32. Countries with clinical practice guidelines for the management of CVD risk factors



Note: N=18 EU+2 and OECD G20 countries (Austria, Canada, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: OECD Policy and Data Questionnaire for the OECD Report on the State of Cardiovascular Health, 2025.

Clinical practice guidelines, such as the ESC guidelines on CVD prevention in clinical practice, call for clinicians to encourage lifestyle changes and support adherence to drug therapy, but these guideline recommendations face challenges (ESC, 2021^[131]). As seen in Section 3.2.1, just over a quarter (28%) of primary care users aged 45 years and older report that a health professional talked to them about the risks of tobacco use, and from those that currently smoke only half (49%) report that a healthcare professional has talked to them about the risks of tobacco and quitting. A Cochrane systematic review has shown that simple advice on quitting significantly increases quitting rates (Relative Risk: 1.66, Confidence Interval: 1.42 to 1.94) (Stead et al., 2013^[223]). Related to alcohol use, only 13% of healthcare users report that a healthcare professional has talked to them about their alcohol use. Regarding healthy eating, only a third report that they have received advice on healthy eating. Given the importance of managing risk factors to prevent and manage CVD, prevention and promotion strategies in primary care need to be strengthened.

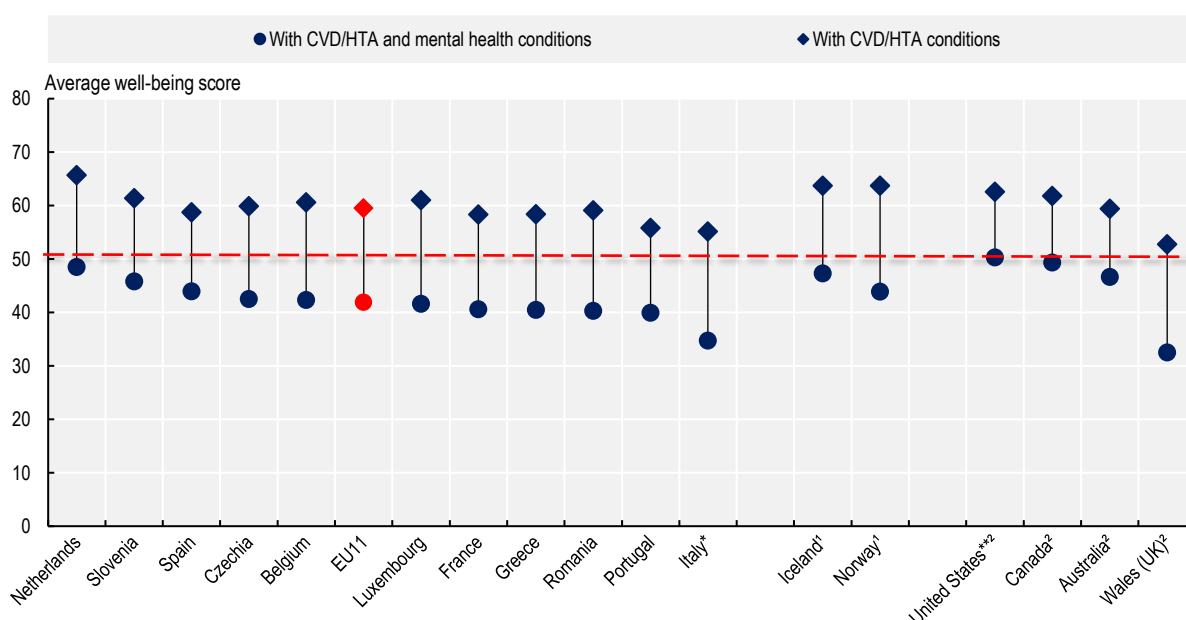
Before my diagnosis, I was largely unaware of the risk factors contributing to my condition. Post-diagnosis, I received excellent medical care, but the guidance on lifestyle changes was limited. It was through my own research and determination that I adopted a healthier lifestyle, including regular exercise and dietary changes. I believe primary care providers need to play a more proactive role in educating patients about prevention and supporting them in addressing modifiable risk factors.

Caius, artist, researcher, patient advocate, and heart attack survivor.

Considering that about a third (31%) of people with CVD and related clinical risk factors in Europe reported at least four depressive symptoms on the EURO-D scale in 2022, it is important to adequately manage mental health conditions as a management strategy to reduce CVD risk. Depression and anxiety can increase the risk of CVD as well as increase the challenges of adequately managing behavioural risk factors (Section 3.1.6). Among PaRIS respondents, having a mental health condition, such as anxiety or depression, is associated with worse perceived well-being, underscoring the need for stronger support within primary care. Figure 3.33 shows a 20 point higher reported well-being among people aged 45 and older with CVD or hypertension compared to those with CVD or hypertension that also report a mental health condition. There is a need for a targeted approach for people with CVD and mental health conditions, to provide better support to improve well-being and thus improve adherence to lifestyle changes and drug treatments.

Figure 3.33. People with CVD or hypertension and mental health conditions have 20-points lower well-being than those with only CVD or hypertension

Average well-being score of primary care user aged 45 and older



Note: The EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. WHO-5 well-being index with a range of 0-100. A cutoff of 50, below which suggests poor mental well-being. All within country differences are statistically significant ($p < 0.05$). * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. HTA: Hypertension.

Source: OECD PaRIS 2024 Database.

3.5.2. Early detection through primary care and screening programmes improves outcomes

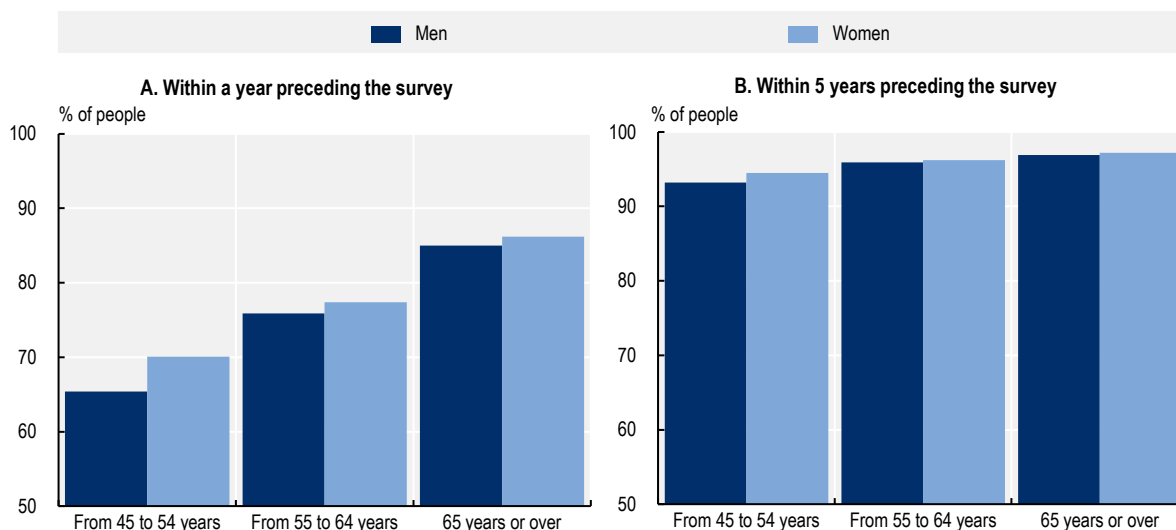
The ESC recommends a CVD risk assessment to be systematically done in individuals with vascular risk factors (i.e. family history of premature CVD, familial hypercholesterolemia, CVD risk factors such as smoking, arterial hypertension, diabetes mellitus, raised lipid level, obesity, or comorbidities increasing CVD risk). Women younger than 50 years of age and men younger than 40 years of age with no vascular risk factors have low risk of cardiovascular events, therefore a systematic CVD risk assessment in these groups is not recommended. Conversely, women over 75 years of age and men over 65 years of age

usually have a high 10-year CVD risk. Given that the risk varies between these age groups a systematic or opportunistic CVD risk assessment in men 40 years and older and women 50 years and older may be considered and can be repeated every five years if there is low risk of CVD (ESC, 2021^[131]). Risk assessment can be done using the Systematic Coronary Risk Estimation 2 (SCORE2) which consider the age, sex, smoking status, systolic blood pressure, non-HDL cholesterol, and the population group to estimate the 10-year risk of fatal and non-fatal CV events.

Systolic blood pressure measurement is one of the first steps for CVD risk assessment. Although a blood pressure measurement can be considered a readily accessible screening tool, on average 94% of people aged 45 to 54 (age range where systematic CVD screening is recommended) report having had a blood pressure measurement by a health professional within the five years before the survey (Figure 3.34), this goes down to 68% reporting having had the blood pressure measurement within the year preceding the survey (Figure 3.35). ESC guidelines for elevated blood pressure recommend a blood pressure measurement in adults aged 40 and over at least annually (ESC, 2024^[15]). This means that about 30% of people aged 45 to 54 in the EU did not have their blood pressure measured within the year preceding the survey or have never had their blood pressure measured. Although screening for CVD in men is recommended to begin at age 40 and for women at age 50, among those aged 45 to 54, men report lower rates (65%) than women (70%) of having had their blood pressure measured within the year preceding the survey. Given that the age-standardised prevalence of hypertension in the EU ranges from 30-45%, and hypertension is one of the main risk factors for CVD, scaling up screening for hypertension for timely diagnosis and management is key (Section 0). Further discussion of risk assessment policies can be found in Chapter 6.

Figure 3.34. Blood pressure measurement in the EU is lacking most among those aged 45 to 54

Percentage of population reporting having had their blood pressure measured by a health professional, 2019

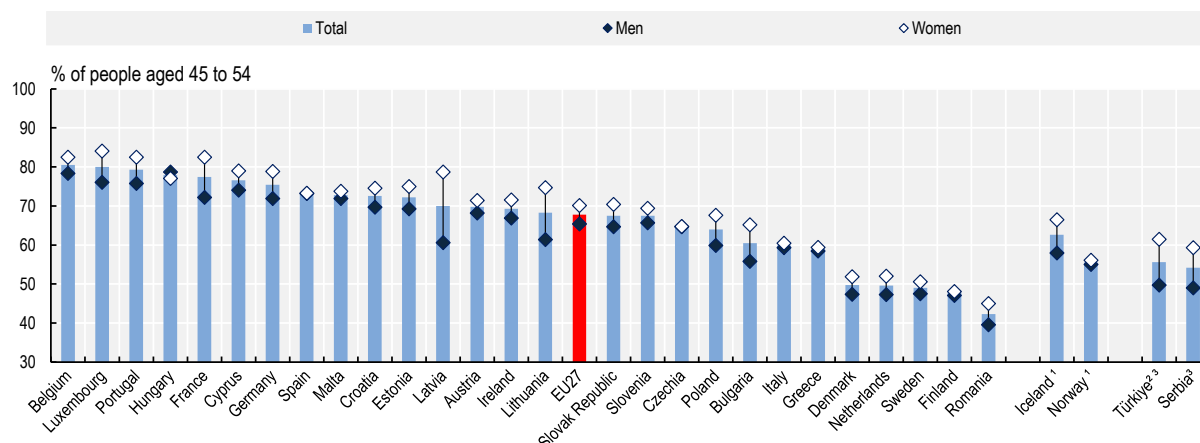


Note: EU27 is the weighted average.

Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

Figure 3.35. Over a third of adults aged 45 to 54 reported having had their blood pressure measured within a year

Percentage of population aged 45 to 54 reporting having had their blood pressure measured by a health professional within the year preceding the survey, 2019



Note: EU27 is the weighted average. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

A measurement of the blood cholesterol and blood glucose is essential to assess the risk of CVD. While more than 90% of men and women over the age of 55 report having had a blood glucose and cholesterol measurement in the five years preceding the survey, rates are lower among those aged 45-54 (Figure 3.36). Among those aged 45-54, men report lower rates than women for both blood cholesterol measurement (87% vs. 89%) and blood sugar measurement (86% vs. 88%) in the past five years. Improving blood cholesterol and blood glucose measurements to assess CVD risk, especially in men aged 40 and over, remains a priority.

Figure 3.36. Screening for blood cholesterol and blood sugar in the EU is lacking most among those aged 45 to 54

Percentage of population, by age group, reporting having had a blood cholesterol or blood sugar measured by a health professional in less than 5 years from the time of the survey, 2019



Note: EU27 is the weighted average.

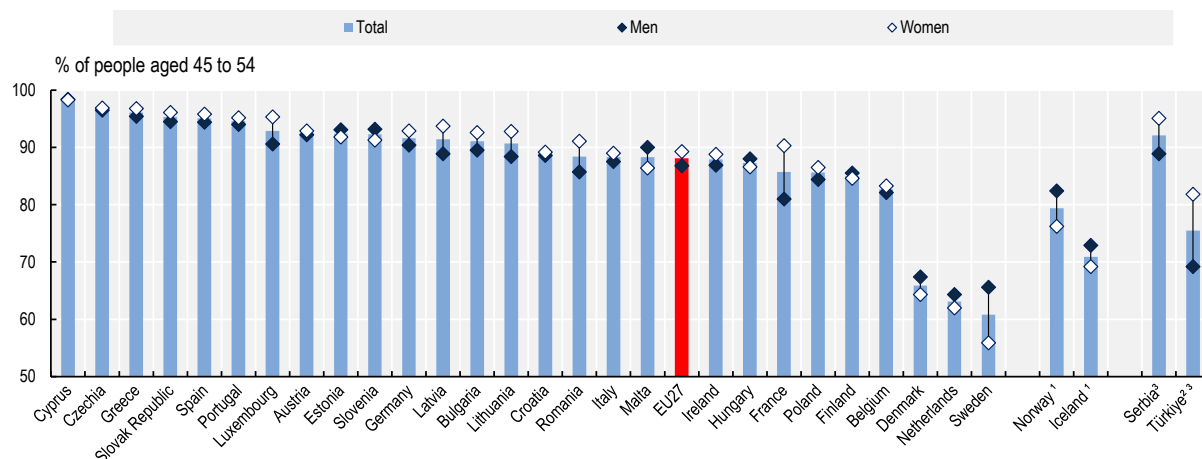
Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

High cholesterol levels, more specifically LDL-C, play an important role in the development of CVD. Lowering LDL-C reduces the risk of CVD, therefore it is important to detect the level of cholesterol to be able assess the risk of CVD and initiate timely treatment (Section 0). In the EU most adults aged 45-54 (88%) report having had their blood cholesterol measured in the past five years (Figure 3.37), this aligns with current guidelines which consider 5-year intervals for cholesterol measurement if levels are normal and there are no other CVD risk factors (ESC, 2021^[131]). This is consistent with most EU countries where 80% or more of adults aged 45-54 report having had their blood cholesterol measured in the previous five years, only Denmark (66%), the Netherlands (63%) and Sweden (61%) report values lower than 80%, this is also seen in Norway (79%), Iceland (71%) and Türkiye (76%).

As seen in Section 3.1.1, diabetes increases the incidence of CVD by 2.6 in women and 1.8 in men compared to those without diabetes. This is why within the CVD risk assessment it is important to measure blood glucose levels. There is a direct relationship between blood glucose level and the risk for CVD (3.1.1). In the EU, most adults aged 45-54 (87%) report having had their blood glucose level measure in the previous five years (Figure 3.38); this ranges from below 70% in the Netherlands, Sweden and Denmark to over 95% in Greece, Czechia and Cyprus.

Figure 3.37. Most adults aged 45 to 54 reported having had their blood cholesterol level measured

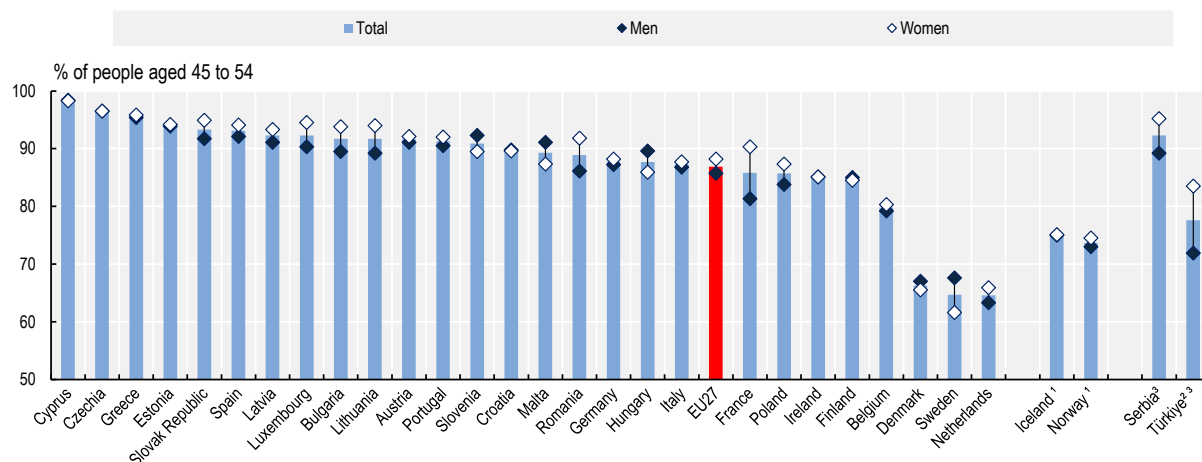
Percentage of population aged 45 to 54 reporting having had their blood cholesterol measured by a health professional within 5 years preceding the survey, 2019



Note: EU27 is the weighted average. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

Figure 3.38. Most adults aged 45 to 54 reported having had their blood sugar level measured

Percentage of population aged 45 to 54 reporting having had a blood sugar level measured by a health professional less than 5 years from the time of the survey, 2019



Note: EU27 is the weighted average. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. Source: Eurostat (2022), Self-reported screening of CVD and diabetes risks by sex, age and educational attainment level (hlth_ehis_pa2e), https://ec.europa.eu/eurostat/web/products-datasets/product?code=hlth_ehis_pa2e (accessed 17 October 2025).

Screening for metabolic risk factors is key to control underlying conditions such as hypertension, diabetes and dyslipidaemia, which if not control can lead to a CVD event with greater complications to the patients. Screening through CVD risk assessment also helps primary care identify higher risk patients to provide support on self-management and information on signs of alarm to identify a CVD event.

Despite the accessibility of blood pressure screening, more than 30% of adults aged 45-54 in the EU have not had a measurement in the last year, and about 6% have not had a measurement in the past five years, despite hypertension being a major CVD risk factor. Cholesterol and blood glucose screening is also lacking, with over 10% of adults aged 45-54 in the EU not having had a test in the past five years. These screenings are essential for identifying and managing metabolic risk factors – hypertension, diabetes, and dyslipidaemia – thereby enabling timely interventions and supporting self-management in primary care settings. However, screening alone is not sufficient – timely follow-up care, including diagnosis, treatment, and patient support, is essential to translate early detection into improved outcomes. Effective management of metabolic risk factors and patient engagement in self-care are critical components of a comprehensive CVD prevention strategy. These concepts are further discussed in Chapter 4.

3.6. Conclusion

This chapter outlines the risk factors associated with CVD, many of which are amenable to policy action, see Chapter 6 for a description of prevention and promotion policies addressing CVD. Although many of these indicators on protective and risk factors can be further broken by sex, education level, income status, the scope of this chapter focusses on the general view of risk factors. See Chapter 2 for an analysis of the burden of CVD by disaggregated by socio-economic characteristics.

References

- Aboyans, V. and F. Cosentino (eds.) (2019), “Diabetes as a cardiovascular risk factor: An overview of global trends of macro and micro vascular complications”, *European Journal of Preventive Cardiology*, Vol. 26/2_suppl, pp. 25-32, <https://doi.org/10.1177/2047487319878371>. [8]
- Afshin et al (2019), “Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017”, *The Lancet*, Vol. 393/10184, pp. 1958 - 1972. [132]
- Agbaje, A. (2025), “Incidental and Progressive Tobacco Smoking in Childhood and Subsequent Risk of Premature Cardiac Damage”, *Journal of the American College of Cardiology*, Vol. 85/5, pp. 546-549, <https://doi.org/10.1016/j.jacc.2024.09.1229>. [94]
- Akiyamen, L. et al. (2019), “Risk factors for cardiovascular disease in heterozygous familial hypercholesterolemia: A systematic review and meta-analysis”, *Journal of Clinical Lipidology*, Vol. 13/1, pp. 15-30, <https://doi.org/10.1016/j.jacl.2018.10.012>. [216]
- Alahmad, B. et al. (2023), “Associations Between Extreme Temperatures and Cardiovascular Cause-Specific Mortality: Results From 27 Countries”, *Circulation*, Vol. 147/1, pp. 35-46, <https://doi.org/10.1161/circulationaha.122.061832>. [182]
- American Heart Association (2022), “Life’s Essential 8: Updating and Enhancing the American Heart Association’s Construct of Cardiovascular Health: A Presidential Advisory From the American Heart Association”, *Circulation*, Vol. 146/5, <https://doi.org/10.1161/cir.0000000000001078>. [153]
- American Heart Association (2021), “Obesity and Cardiovascular Disease”, *PMC*, Vol. 143/21, <https://doi.org/10.1161/cir.0000000000000973>. [35]

- Ananth, P. et al. (2024), "H1N1-associated Cardiomyopathy: A Case Series", *Journal of Association of Pulmonologist of Tamil Nadu*, Vol. 7/1, pp. 24-26, https://doi.org/10.4103/japt.japt_40_23. [70]
- Anderer, S. (2024), "Cannabis Use Linked to Elevated Myocardial Infarction and Stroke Risk", *JAMA*, Vol. 331/14, p. 1172, <https://doi.org/10.1001/jama.2024.2075>. [119]
- Andersson, C. and R. Vasan (2017), "Epidemiology of cardiovascular disease in young individuals", *Nature Reviews Cardiology*, Vol. 15/4, pp. 230-240, <https://doi.org/10.1038/nrcardio.2017.154>. [197]
- Asubiaro, J. (2024), "The Impact of Hormonal Contraceptives on the Incidence and Progression of Cardiovascular Diseases in Women: A Systematic Review", *Cureus*, <https://doi.org/10.7759/cureus.65366>. [208]
- Badve, S. et al. (2025), "Effects of GLP-1 receptor agonists on kidney and cardiovascular disease outcomes: a meta-analysis of randomised controlled trials", *The Lancet Diabetes & Endocrinology*, Vol. 13/1, pp. 15-28, [https://doi.org/10.1016/s2213-8587\(24\)00271-7](https://doi.org/10.1016/s2213-8587(24)00271-7). [44]
- Banks, E. et al. (2023), "Electronic cigarettes and health outcomes: umbrella and systematic review of the global evidence", *Medical Journal of Australia*, Vol. 218/6, pp. 267-275, <https://doi.org/10.5694/mja2.51890>. [110]
- Bansal, M. (2020), "Cardiovascular disease and COVID-19", *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, Vol. 14/3, pp. 247-250, <https://doi.org/10.1016/j.dsx.2020.03.013>. [76]
- Behrens, T. (ed.) (2012), "Job Strain, Job Insecurity, and Incident Cardiovascular Disease in the Women's Health Study: Results from a 10-Year Prospective Study", *PLoS ONE*, Vol. 7/7, p. e40512, <https://doi.org/10.1371/journal.pone.0040512>. [168]
- Behrouzi, B. et al. (2022), "Association of Influenza Vaccination With Cardiovascular Risk", *JAMA Network Open*, Vol. 5/4, p. e228873, <https://doi.org/10.1001/jamanetworkopen.2022.8873>. [80]
- Biondi-Zoccai, G. et al. (2019), "Acute Effects of Heat-Not-Burn, Electronic Vaping, and Traditional Tobacco Combustion Cigarettes: The Sapienza University of Rome-Vascular Assessment of Proatherosclerotic Effects of Smoking (SUR-VAPES) 2 Randomized Trial", *Journal of the American Heart Association*, Vol. 8/6, <https://doi.org/10.1161/jaha.118.010455>. [109]
- Blood Pressure UK (n.d.), *Know Your Numbers!*, <https://www.bloodpressureuk.org/know-your-numbers/> (accessed on 16 July 2025). [26]
- Bocquier, A. et al. (2012), "Small-area analysis of social inequalities in residential exposure to road traffic noise in Marseilles, France", *European Journal of Public Health*, Vol. 23/4, pp. 540-546, <https://doi.org/10.1093/eurpub/cks059>. [192]
- Bots, S. et al. (2019), "Adverse Drug Reactions to Guideline-Recommended Heart Failure Drugs in Women", *JACC: Heart Failure*, Vol. 7/3, pp. 258-266, <https://doi.org/10.1016/j.jchf.2019.01.009>. [214]
- Bratincsák, A. et al. (2010), "Fulminant Myocarditis Associated With Pandemic H1N1 Influenza A Virus in Children", *Journal of the American College of Cardiology*, Vol. 55/9, pp. 928-929, <https://doi.org/10.1016/j.jacc.2010.01.004>. [69]

- Brauer, M. et al. (2024), “Global burden and strength of evidence for 88 risk factors in 204 countries and 811 subnational locations, 1990–2021: a systematic analysis for the Global Burden of Disease Study 2021”, *The Lancet*, Vol. 403/10440, pp. 2162-2203, [https://doi.org/10.1016/s0140-6736\(24\)00933-4](https://doi.org/10.1016/s0140-6736(24)00933-4). [86]
- Buffel, V., S. Van de Velde and P. Bracke (2014), “Professional care seeking for mental health problems among women and men in Europe: the role of socioeconomic, family-related and mental health status factors in explaining gender differences”, *Social Psychiatry and Psychiatric Epidemiology*, Vol. 49/10, pp. 1641-1653, <https://doi.org/10.1007/s00127-014-0879-z>. [61]
- Cainzos-Achirica, M. et al. (2019), “Epidemiology, risk factors, and opportunities for prevention of cardiovascular disease in individuals of South Asian ethnicity living in Europe”, *Atherosclerosis*, Vol. 286, pp. 105-113, <https://doi.org/10.1016/j.atherosclerosis.2019.05.014>. [218]
- Canoy, D. et al. (2015), “Age at Menarche and Risks of Coronary Heart and Other Vascular Diseases in a Large UK Cohort”, *Circulation*, Vol. 131/3, pp. 237-244, <https://doi.org/10.1161/circulationaha.114.010070>. [201]
- Cappuccio, F. et al. (2010), “Sleep Duration and All-Cause Mortality: A Systematic Review and Meta-Analysis of Prospective Studies”, *Sleep*, Vol. 33/5, pp. 585-592, <https://doi.org/10.1093/sleep/33.5.585>. [156]
- CDC (2024), *Cannabis and Heart Health*, <https://www.cdc.gov/cannabis/health-effects/heart-health.html>. [115]
- Chaddha, A. et al. (2016), “Mental Health and Cardiovascular Disease”, *The American Journal of Medicine*, Vol. 129/11, pp. 1145-1148, <https://doi.org/10.1016/j.amjmed.2016.05.018>. [57]
- Chandy, M., N. Jimenez-Tellez and J. Wu (2025), “The relationship between cannabis and cardiovascular disease: clearing the haze”, *Nature Reviews Cardiology*, Vol. 22/7, pp. 467-481, <https://doi.org/10.1038/s41569-025-01121-6>. [118]
- Cheng, Y. et al. (2020), “Effects of influenza vaccination on the risk of cardiovascular and respiratory diseases and all-cause mortality”, *Ageing Research Reviews*, Vol. 62, p. 101124, <https://doi.org/10.1016/j.arr.2020.101124>. [78]
- Chih, H. et al. (2021), “Assisted reproductive technology and hypertensive disorders of pregnancy: systematic review and meta-analyses”, *BMC Pregnancy and Childbirth*, Vol. 21/1, <https://doi.org/10.1186/s12884-021-03938-8>. [205]
- Chilazi, M. et al. (2021), “COVID and Cardiovascular Disease: What We Know in 2021”, *Current Atherosclerosis Reports*, Vol. 23/7, <https://doi.org/10.1007/s11883-021-00935-2>. [71]
- Chong, B. et al. (2024), “Global burden of cardiovascular diseases: projections from 2025 to 2050”, *European Journal of Preventive Cardiology*, <https://doi.org/10.1093/eurjpc/zwae281>. [195]
- Chrissini, M. and D. Panagiotakos (2022), “Acute Myocardial Infarction in Young Patients and its Correlation with Obesity Status at Pre-adolescent Stage: A Narrative Review”, *The Open Cardiovascular Medicine Journal*, Vol. 16/1, <https://doi.org/10.2174/18741924-v16-e2206200>. [36]

- Comunian, S. et al. (2020), “Air Pollution and COVID-19: The Role of Particulate Matter in the Spread and Increase of COVID-19’s Morbidity and Mortality”, *International Journal of Environmental Research and Public Health*, Vol. 17/12, p. 4487, <https://doi.org/10.3390/ijerph17124487>. [180]
- Cruz-Flores, S. et al. (2011), “Racial-Ethnic Disparities in Stroke Care: The American Experience”, *Stroke*, Vol. 42/7, pp. 2091-2116, <https://doi.org/10.1161/str.0b013e3182213e24>. [219]
- Dale, L. et al. (2015), “Socioeconomic status and environmental noise exposure in Montreal, Canada”, *BMC Public Health*, Vol. 15/1, <https://doi.org/10.1186/s12889-015-1571-2>. [193]
- de Boer, A. et al. (2024), “Influenza Infection and Acute Myocardial Infarction”, *NEJM Evidence*, Vol. 3/7, <https://doi.org/10.1056/evidoa2300361>. [67]
- De Vita, A. et al. (2024), “The Impact of Climate Change and Extreme Weather Conditions on Cardiovascular Health and Acute Cardiovascular Diseases”, *Journal of Clinical Medicine*, Vol. 13/3, p. 759, <https://doi.org/10.3390/jcm13030759>. [183]
- Diab, A. et al. (2023), “A Heart-Healthy Diet for Cardiovascular Disease Prevention: Where Are We Now?”, *Vascular Health and Risk Management*, Vol. Volume 19, pp. 237-253, <https://doi.org/10.2147/vhrm.s379874>. [130]
- Dong, H. et al. (2025), “Work Stress and Its Association with Cardiovascular Events in Occupational Populations: A Systematic Review and Meta-analysis”, *Asian Journal of Social Health and Behavior*, Vol. 8/2, pp. 47-58, https://doi.org/10.4103/shb.shb_286_24. [167]
- Dong, X. et al. (2017), “Diabetes as a risk factor for acute coronary syndrome in women compared with men: a meta-analysis, including 10 856 279 individuals and 106 703 acute coronary syndrome events”, *Diabetes/Metabolism Research and Reviews*, Vol. 33/5, <https://doi.org/10.1002/dmrr.2887>. [11]
- Drouin-Chartier, J. et al. (2021), “Correlates of Coronary Artery Calcification Prevalence and Severity in Patients With Heterozygous Familial Hypercholesterolemia”, *CJC Open*, Vol. 3/1, pp. 62-70, <https://doi.org/10.1016/j.cjco.2020.09.010>. [31]
- D’Ruiz, C. et al. (2017), “Measurement of cardiovascular and pulmonary function endpoints and other physiological effects following partial or complete substitution of cigarettes with electronic cigarettes in adult smokers”, *Regulatory Toxicology and Pharmacology*, Vol. 87, pp. 36-53, <https://doi.org/10.1016/j.yrtph.2017.05.002>. [107]
- Du, Y. et al. (2022), “Global Population Exposure to Extreme Temperatures and Disease Burden”, *International Journal of Environmental Research and Public Health*, Vol. 19/20, p. 13288, <https://doi.org/10.3390/ijerph192013288>. [181]
- EC (2024), *National low-risk drinking recommendations (or drinking guidelines) and standard units*, https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/national-low-risk-drinking-recommendations-drinking-guidelines_en. [227]
- ECDC (2022), *Prevalence of post COVID-19 condition symptoms: A systematic review and meta-analysis of cohort study data stratified by recruitment setting*, <https://www.ecdc.europa.eu/en/publications-data/prevalence-post-covid-19-condition-symptoms-systematic-review-and-meta-analysis>. [84]

- Ekelund, U. et al. (2020), "Joint associations of accelerometer-measured physical activity and sedentary time with all-cause mortality: a harmonised meta-analysis in more than 44 000 middle-aged and older individuals", *British Journal of Sports Medicine*, Vol. 54/24, pp. 1499-1506, <https://doi.org/10.1136/bjsports-2020-103270>. [127]
- Eller, N. et al. (2009), "Work-Related Psychosocial Factors and the Development of Ischemic Heart Disease", *Cardiology in Review*, Vol. 17/2, pp. 83-97, <https://doi.org/10.1097/crd.0b013e318198c8e9>. [165]
- Emerging Risk Factors Collaboration (2020), "Association Between Depressive Symptoms and Incident Cardiovascular Diseases", *JAMA*, Vol. 324/23, p. 2396, <https://doi.org/10.1001/jama.2020.23068>. [55]
- ESC (2024), "2024 ESC Guidelines for the management of elevated blood pressure and hypertension", *European Heart Journal*, Vol. 45/38, pp. 3912-4018, <https://doi.org/10.1093/eurheartj/ehae178>. [15]
- ESC (2021), "2021 ESC Guidelines on cardiovascular disease prevention in clinical practice", *European Heart Journal*, Vol. 42/34, pp. 3227-3337, <https://doi.org/10.1093/eurheartj/ehab484>. [131]
- ESC (2019), "2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk", *European Heart Journal*, Vol. 41/1, pp. 111-188, <https://doi.org/10.1093/eurheartj/ehz455>. [34]
- ESC Guidelines (2023), "2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes", *European Heart Journal*, Vol. 44/39, pp. 4043-4140, <https://doi.org/10.1093/eurheartj/ehad192>. [5]
- ESC/EAS (2011), "ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)", *European Heart Journal*, Vol. 32/14, pp. 1769-1818, <https://doi.org/10.1093/eurheartj/ehr158>. [32]
- ESS (2025), *European Social Survey European Research Infrastructure*. [125]
- EU (2021), *Saturated fat intake across the EU, Norway and the United Kingdom*, https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/dietary-fats-5b_en. [148]
- EU (2021), *Special Eurobarometer 506: Attitudes of Europeans towards tobacco and electronic cigarettes [Internet]*, http://data.europa.eu/88u/dataset/S2240_506_ENG (accessed on 7 August 2025). [225]
- EU (2021), *Trans Fatty Acid intake across the EU, Norway and the United Kingdom*, https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/dietary-fats-5e_en. [149]
- EU (2019), *Commission Regulation (EU) 2019/649 of 24 April 2019 amending Annex III to Regulation (EC) No 1925/2006 of the European Parliament and of the Council as regards trans fat, other than trans fat naturally occurring in fat of animal origin*. [150]
- EU (2019), *Trans-fat factsheet*, https://food.ec.europa.eu/document/download/ee6db065-4ccf-4a66-9c99-8adfaff25c0f_en?filename=fs_labelling-nutrition_trans-fats-factsheet_en.pdf. [147]

- European Commission (2024), *Standard drink, standard unit*, [228]
https://knowledge4policy.ec.europa.eu/glossary-item/standard-drink-standard-unit_en.
- European Commission (2021), *Report on the application of the Tobacco Products Directive*. [92]
- European Commission (n.d.), *Best practices Portal*, <https://webgate.ec.europa.eu/dyna/bp-portal/> [142]
 (accessed on 12 July 2025).
- European Environment Agency (2024), *Europe's air quality status 2024*, [174]
<https://www.eea.europa.eu/publications/europes-air-quality-status-2024>.
- European Environment Agency (2023), *Air pollution*, [179]
<https://www.eea.europa.eu/publications/beatng-cardiovascular-disease/air-pollution>.
- Eurostat (2024), *Almost 1 out of 10 in the EU could not afford a proper meal*, [134]
<https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240712-1>.
- Eurostat (2024), *Food price monitoring tool, Eurostat Database*, [136]
<https://ec.europa.eu/eurostat/cache/website/economy/food-price-monitoring/>.
- Eurostat (2023), *Persons reporting a work-related health problem by type of diagnose*, [171]
https://doi.org/10.2908/hsw_pb5.
- Eurostat (2021), *Persons reporting a chronic disease, by disease, sex, age and educational attainment level*. [29]
- Eurostat (2021a), *Self-reported work-related health problems and risk factors - key statistics*, [170]
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Self-reported_work-related_health_problems_and_risk_factors_-_key_statistics (accessed on 8 July 2025).
- Everard, C. et al. (2025), "Exploring the relationship between non-communicable diseases and depression", *OECD Health Working Papers*, No. 178, OECD Publishing, Paris, [65]
<https://doi.org/10.1787/02a1cfc5-en>.
- Farland, L. et al. (2023), "Infertility and Risk of Cardiovascular Disease: A Prospective Cohort Study", *Journal of the American Heart Association*, Vol. 12/5, [203]
<https://doi.org/10.1161/jaha.122.027755>.
- Feeney, S., V. Rossetti and J. Terrien (2022), "E-Cigarettes—a review of the evidence—harm versus harm reduction", *Tobacco Use Insights*, Vol. 15, [103]
<https://doi.org/10.1177/1179173x221087524>.
- Ference, B. et al. (2017), "Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel", *European Heart Journal*, Vol. 38/32, pp. 2459-2472, <https://doi.org/10.1093/eurheartj/ehx144>. [25]
- Fischer, F. and A. Kraemer (2015), "Meta-analysis of the association between second-hand smoke exposure and ischaemic heart diseases, COPD and stroke", *BMC Public Health*, Vol. 15/1, <https://doi.org/10.1186/s12889-015-2489-4>. [96]
- Flor, L. et al. (2024), "Health effects associated with exposure to secondhand smoke: a Burden of Proof study", *Nature Medicine*, Vol. 30/1, pp. 149-167, <https://doi.org/10.1038/s41591-023-02743-4>. [97]

- for the Metabolic Syndrome and Arteries Research (MARE) Consortium (2014), “Metabolic syndrome across Europe: Different clusters of risk factors”, *European Journal of Preventive Cardiology*, Vol. 22/4, pp. 486-491, <https://doi.org/10.1177/2047487314525529>. [51]
- Forouzanfar, M. et al. (2017), “Global Burden of Hypertension and Systolic Blood Pressure of at Least 110 to 115 mm Hg, 1990-2015”, *JAMA*, Vol. 317/2, p. 165, <https://doi.org/10.1001/jama.2016.19043>. [16]
- Franchini, M. and P. Mannucci (2012), “Air pollution and cardiovascular disease”, *Thrombosis Research*, Vol. 129/3, pp. 230-234, <https://doi.org/10.1016/j.thromres.2011.10.030>. [176]
- Frankenthal, D., L. Keinan-Boker and M. Bromberg (2022), “Rise in depression and anxiety during the COVID-19 pandemic: results from a cross-sectional national survey”, *Psychology, Health & Medicine*, Vol. 28/1, pp. 139-147, <https://doi.org/10.1080/13548506.2022.2057558>. [62]
- Galea, G. et al. (2025), “Quick buys for prevention and control of noncommunicable diseases”, *The Lancet Regional Health - Europe*, p. 101281, <https://doi.org/10.1016/j.lanepe.2025.101281>. [129]
- Galea, G. et al. (2025), “Quick buys for prevention and control of noncommunicable diseases”, *The Lancet Regional Health - Europe*, Vol. 52, p. 101281, <https://doi.org/10.1016/j.lanepe.2025.101281>. [21]
- Garcia Herrero, L. et al. (2025), “Criteria for Sustainable Public Procurement (SPP) for Food, Food services, and Vending machines”, *Office of the European Union*, <https://doi.org/10.2760/0895877>. [47]
- George, J. et al. (2019), “Cardiovascular Effects of Switching From Tobacco Cigarettes to Electronic Cigarettes”, *Journal of the American College of Cardiology*, Vol. 74/25, pp. 3112-3120, <https://doi.org/10.1016/j.jacc.2019.09.067>. [111]
- Golabchi, A. (2010), “What Every Cardiologist Should Know about H1N1?”, *ARYA Atheroscler*, Vol. 6/3, pp. 118-21, <https://pmc.ncbi.nlm.nih.gov/articles/PMC3347827/>. [68]
- Goodchild, M., N. Nargis and E. Tursan d'Espaignet (2017), “Global economic cost of smoking-attributable diseases”, *Tobacco Control*, Vol. 27/1, pp. 58-64, <https://doi.org/10.1136/tobaccocontrol-2016-053305>. [89]
- Goraya, T. et al. (2002), “Coronary atherosclerosis in diabetes mellitus”, *Journal of the American College of Cardiology*, Vol. 40/5, pp. 946-953, [https://doi.org/10.1016/s0735-1097\(02\)02065-X](https://doi.org/10.1016/s0735-1097(02)02065-X). [9]
- Gronlund, C. (2014), “Racial and Socioeconomic Disparities in Heat-Related Health Effects and Their Mechanisms: a Review”, *Current Epidemiology Reports*, Vol. 1/3, pp. 165-173, <https://doi.org/10.1007/s40471-014-0014-4>. [186]
- Gudzune, K. and R. Kushner (2024), “Medications for Obesity”, *JAMA*, Vol. 332/7, p. 571, <https://doi.org/10.1001/jama.2024.10816>. [43]
- Hanna, M., A. Wabnitz and P. Grewal (2024), “Sex and stroke risk factors: A review of differences and impact”, *Journal of Stroke and Cerebrovascular Diseases*, Vol. 33/4, p. 107624, <https://doi.org/10.1016/j.jstrokecerebrovasdis.2024.107624>. [198]

- Havard, S. et al. (2011), “Social inequalities in residential exposure to road traffic noise: An environmental justice analysis based on the RECORD Cohort Study”, *Occupational and Environmental Medicine*, Vol. 68/5, pp. 366-374, <https://doi.org/10.1136/oem.2010.060640>. [191]
- Henderson, E. et al. (2021), “Secondhand smoke exposure assessment in outdoor hospitality venues across 11 European countries”, *Environmental Research*, Vol. 200, p. 111355, <https://doi.org/10.1016/j.envres.2021.111355>. [102]
- Hendren, N. et al. (2020), “Description and Proposed Management of the Acute COVID-19 Cardiovascular Syndrome”, *Circulation*, Vol. 141/23, pp. 1903-1914, <https://doi.org/10.1161/circulationaha.120.047349>. [72]
- Henking, C., A. Reeves and B. Chrisinger (2023), “Global inequalities in mental health problems: understanding the predictors of lifetime prevalence, treatment utilisation and perceived helpfulness across 111 countries”, *Preventive Medicine*, Vol. 177, p. 107769, <https://doi.org/10.1016/j.ypmed.2023.107769>. [58]
- Hidaka, B. (2012), “Depression as a disease of modernity: Explanations for increasing prevalence”, *Journal of Affective Disorders*, Vol. 140/3, pp. 205-214, <https://doi.org/10.1016/j.jad.2011.12.036>. [63]
- Hindy, G. (ed.) (2021), “Polygenic risk scores in cardiovascular risk prediction: A cohort study and modelling analyses”, *PLOS Medicine*, Vol. 18/1, p. e1003498, <https://doi.org/10.1371/journal.pmed.1003498>. [222]
- Hippisley-Cox, J., C. Coupland and P. Brindle (2017), “Development and validation of QRISK3 risk prediction algorithms to estimate future risk of cardiovascular disease: prospective cohort study”, *BMJ*, p. j2099, <https://doi.org/10.1136/bmj.j2099>. [217]
- Honigberg, M. et al. (2022), “Low depression frequency is associated with decreased risk of cardiometabolic disease”, *Nature Cardiovascular Research*, Vol. 1/2, pp. 125-131, <https://doi.org/10.1038/s44161-021-00011-7>. [53]
- Huang, B. et al. (2021), “Sleep and physical activity in relation to all-cause, cardiovascular disease and cancer mortality risk”, *British Journal of Sports Medicine*, Vol. 56/13, pp. 718-724, <https://doi.org/10.1136/bjsports-2021-104046>. [163]
- IDF (2025), *IDF Diabetes Atlas 11th edition 2025*. [6]
- IHME (2024), *GBD 2021 Cause and Risk Summary*. [7]
- IHME (2021), *GDB Compare*, <https://healthdata-digex.healthdata.org/data-tools-practices/interactive-data-visuals> (accessed on 16 June 2025). [1]
- Izquierdo-Condoy, J. et al. (2024), “Direct health implications of e-cigarette use: a systematic scoping review with evidence assessment”, *Frontiers in Public Health*, Vol. 12, <https://doi.org/10.3389/fpubh.2024.1427752>. [106]
- Jaspan, V. et al. (2024), “The Role of Sleep in Cardiovascular Disease”, *Current Atherosclerosis Reports*, Vol. 26/7, pp. 249-262, <https://doi.org/10.1007/s11883-024-01207-5>. [152]
- Jensen, C. (2024), “Cardiovascular Disease in the Aging Population: Addressing Challenges and Management Approaches”, *J Cardiovasc Disc Diagn*, Vol. 12, p. 629, <https://doi.org/10.37421/2329-9517.2024.12.629>. [194]

- Jeong, S. et al. (2023), “Effects of Diet on 10-Year Atherosclerotic Cardiovascular Disease Risk (from the DASH Trial)”, *The American Journal of Cardiology*, Vol. 187, pp. 10-17, <https://doi.org/10.1016/j.amjcard.2022.10.019>. [133]
- Johansson, T. et al. (2022), “Oral Contraceptives, Hormone Replacement Therapy, and Stroke Risk”, *Stroke*, Vol. 53/10, pp. 3107-3115, <https://doi.org/10.1161/strokeaha.121.038659>. [211]
- Jouanjus, E. et al. (2017), “What is the Current Knowledge About the Cardiovascular Risk for Users of Cannabis-Based Products? A Systematic Review”, *Current Atherosclerosis Reports*, Vol. 19/6, <https://doi.org/10.1007/s11883-017-0663-0>. [114]
- Jowell, A. et al. (2022), “Abstract 462: Clinical And Genetic Risk Factors Underlying Family History Of Heart Disease”, *Arteriosclerosis, Thrombosis, and Vascular Biology*, Vol. 42/Suppl_1, https://doi.org/10.1161/atvb.42.suppl_1.462. [215]
- Kamel, I. et al. (2025), “Myocardial Infarction and Cardiovascular Risks Associated With Cannabis Use”, *JACC: Advances*, Vol. 4/5, p. 101698, <https://doi.org/10.1016/j.jacadv.2025.101698>. [116]
- Karami, N. et al. (2023), “Global prevalence of depression, anxiety, and stress in cardiac patients: A systematic review and meta-analysis”, *Journal of Affective Disorders*, Vol. 324, pp. 175-189, <https://doi.org/10.1016/j.jad.2022.12.055>. [60]
- Kazi, D. et al. (2024), “Climate Change and Cardiovascular Health”, *JAMA Cardiology*, Vol. 9/8, p. 748, <https://doi.org/10.1001/jamacardio.2024.1321>. [185]
- Kivimäki, M. and I. Kawachi (2015), “Work Stress as a Risk Factor for Cardiovascular Disease”, *Current Cardiology Reports*, Vol. 17/9, <https://doi.org/10.1007/s11886-015-0630-8>. [164]
- Kivimäki, M. et al. (2006), “Work stress in the etiology of coronary heart disease—a meta-analysis”, *Scandinavian Journal of Work, Environment & Health*, Vol. 32/6, pp. 431-442, <https://doi.org/10.5271/sjweh.1049>. [166]
- Krismanuel, H. (2025), “Air pollution and cardiovascular diseases: mechanisms, evidence, and mitigation strategies”, *Journal of Medicine and Life*, Vol. 18/5, pp. 411-427, <https://doi.org/10.25122/jml-2025-0018>. [178]
- Kuehn, B. (2019), “Sleep Duration Linked to Cardiovascular Disease”, *Circulation*, Vol. 139/21, pp. 2483-2484, <https://doi.org/10.1161/circulationaha.119.041278>. [158]
- Kwapong, Y. et al. (2023), “Association of Depression and Poor Mental Health With Cardiovascular Disease and Suboptimal Cardiovascular Health Among Young Adults in the United States”, *Journal of the American Heart Association*, Vol. 12/3, <https://doi.org/10.1161/jaha.122.028332>. [59]
- Kwapong, Y. et al. (2023), “Association of Depression and Poor Mental Health With Cardiovascular Disease and Suboptimal Cardiovascular Health Among Young Adults in the United States”, *Journal of the American Heart Association*, Vol. 12/3, <https://doi.org/10.1161/jaha.122.028332>. [54]
- Kwong, E. et al. (2022), “Population-level salt intake in the WHO European Region in 2022: a systematic review”, *Public Health Nutrition*, Vol. 26/S1, pp. s6-s19, <https://doi.org/10.1017/s136898002200218x>. [138]

- Kwong, J. et al. (2018), “Acute Myocardial Infarction after Laboratory-Confirmed Influenza Infection”, *New England Journal of Medicine*, Vol. 378/4, pp. 345-353, <https://doi.org/10.1056/nejmoa1702090>. [66]
- Lao, X. et al. (2018), “Sleep Quality, Sleep Duration, and the Risk of Coronary Heart Disease: A Prospective Cohort Study With 60,586 Adults”, *Journal of Clinical Sleep Medicine*, Vol. 14/01, pp. 109-117, <https://doi.org/10.5664/jcsm.6894>. [157]
- Lawes, C. et al. (2004), “Blood Pressure and Stroke”, *Stroke*, Vol. 35/3, pp. 776-785, <https://doi.org/10.1161/01.str.0000116869.64771.5a>. [17]
- Law, M., J. Morris and N. Wald (2009), “Use of blood pressure lowering drugs in the prevention of cardiovascular disease: meta-analysis of 147 randomised trials in the context of expectations from prospective epidemiological studies”, *BMJ*, Vol. 338/may19 1, pp. b1665-b1665, <https://doi.org/10.1136/bmj.b1665>. [22]
- Leosdottir, M. et al. (2023), “Temporal trends in cardiovascular risk factors, lifestyle and secondary preventive medication for patients with myocardial infarction attending cardiac rehabilitation in Sweden 2006–2019: a registry-based cohort study”, *BMJ Open*, Vol. 13/5, p. e069770, <https://doi.org/10.1136/bmjopen-2022-069770>. [48]
- Li, A. et al. (2025), “Climate warming may undermine sleep duration and quality in repeated-measure study of 23 million records”, *Nature Communications*, Vol. 16/1, <https://doi.org/10.1038/s41467-025-57781-y>. [161]
- Li, B. et al. (2020), “Prevalence and impact of cardiovascular metabolic diseases on COVID-19 in China”, *Clinical Research in Cardiology*, Vol. 109/5, pp. 531-538, <https://doi.org/10.1007/s00392-020-01626-9>. [74]
- Lindley, R. (2018), “Stroke Prevention in the Very Elderly”, *Stroke*, Vol. 49/3, pp. 796-802, <https://doi.org/10.1161/strokeaha.117.017952>. [23]
- Lippi, G. and M. Plebani (2020), “Laboratory abnormalities in patients with COVID-2019 infection”, *Clinical Chemistry and Laboratory Medicine (CCLM)*, Vol. 58/7, pp. 1131-1134, <https://doi.org/10.1515/cclm-2020-0198>. [75]
- Lubin, J. et al. (2016), “Risk of Cardiovascular Disease from Cumulative Cigarette Use and the Impact of Smoking Intensity”, *Epidemiology*, Vol. 27/3, pp. 395-404, <https://doi.org/10.1097/ede.0000000000000437>. [93]
- Ma, C. et al. (2021), “Global trends in the prevalence of secondhand smoke exposure among adolescents aged 12–16 years from 1999 to 2018: an analysis of repeated cross-sectional surveys”, *The Lancet Global Health*, Vol. 9/12, pp. e1667-e1678, [https://doi.org/10.1016/s2214-109x\(21\)00365-x](https://doi.org/10.1016/s2214-109x(21)00365-x). [101]
- Madrid, J. et al. (2024), “Cardioprotective effects of vaccination in hospitalized patients with COVID-19”, *Clinical and Experimental Medicine*, Vol. 24/1, <https://doi.org/10.1007/s10238-024-01367-3>. [77]
- Maes, M. et al. (2022), “Monitoring exposure to climate-related hazards: Indicator methodology and key results”, *OECD Environment Working Papers*, No. 201, OECD Publishing, Paris, <https://doi.org/10.1787/da074cb6-en>. [187]

- Maki, K., M. Dicklin and C. Kirkpatrick (2021), “Saturated fats and cardiovascular health: Current evidence and controversies”, *Journal of Clinical Lipidology*, Vol. 15/6, pp. 765-772, <https://doi.org/10.1016/j.jacl.2021.09.049>. [146]
- Masmoum, M. et al. (2024), “The Effectiveness of Exercise in Reducing Cardiovascular Risk Factors Among Adults: A Systematic Review and Meta-Analysis”, *Cureus*, <https://doi.org/10.7759/cureus.68928>. [126]
- Mathieu-Bolh, N. (forthcoming), “Economic and policy implications of breakthrough obesity treatment”. [46]
- Matricciani, L. et al. (2017), “Past, present, and future: trends in sleep duration and implications for public health”, *Sleep Health*, Vol. 3/5, pp. 317-323, <https://doi.org/10.1016/j.sleh.2017.07.006>. [160]
- Mensah, A. (2021), “Job Stress and Mental Well-Being among Working Men and Women in Europe: The Mediating Role of Social Support”, *International Journal of Environmental Research and Public Health*, Vol. 18/5, p. 2494, <https://doi.org/10.3390/ijerph18052494>. [172]
- Ministerio de la Presidencia, Justicia y Relaciones con las Cortes (2025), *Real Decreto 315/2025*, https://www.boe.es/diario_boe/txt.php?id=BOE-A-2025-7659. [135]
- Moiz, A. et al. (2025), “Efficacy and Safety of Glucagon-Like Peptide-1 Receptor Agonists for Weight Loss Among Adults Without Diabetes”, *Annals of Internal Medicine*, Vol. 178/2, pp. 199-217, <https://doi.org/10.7326/annals-24-01590>. [42]
- Mottillo, S. et al. (2010), “The Metabolic Syndrome and Cardiovascular Risk”, *Journal of the American College of Cardiology*, Vol. 56/14, pp. 1113-1132, <https://doi.org/10.1016/j.jacc.2010.05.034>. [49]
- Münzel, T., M. Sørensen and A. Daiber (2021), “Transportation noise pollution and cardiovascular disease”, *Nature Reviews Cardiology*, Vol. 18/9, pp. 619-636, <https://doi.org/10.1038/s41569-021-00532-5>. [190]
- Murphy, E. and E. King (2022), *Environmental noise pollution: Noise mapping, public health, and policy*, Elsevier, <https://doi.org/10.1016/C2012-0-13587-0>. [188]
- Nagai, M., S. Hoshida and K. Kario (2010), “Sleep Duration as a Risk Factor for Cardiovascular Disease- a Review of the Recent Literature”, *Current Cardiology Reviews*, Vol. 6/1, pp. 54-61, <https://doi.org/10.2174/157340310790231635>. [162]
- NCD-RisC (2020), “Repositioning of the global epicentre of non-optimal cholesterol”, *Nature*, Vol. 582/7810, pp. 73-77, <https://doi.org/10.1038/s41586-020-2338-1>. [30]
- Ng, M. et al. (2025), “Global, regional, and national prevalence of adult overweight and obesity, 1990–2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021”, *The Lancet*, Vol. 405/10481, pp. 813-838, [https://doi.org/10.1016/s0140-6736\(25\)00355-1](https://doi.org/10.1016/s0140-6736(25)00355-1). [41]
- NHS England (2025), *This May Measure Month get your blood pressure checked to help avoid the number one cause of preventable death worldwide*, <https://www.england.nhs.uk/north-west/2025/05/06/this-may-measure-month-get-your-blood-pressure-checked-to-help-avoid-the-number-one-cause-of-preventable-death-worldwide>. [28]

- NHS Gloucestershire (2024), *Know Your Numbers: more than 1,250 people so far take up the offer of blood pressure checks at community drop-in events*, <https://www.nhsglos.nhs.uk/news/know-your-numbers-more-than-1250-people-so-far-take-up-the-offer-of-blood-pressure-checks-at-community-drop-in-events/>. [27]
- Nielsen, R., J. Banner and S. Jensen (2020), “Cardiovascular disease in patients with severe mental illness”, *Nature Reviews Cardiology*, Vol. 18/2, pp. 136-145, <https://doi.org/10.1038/s41569-020-00463-7>. [56]
- O’Kelly, A. et al. (2022), “Pregnancy and Reproductive Risk Factors for Cardiovascular Disease in Women”, *Circulation Research*, Vol. 130/4, pp. 652-672, <https://doi.org/10.1161/circresaha.121.319895>. [199]
- OECD (2025), *Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS)*, OECD Publishing, Paris, <https://doi.org/10.1787/c8af05a5-en>. [224]
- OECD (2025), “The prevalence and impact of Long COVID in the primary care population: Findings from the OECD PaRIS survey”, OECD Publishing, Paris, <https://doi.org/10.1787/119b0e8f-en>. [85]
- OECD (2024), *Tobacco Taxation in Latin America and the Caribbean: A Call for Tobacco Tax Reform*, OECD Publishing, Paris, <https://doi.org/10.1787/080cd662-en>. [95]
- OECD (2022), *Promoting Health and Well-being at Work: Policy and Practices*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/e179b2a5-en>. [173]
- OECD (2021), *Preventing Harmful Alcohol Use*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/6e4b4ffb-en>. [123]
- OECD/European Commission (2024), *Health at a Glance: Europe 2024: State of Health in the EU Cycle*, OECD Publishing, Paris, <https://doi.org/10.1787/b3704e14-en>. [137]
- OECD/European Commission (2024), *Health at a Glance: Europe 2024: State of Health in the EU Cycle*, OECD Publishing, Paris, <https://doi.org/10.1787/b3704e14-en>. [91]
- OECD/WHO (2023), *Step Up! Tackling the Burden of Insufficient Physical Activity in Europe*, OECD Publishing, Paris, <https://doi.org/10.1787/500a9601-en>. [128]
- Okoth, K. et al. (2020), “Association between the reproductive health of young women and cardiovascular disease in later life: umbrella review”, *BMJ*, p. m3502, <https://doi.org/10.1136/bmj.m3502>. [202]
- Omidi, F. et al. (2023), “Influenza vaccination and major cardiovascular risk: a systematic review and meta-analysis of clinical trials studies”, *Scientific Reports*, Vol. 13/1, <https://doi.org/10.1038/s41598-023-47690-9>. [79]
- Oono, I., D. Mackay and J. Pell (2011), “Meta-analysis of the association between secondhand smoke exposure and stroke”, *Journal of Public Health*, Vol. 33/4, pp. 496-502, <https://doi.org/10.1093/pubmed/fdr025>. [98]
- Parikh, N. et al. (2021), “Adverse Pregnancy Outcomes and Cardiovascular Disease Risk: Unique Opportunities for Cardiovascular Disease Prevention in Women: A Scientific Statement From the American Heart Association”, *Circulation*, Vol. 143/18, pp. e902-e916, <https://doi.org/10.1161/CIR.0000000000000961>. [204]

- Patel, N. et al. (2022), “Racial/Ethnic Disparities and Determinants of Sufficient Physical Activity Levels”, *Kansas Journal of Medicine*, Vol. 15/2, pp. 267-272, <https://doi.org/10.17161/kjm.vol15.17592>. [220]
- Patel, P. and R. Giugliano (2020), “Low-density lipoprotein cholesterol lowering therapy for the secondary prevention of atherosclerotic cardiovascular disease”, *Global Cardiology Science and Practice*, Vol. 2020/3, <https://doi.org/10.21542/gcsp.2020.39>. [33]
- Paulraj, S. et al. (2025), “Arrhythmias and cannabis use: A comprehensive overview”, *Heart Rhythm O2*, Vol. 6/1, pp. 78-85, <https://doi.org/10.1016/j.hroo.2024.10.020>. [117]
- Perez, M., V. Musini and J. Wright (2009), “Effect of early treatment with anti-hypertensive drugs on short and long-term mortality in patients with an acute cardiovascular event”, *Cochrane Database of Systematic Reviews*, <https://doi.org/10.1002/14651858.cd006743.pub2>. [20]
- Peterson, L., C. McKenzie and J. Schaffer (2012), “Diabetic Cardiovascular Disease: Getting to the Heart of the Matter”, *Journal of Cardiovascular Translational Research*, Vol. 5/4, pp. 436-445, <https://doi.org/10.1007/s12265-012-9374-7>. [13]
- Peters, S., R. Huxley and M. Woodward (2014), “Diabetes as a risk factor for stroke in women compared with men: a systematic review and meta-analysis of 64 cohorts, including 775 385 individuals and 12 539 strokes”, *The Lancet*, Vol. 383/9933, pp. 1973-1980, [https://doi.org/10.1016/s0140-6736\(14\)60040-4](https://doi.org/10.1016/s0140-6736(14)60040-4). [12]
- Poon, K. et al. (2024), “Mediating roles of sleep quality and resilience in the relationships between chronotypes and mental health symptoms”, *Scientific Reports*, Vol. 14/1, <https://doi.org/10.1038/s41598-024-56688-w>. [159]
- Programa Activa (n.d.), *Programa Activa – Gobierno de Murcia*, <https://activamurcia.com/> (accessed on 12 July 2025). [141]
- Quan, S. (2009), “Sleep Disturbances and Their Relationship to Cardiovascular Disease”, *American Journal of Lifestyle Medicine*, Vol. 3/1_suppl, pp. 55S-59S, <https://doi.org/10.1177/1559827609331709>. [155]
- Rai, A. (2025), “Excessive Drinking Raises Heart Disease Risk”, *Medscape*, <https://www.medscape.com/viewarticle/excessive-drinking-raises-heart-disease-risk-2025a10004es?form=fpf>. [213]
- Rajagopalan, S., S. Al-Kindi and R. Brook (2018), “Air Pollution and Cardiovascular Disease”, *Journal of the American College of Cardiology*, Vol. 72/17, pp. 2054-2070, <https://doi.org/10.1016/j.jacc.2018.07.099>. [175]
- Ramar, K. et al. (2021), “Sleep is essential to health: an American Academy of Sleep Medicine position statement”, *Journal of Clinical Sleep Medicine*, Vol. 17/10, pp. 2115-2119, <https://doi.org/10.5664/jcsm.9476>. [151]
- Region de Murcia (2025), *CARM.es - El Gobierno regional subvenciona el programa 'Activa tu ocio' con una amplia oferta de actividades inclusivas para el tiempo libre*, [https://www.carm.es/web/pagina?IDCONTENIDO=121011&IDTIPO=10&RASTRO=c54\\$s3\\$m](https://www.carm.es/web/pagina?IDCONTENIDO=121011&IDTIPO=10&RASTRO=c54$s3$m) (accessed on 12 July 2025). [143]
- Reynolds, A. et al. (2022), “Saturated fat and trans-fat intakes and their replacement with other macronutrients A systematic review and meta-analysis of prospective observational studies”. [144]

- Rich-Edwards, J. et al. (2019), "Randomized Trial to Reduce Cardiovascular Risk in Women with Recent Preeclampsia", *Journal of Women's Health*, Vol. 28/11, pp. 1493-1504, <https://doi.org/10.1089/jwh.2018.7523>. [212]
- Ritsinger, V. et al. (2020), "Heart failure is a common complication after acute myocardial infarction in patients with diabetes: A nationwide study in the SWEDEHEART registry", *European Journal of Preventive Cardiology*, Vol. 27/17, pp. 1890-1901, <https://doi.org/10.1177/2047487319901063>. [14]
- Ross, R. et al. (2020), "Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity", *Nature Reviews Endocrinology*, Vol. 16/3, pp. 177-189, <https://doi.org/10.1038/s41574-019-0310-7>. [38]
- Rus, M. et al. (2023), "Prevalence and Risk Factors of Metabolic Syndrome: A Prospective Study on Cardiovascular Health", *Medicina*, Vol. 59/10, p. 1711, <https://doi.org/10.3390/medicina59101711>. [52]
- Samani, N. et al. (2024), "Polygenic risk score adds to a clinical risk score in the prediction of cardiovascular disease in a clinical setting", *European Heart Journal*, Vol. 45/34, pp. 3152-3160, <https://doi.org/10.1093/eurheartj/ehae342>. [221]
- Santé Publique France (2022), *Hospitalizations for cardiovascular diseases attributable to tobacco smoking in France in 2015*. [90]
- SCHEER (2021), *Scientific Committee on Health, Environmental and Emerging Risks (SCHEER) Opinion on electronic cigarettes*, European Commission, <https://doi.org/10.2875/457545>. [112]
- Schienkiewitz, A. et al. (2017), "Overweight and obesity among adults in Germany", *Health Monit*, Vol. 2/2, pp. 20-27, <https://doi.org/10.17886/RKI-GBE-2017-038>. [2]
- Sebastian, S. et al. (2025), "Cannabis use and atherosclerotic cardiovascular disease outcomes: A meta-analysis of multinational cohort data", *Disease-a-Month*, Vol. 71/3, p. 101849, <https://doi.org/10.1016/j.disamonth.2024.101849>. [113]
- Shufelt, C. and C. Bairey Merz (2009), "Contraceptive Hormone Use and Cardiovascular Disease", *Journal of the American College of Cardiology*, Vol. 53/3, pp. 221-231, <https://doi.org/10.1016/j.jacc.2008.09.042>. [209]
- Siam, N. et al. (2024), "Diabetes Mellitus and Cardiovascular Disease: Exploring Epidemiology, Pathophysiology, and Treatment Strategies", *Reviews in Cardiovascular Medicine*, Vol. 25/12, <https://doi.org/10.31083/j.rcm2512436>. [10]
- Silva, G. et al. (2024), "Blood pressure management to prevent recurrent stroke: current evidence and perspectives", *npj Cardiovascular Health*, Vol. 1/1, <https://doi.org/10.1038/s44325-024-00021-x>. [19]
- Starker, A. et al. (2025), "Prevalence of obesity and smoking among adults in Germany - trends from 2003 to 2023", *J Health Monit*, Vol. 10/1, <https://doi.org/10.25646/13038>. [3]
- Stead, L. et al. (2013), "Physician advice for smoking cessation", *Cochrane Database of Systematic Reviews*, Vol. 2013/5, <https://doi.org/10.1002/14651858.cd000165.pub4>. [223]

- Storck, W. et al. (2025), “Cardiovascular risk associated with the use of cannabis and cannabinoids: a systematic review and meta-analysis”, *Heart*, pp. heartjnl-2024-325429, <https://doi.org/10.1136/heartjnl-2024-325429>. [120]
- Sun, J. et al. (2023), “Global, regional, and national burden of cardiovascular diseases in youths and young adults aged 15–39 years in 204 countries/territories, 1990–2019: a systematic analysis of Global Burden of Disease Study 2019”, *BMC Medicine*, Vol. 21/1, <https://doi.org/10.1186/s12916-023-02925-4>. [196]
- Sun, Q., X. Hong and L. Wold (2010), “Cardiovascular Effects of Ambient Particulate Air Pollution Exposure”, *Circulation*, Vol. 121/25, pp. 2755–2765, <https://doi.org/10.1161/circulationaha.109.893461>. [177]
- The Lancet (2020), <https://www.thelancet.com/pb-assets/Lancet/gbd/summaries/risks/second-hand-smoke.pdf>. [100]
- Trinh, A. et al. (2023), “Contraception and Cardiovascular Effects: What Should the Cardiologist Know?”, *Current Cardiology Reports*, Vol. 25/11, pp. 1489–1498, <https://doi.org/10.1007/s11886-023-01981-9>. [207]
- Tsampsasian, V. et al. (2024), “Cardiovascular disease as part of Long COVID: a systematic review”, *European Journal of Preventive Cardiology*, Vol. 32/6, pp. 485–498, <https://doi.org/10.1093/eurjpc/zwae070>. [82]
- Twenge, J. et al. (2018), “Digital Media May Explain a Substantial Portion of the Rise in Depressive Symptoms Among Adolescent Girls: Response to Daly”, *Clinical Psychological Science*, Vol. 6/3, pp. 296–297, <https://doi.org/10.1177/2167702618759321>. [64]
- U.S. Department of Health and Human Services (2010), *How Tobacco Smoke Causes Disease*. [88]
- U.S. Dept of Health and Human Services (2014), *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*. [99]
- Ungvari, Z. et al. (2025), “Inadequate sleep increases stroke risk: evidence from a comprehensive meta-analysis of incidence and mortality”, *GeroScience*, <https://doi.org/10.1007/s11357-025-01593-x>. [154]
- Vahtera, J. et al. (2004), “Organisational downsizing, sickness absence, and mortality: 10-town prospective cohort study”, *BMJ*, Vol. 328/7439, p. 555, <https://doi.org/10.1136/bmj.37972.496262.0d>. [169]
- Vasan, R. et al. (2001), “Impact of High-Normal Blood Pressure on the Risk of Cardiovascular Disease”, *New England Journal of Medicine*, Vol. 345/18, pp. 1291–1297, <https://doi.org/10.1056/nejmoa003417>. [24]
- Vassiliou, V. et al. (2025), “Cardiovascular disease prevention and management in COVID-19: a clinical consensus statement of the European Association of Preventive Cardiology, the European Association of Cardiovascular Imaging, the Association of Cardiovascular Nursing & Allied Professions, the European Association of Percutaneous Cardiovascular Interventions, and the Heart Failure Association of the ESC”, *European Journal of Preventive Cardiology*, <https://doi.org/10.1093/eurjpc/zwaf540>. [73]

- Veldheer, S. et al. (2019), “Pulmonary and other health effects of electronic cigarette use among adult smokers participating in a randomized controlled smoking reduction trial”, *Addictive Behaviors*, Vol. 91, pp. 95-101, <https://doi.org/10.1016/j.addbeh.2018.10.041>. [108]
- Vogel, B. et al. (2021), “The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030”, *The Lancet*, Vol. 397/10292, pp. 2385-2438, [https://doi.org/10.1016/S0140-6736\(21\)00684-X/ASSET/F41BEF47-0EB8-460A-B7CB-D9C370907872/MAIN.ASSETS/GR4.JPG](https://doi.org/10.1016/S0140-6736(21)00684-X/ASSET/F41BEF47-0EB8-460A-B7CB-D9C370907872/MAIN.ASSETS/GR4.JPG). [200]
- Weilhammer, V. et al. (2021), “Extreme weather events in Europe and their health consequences – A systematic review”, *International Journal of Hygiene and Environmental Health*, Vol. 233, p. 113688, <https://doi.org/10.1016/j.ijheh.2021.113688>. [184]
- Whelton, S. et al. (2020), “Association of Normal Systolic Blood Pressure Level With Cardiovascular Disease in the Absence of Risk Factors”, *JAMA Cardiology*, Vol. 5/9, p. 1011, <https://doi.org/10.1001/jamacardio.2020.1731>. [18]
- WHF (2025), *World Heart Report 2025 - World Heart Report 2025*, <https://world-heart-federation.org/report2025/> (accessed on 12 July 2025). [37]
- WHO (2025), *From policy to plate: how countries can reduce salt intake and protect people's health*, <https://www.who.int/europe/news/item/15-05-2025-from-policy-to-plate--how-countries-can-reduce-salt-intake-and-protect-people-s-health>. [140]
- WHO (2025), *Sodium reduction*, <https://www.who.int/news-room/fact-sheets/detail/sodium-reduction>. [139]
- WHO (2024), *Global status report on alcohol and health and treatment of substance use disorders*, World Health Organization. [121]
- WHO (2023), *Global Tobacco Surveillance System (GTSS)*. [105]
- WHO (2023), “Saturated fatty acid and trans-fatty acid intake for adults and children WHO guideline”. [145]
- WHO (2022), *European framework for action on alcohol 2022–2025*, World Health Organization. [124]
- WHO (2022), *Post COVID-19 condition (Long COVID)*, <https://www.who.int/europe/news-room/fact-sheets/item/post-covid-19-condition>. [81]
- WHO (2020), *Tobacco use and exposure to second-hand smoke linked to more than 20% of deaths from coronary heart disease*, World Health Organization, <https://www.who.int/europe/news/item/29-09-2020-tobacco-use-and-exposure-to-second-hand-smoke-linked-to-more-than-20-of-deaths-from-coronary-heart-disease>. [87]
- WHO (2018), *Environmental Noise Guidelines for the European Region*, World Health Organization, <https://www.who.int/europe/publications/i/item/9789289053563>. [189]
- WHO (2013), *Global action plan for the prevention and control of noncommunicable diseases 2013-2020.*, <https://iris.who.int/server/api/core/bitstreams/15f51d0a-bfbd-43ad-a637-73778feb57e3/content>. [226]
- WHO Europe (2024), *Prevalence of tobacco and e-cigarette use by young people in the HWO European region*. [104]

- WHO Global Health Observatory (2025), *Body mass index among adults*, [39]
<https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/bmi-among-adults>.
- WHO Global Health Observatory (2025), *Body mass index among children*, [40]
<https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/bmi-among-children>.
- WHO Global Health Observatory (2024), *Diabetes, prevalence (%)*, [4]
<https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-diabetes-age-standardized>.
- Williams, J. et al. (2024), "Differences in cardiovascular risk factors associated with sex and gender identity, but not gender expression, in young, healthy cisgender adults", *Frontiers in Cardiovascular Medicine*, Vol. 11, <https://doi.org/10.3389/fcvm.2024.1374765>. [210]
- Wood, A. et al. (2018), *Risk thresholds for alcohol consumption: combined analysis of individual-participant data for 599912 current drinkers in 83 prospective studies*. [122]
- Xie, Y., T. Choi and Z. Al-Aly (2025), "Author Correction: Mapping the effectiveness and risks of GLP-1 receptor agonists", *Nature Medicine*, Vol. 31/3, pp. 1038-1038, <https://doi.org/10.1038/s41591-025-03542-9>. [45]
- Xie, Y., T. Choi and Z. Al-Aly (2024), "Postacute Sequelae of SARS-CoV-2 Infection in the Pre-Delta, Delta, and Omicron Eras", *New England Journal of Medicine*, Vol. 391/6, pp. 515-525, <https://doi.org/10.1056/nejmoa2403211>. [83]
- Yonis, H. et al. (2025), "Stroke and myocardial infarction with contemporary hormonal contraception: real-world, nationwide, prospective cohort study", *BMJ*, p. e082801, <https://doi.org/10.1136/bmj-2024-082801>. [206]
- Zila-Velasque, J. et al. (2024), "Prevalence of metabolic syndrome and its components according to altitude levels: a systematic review and meta-analysis", *Scientific Reports*, Vol. 14/1, <https://doi.org/10.1038/s41598-024-77928-z>. [50]

Annex 3.A. DALY Definitions

Disability Adjusted Life Year (DALY)

DALYs are a measure of overall disease burden, one DALY is equivalent to the loss of one year of full health, combining Years of Life Lost (YLLs), due to premature mortality, and Years Lived with Disability (YLDs).

Attributable burden is the reduction in current disease burden that would have been possible if past population exposure had shifted to an alternative or counter-factual distribution of risk exposure. Deaths and DALYs can be attributed to several risk factors at once and are not summative.

Risk factor estimates defined by the Institute for Health Metrics and Evaluation (IHME) model the risk factor attributions

Metabolic risks

- High systolic blood pressure – estimation of brachial systolic blood pressure, using a theoretical minimum risk exposure level (TMREL) ranging from 105 to 115 mmHg.
- High low-density lipoprotein cholesterol (LDL-c) – is the estimated blood concentration of LDL-c in units of mmol/L with a TMREL of 0.9 and 1.4 mmol/L.
- High body-mass index (BMI) – is defined for adults ages 20 and older as BMI greater than 20-23kg/m².
- High blood sugar – called “high fasting plasma glucose” (levels recorded after no eating or drinking for 8 hours) is defined as any level above the theoretical minimum risk exposure level of 4.9-5.3 mmol/L.
- Kidney dysfunction – is defined as estimated glomerular filtration rate (eGFR) less than 60ml/min/1.73m² or albumin to creatinine ratio (ACR) $\leq$ 30mg/g. The TMREL value used is ACR < 30mg/g and eGFR $\geq$ 60ml/min/1.73m²

Behavioural risks

- Dietary risk includes factors associated with CVD such as diets low in fruit, vegetables, whole grains, milk and fiber, and high in sodium, trans fatty acids, sugar-sweetened beverages, red meat and processed meat.
- Tobacco use includes estimates about smoking (current and former), second-hand smoke (at home, at work and in other public places) and chewing tobacco (use of primary chewing tobacco, non-chew smokeless tobacco and all other smokeless tobacco).
- Harmful use of alcohol is defined as the excess of the region-, age-, sex-, and year-specific theoretical minimum risk exposure level (TMREL). Current drinkers are defined as individuals consuming at least one alcoholic beverage in the past year. The estimate level of alcohol exposure for current drinkers is the reported average grammes of pure alcohol consumed per day (g/day).
- Physical inactivity measured in total metabolic equivalent (MET)-minutes per week and defined as objectively measured, average weekly physical activity (at work, home, transport-related, and recreational) of less than 3 600-4 400 MET-minutes per week.

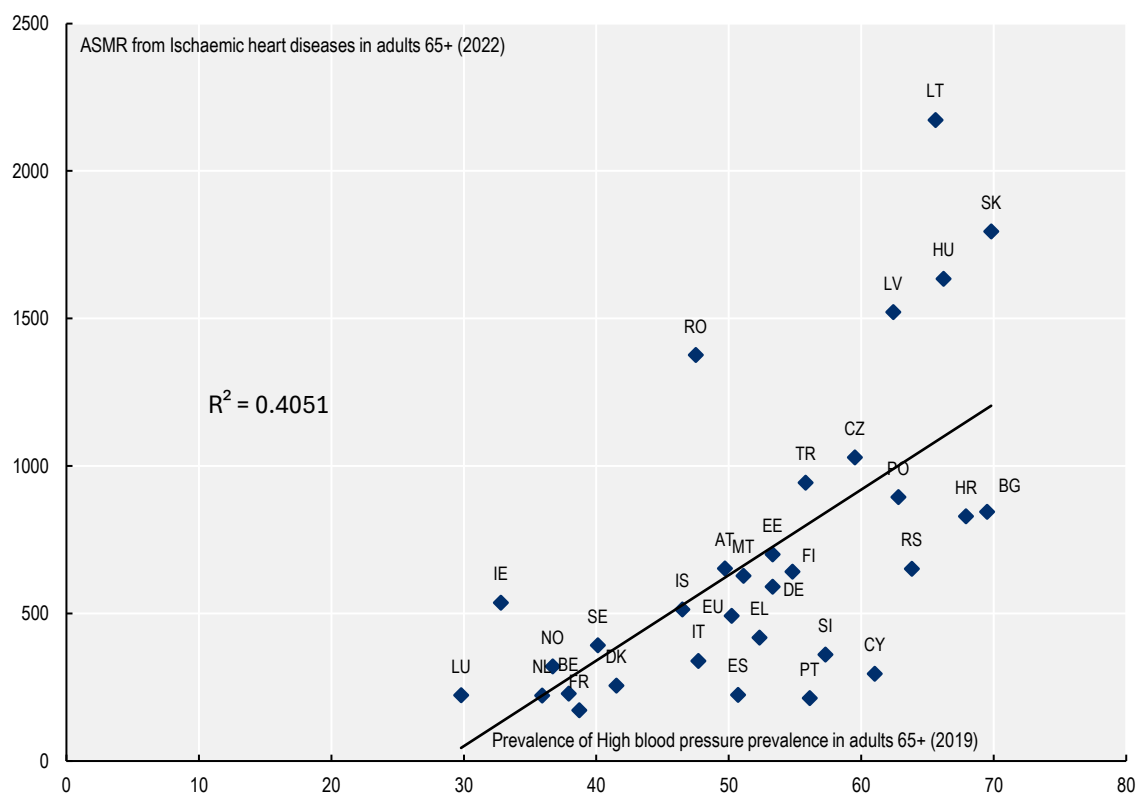
Environmental/occupational risks

- Air pollution includes exposure to particulate matter that are 2.5 microns or less in diameter (PM_{2.5}), including ambient (outdoor) and household (indoor) exposure.
- Non-optimal temperature – aggregate of the burden attributable to low and high temperatures. The population-weighted mean TMREL used was 25.6 °C.

For more detail methodology refer to Brauer et al. (2024^[86]).

Annex 3.B. Relationship between hypertension and cardiovascular conditions

Annex Figure 3.B.1. Countries with higher prevalence of high blood pressure have higher mortality due to ischaemic heart disease in people 65 and over

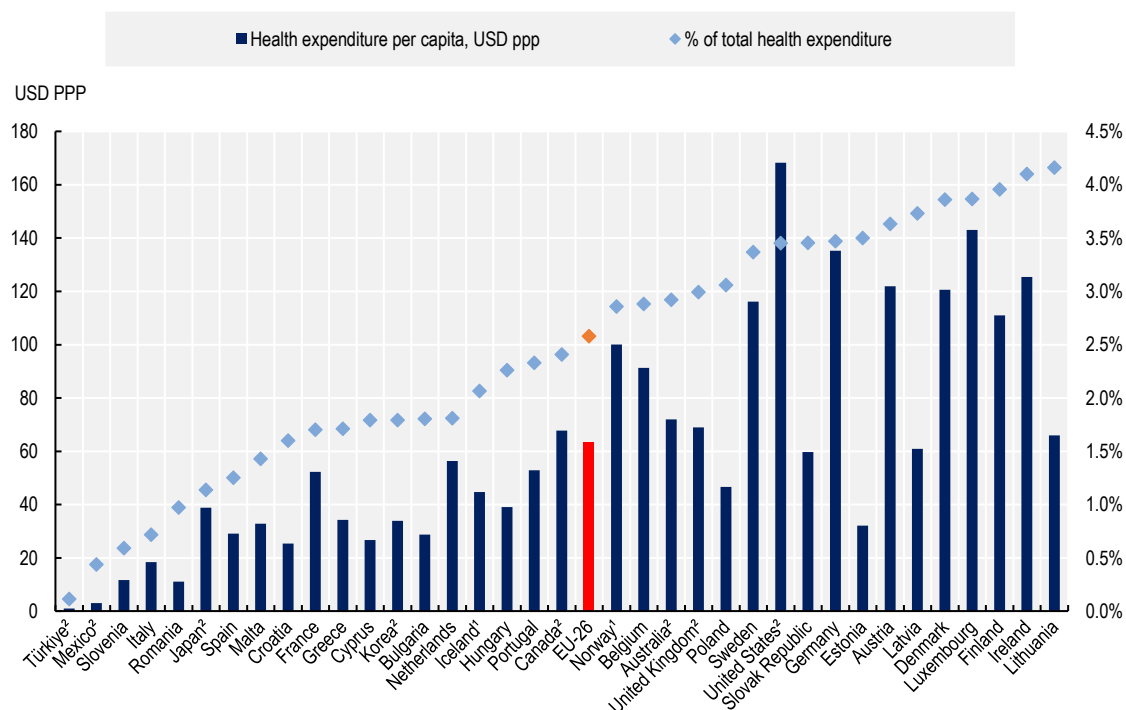


Note: ASMR: Age-adjusted mortality rate.

Source: Eurostat (2021), <https://ec.europa.eu/eurostat/databrowser/bookmark/46974e2c-13e5-4ff4-a1de-4b68019a87bf?lang=en>, and Eurostat (2025), https://doi.org/10.2908/HLTH_CD_ASDR2.

Annex 3.C. The healthcare expenditure associated with diseases caused by harmful alcohol consumption

Annex Figure 3.C.1. Annual health expenditure due to diseases caused by harmful alcohol consumption above 1 drink per day for women and 1.5 drinks per day for men, in USD PPP per capita and as a percentage of total health expenditure, average 2020-50

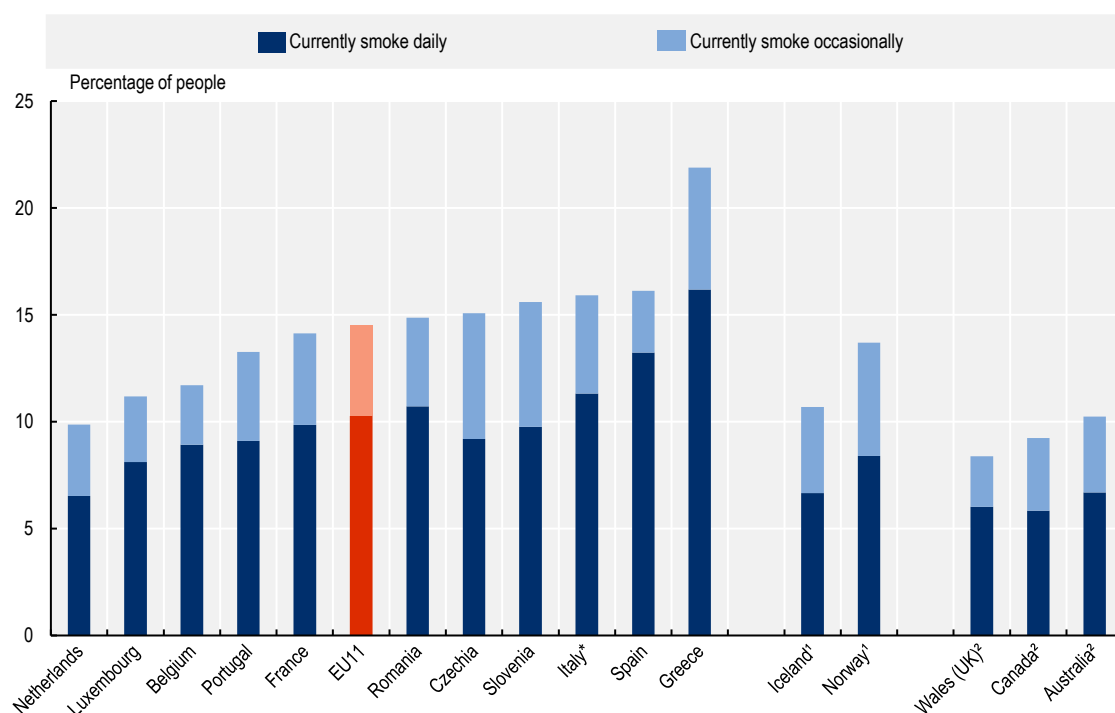


Source: EU26 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. OECD analyses based on the OECD SPHeP-NCDs model, 2020; OECD (2021_[123]), *Preventing Harmful Alcohol Use*, <https://doi.org/10.1787/6e4b4ffb-en>.

Annex 3.D. Additional analysis of risk factor prevalence among PaRIS respondents

Annex Figure 3.D.1. More than a tenth of primary care users aged 45 and older report currently smoking

Percentage of primary care user aged 45 and older reporting their smoking status

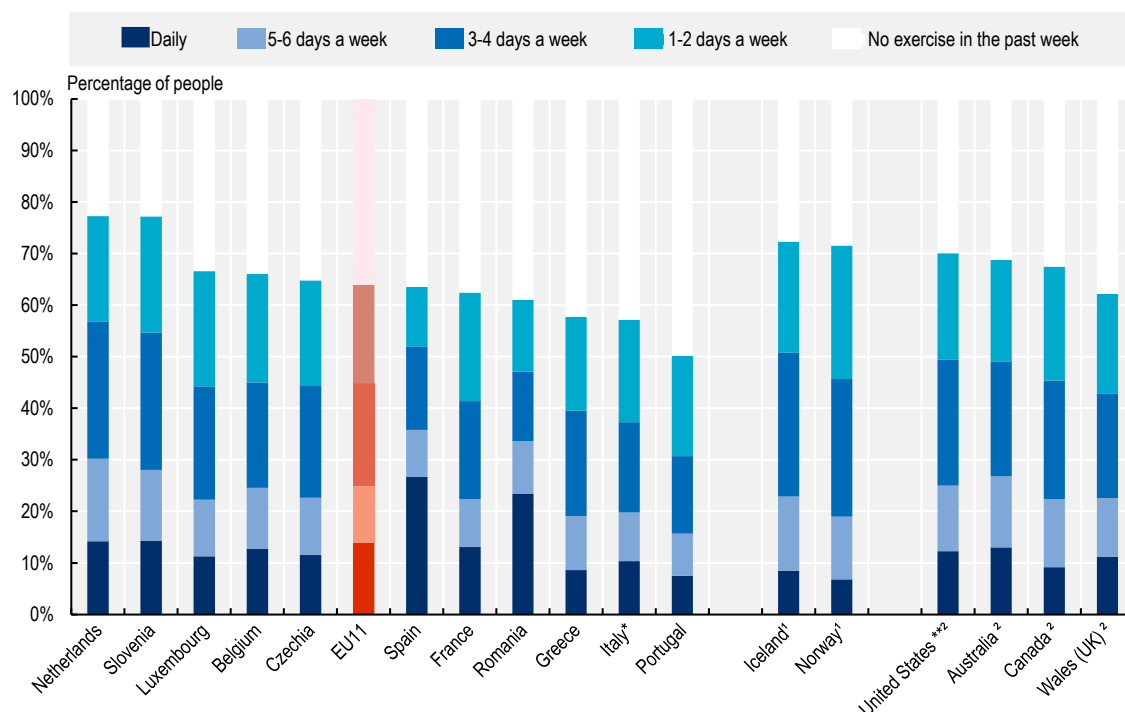


Note: EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to question: "Do you smoke any tobacco products (excluding electronic cigarettes or similar electronic devices)?" * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions.

Source: OECD PaRIS Database 2024.

Annex Figure 3.D.2. More than half of primary care users aged 45 and older do not exercise regularly (less than 60 minutes or less per week)

Percentage of primary care users aged 45 and older reporting how often they exercise weekly

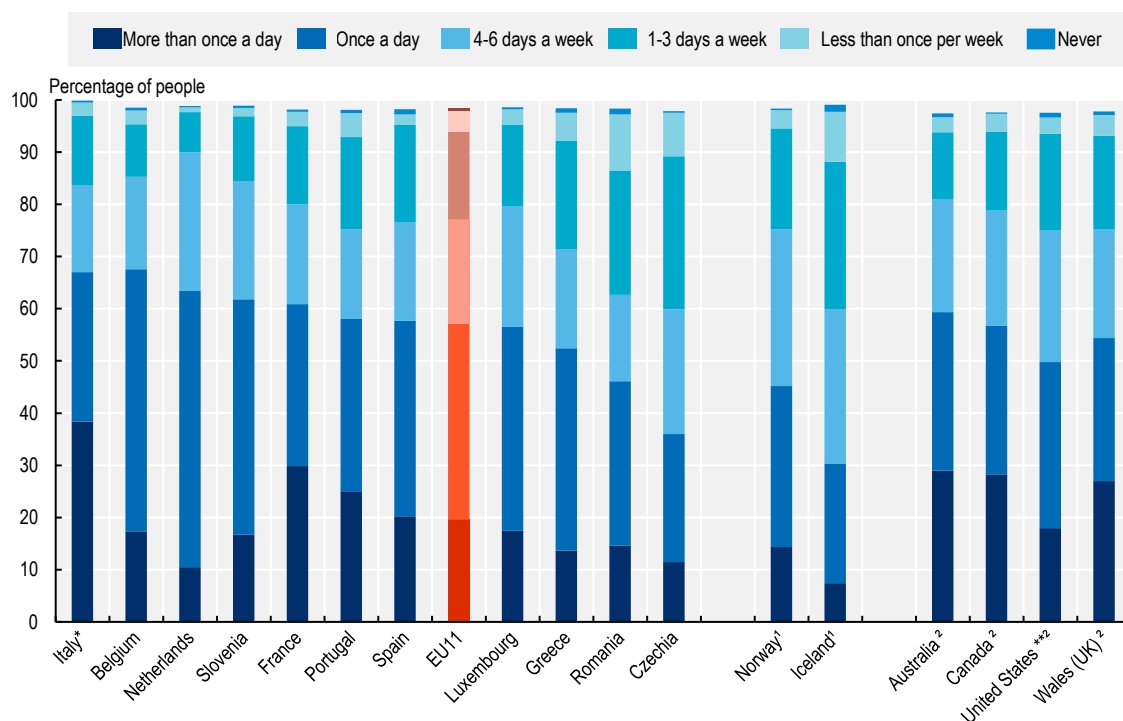


Note: EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to question: "In the past week, on how many days did you do at least 30 minutes of either vigorous or moderate activity (such as running, swimming, riding a bike, brisk walking, or dancing)? Vigorous physical activities typically make you breathe much harder than normal, whereas moderate activities make you breathe somewhat harder than normal." * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS Database 2024.

Annex Figure 3.D.3. Almost two out of three primary care users aged 45 and older consume vegetables daily

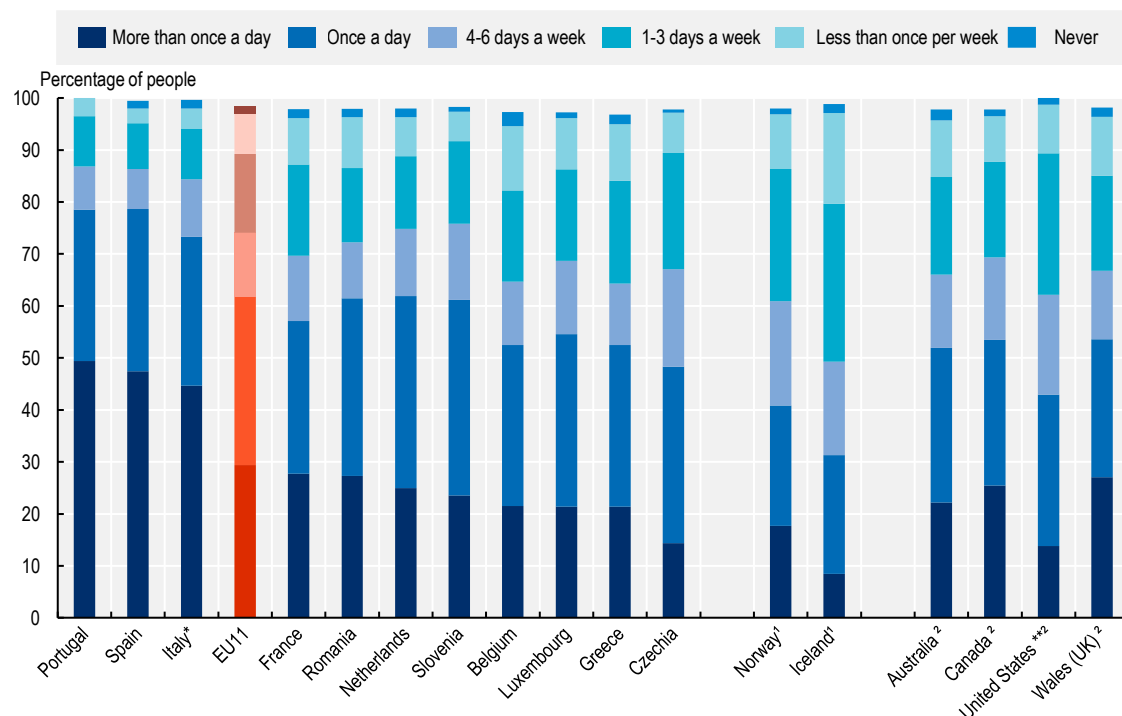
Percentage of primary care users aged 45 and older reporting how often they consume vegetables



Note: EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to question: "How often do you eat vegetables or salad, excluding potatoes and fresh juice or juice made from concentrate?" * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older. Source: OECD PaRIS Database 2024.

Annex Figure 3.D.4. Two out of three primary care users aged 45 and older consume fruits daily

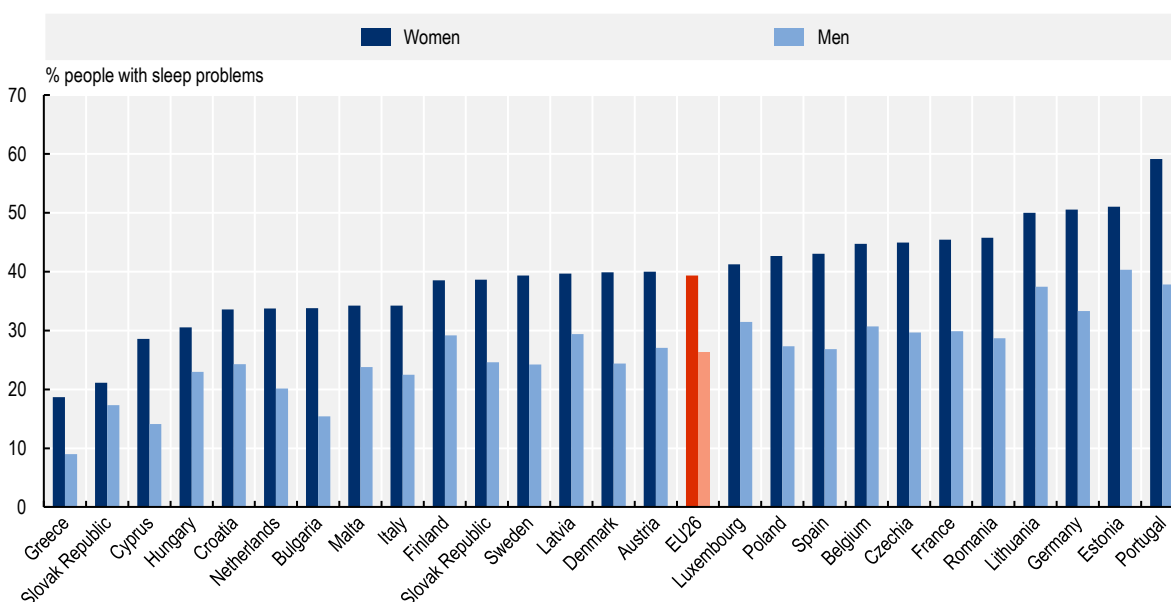
Percentage of primary care users aged 45 and older reporting how often they consume fruits



Note: EU11 average is unweighted. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to question: "How often do you eat fruit, excluding juice squeezed from fresh fruit or made from concentrate?" * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older. Source: OECD PaRIS Database 2024.

Annex 3.E. Sleep quality among men and women

Annex Figure 3.E.1. Women report more sleep problems than men in all EU countries (2022)

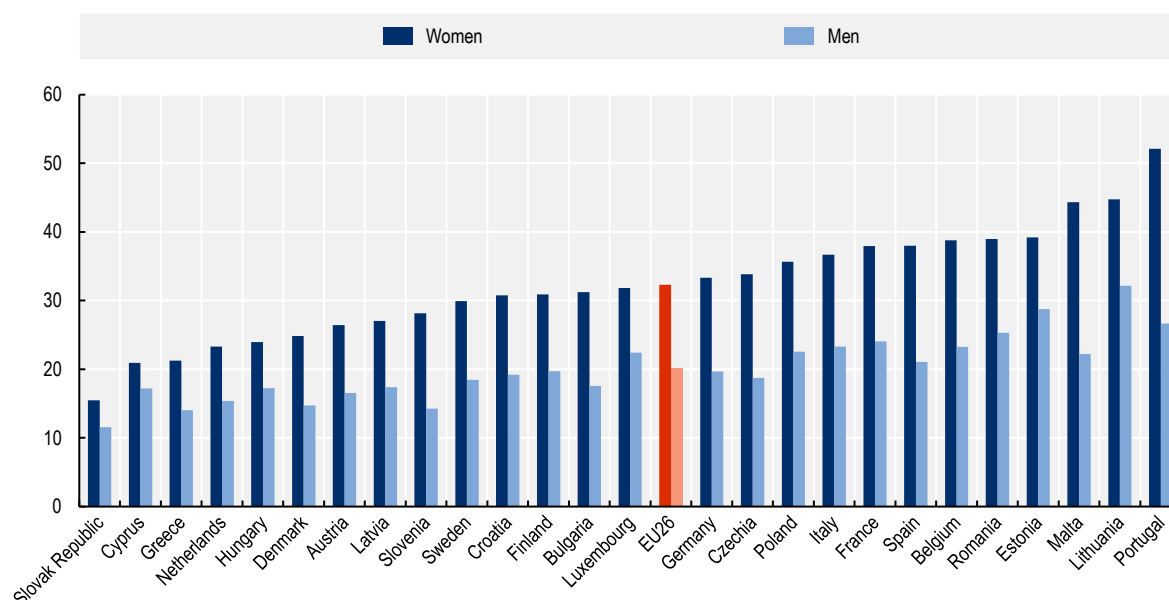


Note: EU26 average is unweighted. Respondents aged 45 and older. Respondents were asked "Have you had trouble sleeping recently?". Responses included "Trouble with sleep or recent change in pattern" and "No trouble sleeping". Ireland is excluded due to data availability. Source: SHARE-ERIC (2024)

Note: Respondents were asked "Have you had trouble sleeping recently?". Responses included "Trouble with sleep or recent change in pattern" and "No trouble sleeping". Ireland is excluded due to data availability.

Annex 3.F. Levels of depression among men and women

Annex Figure 3.F.1. Women report more depressive symptoms than men in all EU countries (2022)

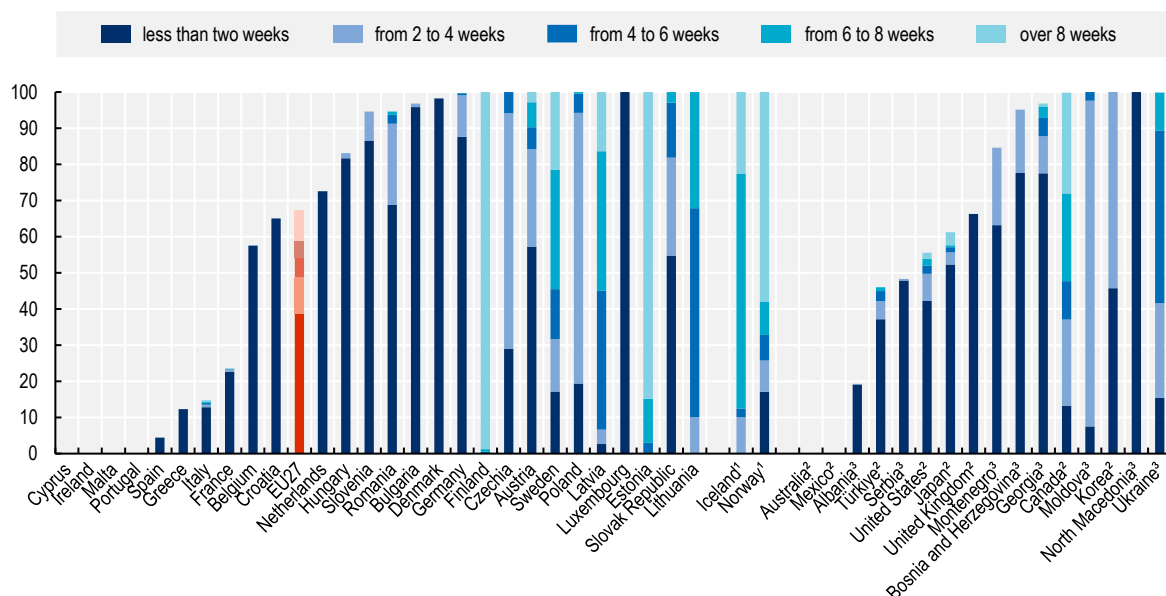


Note: EU26 average is unweighted. Respondents aged 45 and older. The EURO-D depression scale is a composite index of 12 items (depressed mood, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness). The scale ranges from 0 "not depressed" to 12 "very depressed". Ireland is excluded due to data availability.

Source: SHARE-ERIC (2024).

Annex 3.G. Exposure to extreme cold

Annex Figure 3.G.1. Nearly 7 in 10 people in the EU were exposed to at least one icing day (<0°C) in 2023



Note: EU27 average is unweighted. This indicator presents the annual percentage of population exposed to n number of icing days (below 0°C).

1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries.

Source: OECD (2025), *Exposure to extreme temperature* (database), OECD Data Explorer, <http://data-explorer.oecd.org/s/2f7> (accessed 8, July 2025).

Notes

¹ Blood pressure screening rates (Figure 3.35) in Latvia are 30 p.p. higher in women than men, in Lithuania and Bulgaria differences are only about 5 p.p. higher for women than men.

² Lipoproteins transport lipids in the body to produce energy, hormones, bile acid and for deposit. In excess, small lipoproteins, such as low-density lipoprotein cholesterol (LDL-C), can accumulate in the arterial walls generating an atheroma. This process can lead to an atherosclerotic plaques that can limit blood flow to vital organs, such as the heart and brain, giving rise to the CVD (ESC, 2019^[34]).

³ respondents are people aged 45 and older that have used primary care services in the 6-months prior to the survey (OECD, 2025^[224]).

⁴ 14% of respondents to the Special Eurobarometer 506: Attitudes of Europeans towards tobacco and electronic cigarettes report having at least tried e-cigarettes once or twice (EU, 2021^[225]).

⁵ A standard drink refers to a volume of beverage alcohol (e.g. glass of wine, can of beer, or mixed drink containing distilled spirits) that contains approximately the same amounts (in grammes or mL) of pure ethanol regardless of the type of beverage (European Commission, 2024^[228]). In most EU countries, a standard drink is defined as containing 10 grammes of pure alcohol. Therefore, 100g of alcohol per week is equivalent to approximately 10 standard drinks (EC, 2024^[227]).

⁶ A standard drink refers to a volume of beverage alcohol (e.g. glass of wine, can of beer, or mixed drink containing distilled spirits) that contains approximately the same amounts (in grammes or mL) of pure ethanol regardless of the type of beverage (European Commission, 2024^[228]). In most EU countries, a standard drink is defined as containing 10 grammes of pure alcohol. Therefore, 100g of alcohol per week is equivalent to approximately 10 standard drinks (EC, 2024^[227]).

⁷ The WHO has also recommended a 30% relative reduction in mean population intake of salt/sodium as part of the Global Action plan for the Prevention and Control of Non-Communicable Diseases (WHO, 2013^[226]).

⁸ See Figure 3.5 observing the same trend for hypertension specifically.

⁹ A hazard ratio is a statistical measure used to compare the risk of a specific event occurring at any given time point between two groups; for example, a hazard ratio of 2.0 means the event is twice as likely to happen in one group compared to the other.

4

Ensuring high quality and accessible CVD healthcare

This chapter examines the quality and accessibility of cardiovascular disease (CVD) care, spanning prevention, primary care, emergency response, hospital treatment, and post-acute rehabilitation. While health promotion and self-management support can reduce risks and improve outcomes, confidence in self-management varies widely among EU countries. Primary care plays a pivotal role in prevention and secondary management, yet lifestyle counselling and care planning remain inadequate. Emergency responsiveness varies widely, with delays in ambulance services and gender disparities in help-seeking behaviour. Hospitalisation for CVD remains common, though avoidable admissions are declining. Hospital care shows marked inter-country differences in procedure rates, technology availability, and specialised unit distribution. Finally, post-discharge adherence to medications and participation in rehabilitation programmes are low, impacting long-term outcomes.

In Brief

- People living with cardiovascular diseases (CVD) interact with **a wide range of settings and levels of the healthcare system**, including primary care, emergency responders, hospitals, and rehabilitative care after acute events such as heart attacks or stroke.
- Primary care has a critical role in reducing risk factors for CVD and managing CVD. Health promotion initiatives can lower CVD risk in the general population and support those already affected, yet significant opportunities remain to better engage people living with CVD by providing tailored advice that helps them address modifiable risk factors and manage their condition effectively. The extensive uptake of effective and people-centred primary care approaches across countries is essential. Self-management support, in particular, is key to increase the confidence of patients to manage their own health to control clinical and behavioural risk factors and to be able to manage their conditions. Confidence in **self-management among people aged 45 and older with CVD varies more than three-fold across countries** – from 23% in Italy, to 73% in the Netherlands, and up to 84% in France. CVD patients who are confident in managing their own health report higher levels of well-being and are more likely to assess their general health as good or very good, compared to those who lack such confidence.
- **Eighty per cent of primary care users living with CVD take three or more medications on a regular or ongoing basis** – 30% more than primary care users without CVD. Despite demographic changes and evolving CVD risk profiles across Europe, the use of common anti-hypertensive medications has remained stable. In contrast, the use of lipid modifying agents has risen sharply – two-fold in European countries between 2010 and 2023. However, significant variation in medication use persists across OECD countries, and underuse of well-established first-line therapies – particularly antihypertensives and statins – represents a missed opportunity to improve population health in a cost-effective way. This underuse reflects a mix of access barriers, including poor adherence, clinical inertia, and system-level implementation gaps, inhibiting the delivery of effective CVD care in primary care settings.
- Timely access to acute CVD care starts with help-seeking behaviours of the patient and those around them who must recognise the symptoms of potential acute CVD and then be confident to call for help from emergency medical service (EMS). Data from countries suggest that on average **only three of four stroke patients (76%) arrive to a dedicated stroke centre by EMS**; the other quarter of stroke patients continue to arrive by their own means. Evidence from multiple countries shows that **women wait longer than men** to call for emergency services following the onset of stroke symptoms and timeliness in accessing high-quality CVD care also varies by people's socio-economic background. The pandemic however has significantly impacted ambulance response times in several countries, and **average response times have not yet returned to pre-pandemic levels**.
- European countries have been making advances in **expanding access to time-sensitive treatments for stroke**, reflecting improvements in system capacity and co-ordination. Time to diagnosis and assessment is modifiable by improvements at every stage in the process from the call for help through to the decision to treat **and vary widely between countries**. Data from 22 EU countries showed that less than **60% of reporting countries provided intravenous thrombolysis (IVT) to more than 15% of their admitted ischaemic stroke patients in 2023**.
- Equitable provision of sophisticated, high-quality, acute care across an entire population, following the onset of disease that manifests without warning **requires a high degree of**

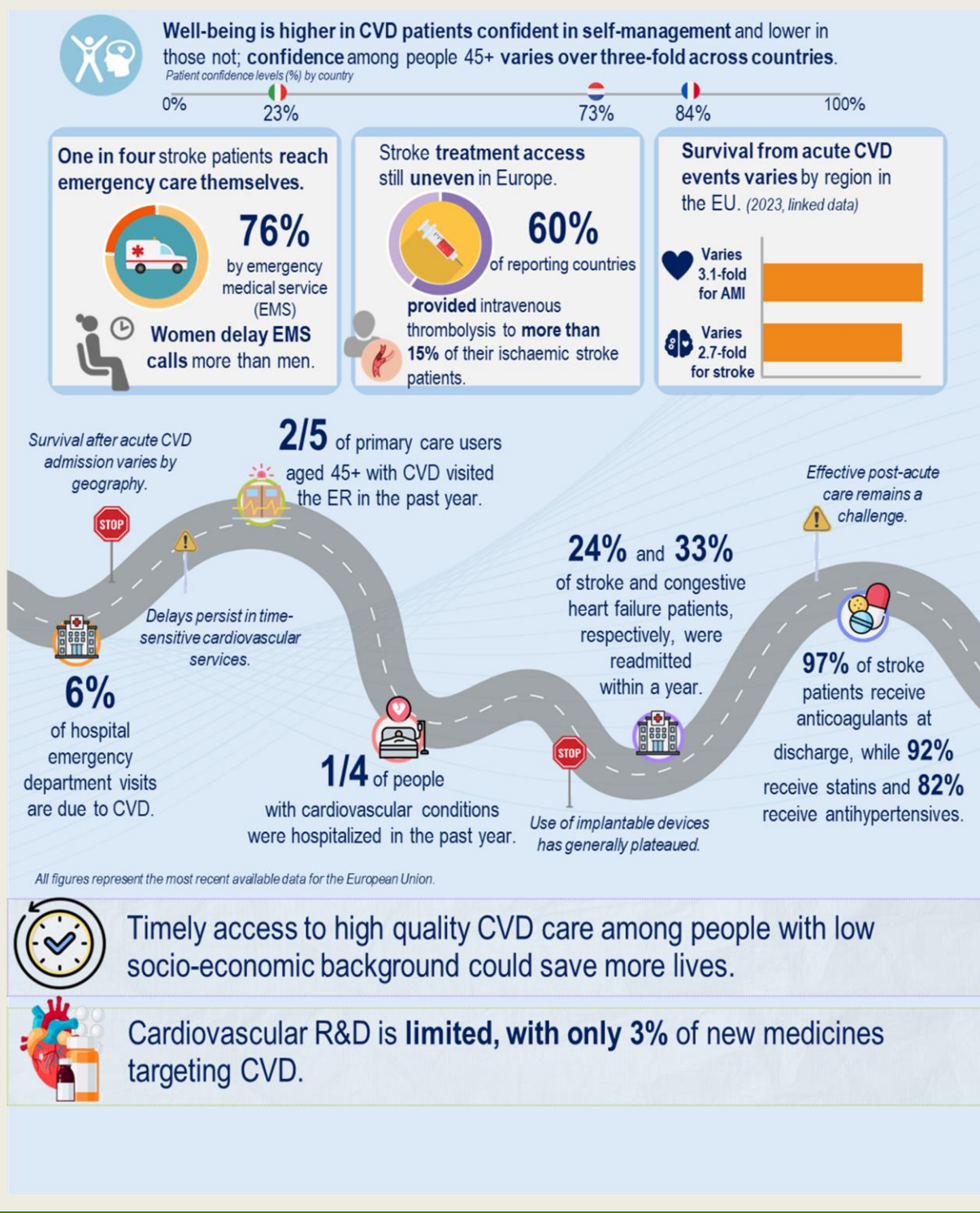
integration between the general community, emergency responders, emergency departments (EDs) and the inpatient teams within hospitals. CVD accounts for up to 6% of hospital ED visits. Approximately **two-in-five primary care users over age 45 living with CVD has used the emergency room in the last year** – and they are twice as likely to have gone to an ED as those without CVD. Modern healthcare delivery systems generate large quantities of data that may be used to measure the quality of care against evidence based and widely accepted guidelines and targets.

- **Avoidable hospital admissions due to congestive heart failure and diabetes are trending down across countries** – as are hospital discharges for circulatory diseases – but variation in rates between countries indicate these can be reduced through better access to high quality primary care. Despite downward trends, hospitalisation remains a common occurrence for people living with CVD, reflecting difficulties in managing CVD-related conditions. Among people aged 45 and over attending primary care, **one-in-four people with cardiovascular conditions has been hospitalised in the last year**, and those with cardiovascular conditions are twice as likely to be hospitalised than those without. **Reducing levels of avoidable hospital admissions to the lowest level within the OECD would reduce hospital spending in the EU by EUR 45 billion. Focussing on reducing inequalities in access to effective primary care, countries can further improve health outcomes of overall population and in turn increase cost-saving.**
- The effectiveness of hospital care varies – and **the likelihood of surviving an admission for an acute CVD event varies by geography**. The 30-day AMI mortality rate in 2023 ranged almost five-fold between the best and worst performing EU country, and 30-day mortality following ischaemic stroke varied four-fold. In recent years, Europe has seen increases in the use of intravenous thrombolysis (IVT) as a frontline treatment for acute ischaemic stroke. Rate of IVT varies by a magnitude of 20 between European Countries – from over 75 per 100 000 population in Latvia and Estonia to below 10 in Ireland and Greece. Furthermore, some countries with high mortality rates due to cerebrovascular disease have notably low rates of use of IVT, including Bulgaria and Romania.
- Hospital care of CVD is highly dependent on technology including imaging and invasive procedures. For example, countries with fewer hospitals implanting implantable cardioverter defibrillators (ICDs) tend to have lower implantation rates. There remain **persistent delays in elective, but time sensitive, cardiovascular services**. Data from seven OECD countries shows that a significant share of patients face delays exceeding three months for procedures such as coronary angioplasty and coronary artery bypass grafting (CABG) for chronic coronary disease, highlighting potential challenges insuring access and equality of service provision.
- **The use of implantable devices – such as pacemakers, cardiac resynchronisation therapy (CRT) for heart failure and ICDs – have generally plateaued**, but the inter-country variation remains great. The exception is the use of transcatheter aortic valve implantations (TAVI), which has increased in all EU countries and seen expanding populations. Many countries have clinical standards in place for device implantation and follow-up, and many have registries for post-market surveillance and safety monitoring – including tracking device use, complications and reoperation rates. Fewer countries have adopted systems for quality audits, such as professional peer review, compliance checks or have implemented systematic measurement of patient-reported outcomes or experiences related to cardiac implant procedures.
- **Post acute care is an opportunity to reduce medium to long term mortality and morbidity, but effectively providing such care remains a challenge for many countries.** Goals include optimising secondary prevention (medication, risk factor change), rehabilitation after the acute

event, and reintegrating with primary care or with ongoing monitoring and self-management programmes. Participation rates in cardiac rehabilitation after hospital discharge remain relatively low across countries. Rates of rehabilitation participation after stroke are generally higher than for cardiac rehabilitation – though overall data coverage and comparability of information related to access to rehabilitation is limited. Data from 14 EU countries shows that, on average, 60% of stroke patients survived without readmission within a year, while 24% were readmitted (5% for stroke-related causes), and 16% died. For CHF patients, 43% survived without readmission, 33% were readmitted (11% for CHF-related causes), and 24% died within the year.

- Discharge from hospital following an acute cardiovascular event requires prescriptions for a combination of medications aimed at preventing another event and managing underlying conditions. **Data on prescribing practices shows that care generally conforms to standards.** Almost all (97%) of stroke patients receive anticoagulating drugs at discharge in countries that report data, while fewer receive statins (92%) and antihypertensive drugs (82%). Additionally, across countries, most patients were discharged on dual anti-platelet therapy and statins following AMI. However, **these prescribing practices need to be sustained** – and in most cases there is a steep drop between discharge and prescribing practices more than a year after the event.
- The pace and direction of pharmaceutical innovation in CVD is increasingly misaligned with the most pressing public health needs, and **investment in cardiovascular R&D has lagged behind other therapeutic areas and focussed on some high-risk population groups where gain is small.** While several new therapies have been developed, they demonstrate only **modest added clinical value over established treatments for small high-risk population subgroups**, raising concerns about alignment between R&D priorities and the most pressing population unmet medical needs. More than half of surveyed countries report placing specific access restrictions to novel CVD medicines such as PCSK9 inhibitors and SGLT2 inhibitors. In addition to being used to control diabetes treatment, Glucagon-Like Peptide-1 Receptor Agonists (GLP-1 RAs), are now authorised to treat obesity in 13 of 17 surveyed OECD countries and have been shown to reduce the occurrence of serious cardiac events in clinical trials. As their indications expand, so too does the potential budgetary impact, raising important questions about **cost-effectiveness and long-term system budgetary sustainability.**

Infographic 4.1. Ensuring high quality and accessible CVD healthcare

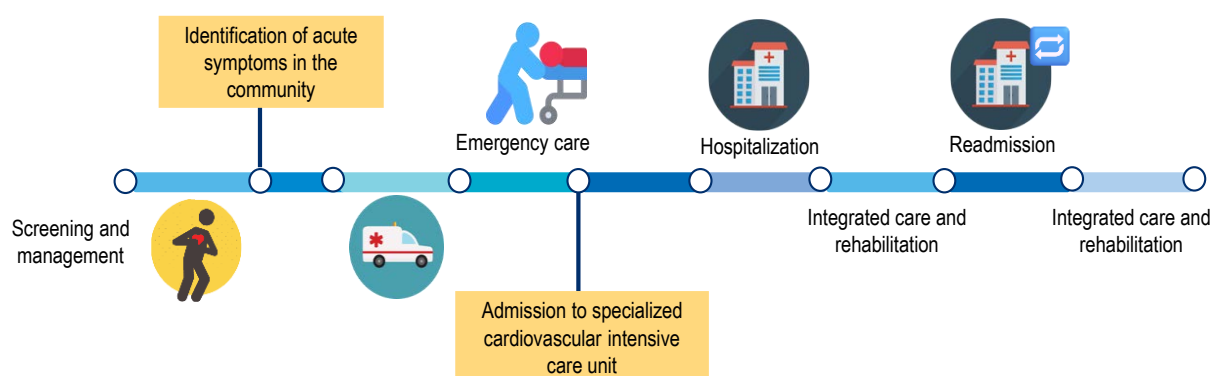


4.1. High quality primary care is a fundamental for CVD control and management

While significant improvements in cardiovascular health can be addressed through modification of risk factors (Chapter 3), high-quality healthcare (i.e. healthcare that is effective, safe, and person-centred) remains an essential component for mitigating the burden of CVD and related disability. Effective primary care based on clinical practice guidelines for CVD prevention, early detection and cost-effective treatment can reduce the burden of CVDs and the cost associated with treating CVDs significantly. However, most CVD related deaths are caused by acute events, such as heart attack and stroke, and as many as 20-40% of heart attacks occur in people previously undiagnosed with CVD (McClellan et al., 2019^[1]), suggesting opportunities to improve quality of primary care. Moreover, once people enter the care system, there are failures in the provision of proven first line treatments and variation in access to advanced treatments (McClellan et al., 2019^[1]). These contribute to high spending by health systems on cardiovascular care and suboptimal health outcomes. Prioritizing high-quality cardiovascular healthcare – through preventive measures, early detection, effective treatment and rehabilitation throughout the care pathway (see Figure 4.1) – can significantly reduce the burden of these conditions.

This chapter discusses trends in the quality of care for CVD across the continuum of prevention, primary care, emergency response, hospital care, and post-acute and rehabilitative care – as well as themes such as timeliness, waiting times, healthcare workforce, and access and use of medicines and medical technologies.

Figure 4.1. Illustrative example of the care pathway for CVD



Note: Simplified example.

4.1.1. Engaging patients in secondary prevention in the primary care setting is critical

As the onset of CVD can be prevented or greatly delayed, care of CVD begins with prevention and primary care has a critical role in lowering CVD risk in the population at large. While genetics and age are major, non-modifiable risk factors for CVD, many CVD risk factors are modifiable (see Chapter 3 for additional discussion of primary prevention of CVD and distribution of risk factors). Smoking, a sedentary lifestyle, unmanaged hypercholesterolemia, obesity and diabetes are all amenable to intervention in the primary and secondary prevention of CVD. Moreover, hypertension is often the first manifestation of CVD and if it is detected and effectively managed, the risk of development of other manifestations (ischemic heart disease (IHD), cerebrovascular disease and cardiomyopathy) can all be reduced. Prevention and management of CVD is a major activity of primary care systems, reducing risks of CVD occurrence among people without CVD (i.e. primary prevention), and helping patients with CVD to effectively manage their conditions and address risk factors to improve long-term health outcomes. As primary care providers are

often the first point of contact for patients, they play an important role in supporting individuals in making lifestyle changes and adhering to treatment plans.

Primary care providers can introduce measures to prevent progression of disease once a first diagnosis is made (i.e. secondary prevention), including screening for metabolic risk factors, the promotion of healthier lifestyles and behaviours, and commencement of medications that can improve outcomes and reduce the occurrence of an acute event like stroke or heart attack. Findings from the OECD Patient-Reported Indicator Surveys (PaRIS) conducted in 19 countries (including 11 EU member states, as well as Norway, Iceland, Switzerland and Wales) show that among primary care users aged 45 and older, on average only 55% of people with CVD or hypertension reported that their primary care doctor gave them advice on physical activity. This result is 10 percentage points (p.p.) higher than primary care users without CVD or hypertension – but still represents a major gap in counselling for most at risk patients. A similar deficit is found regarding dietary advice where less than two-in-five (39%) people living with hypertension or CVD reported receiving advice on healthy eating. As with physical activity, rates in dietary counselling are higher for people with CVD and hypertension than those without – but still offer significant potential for better targeting advice and interventions to those who would most benefit (see Figures in Annex 4.A for more detail).

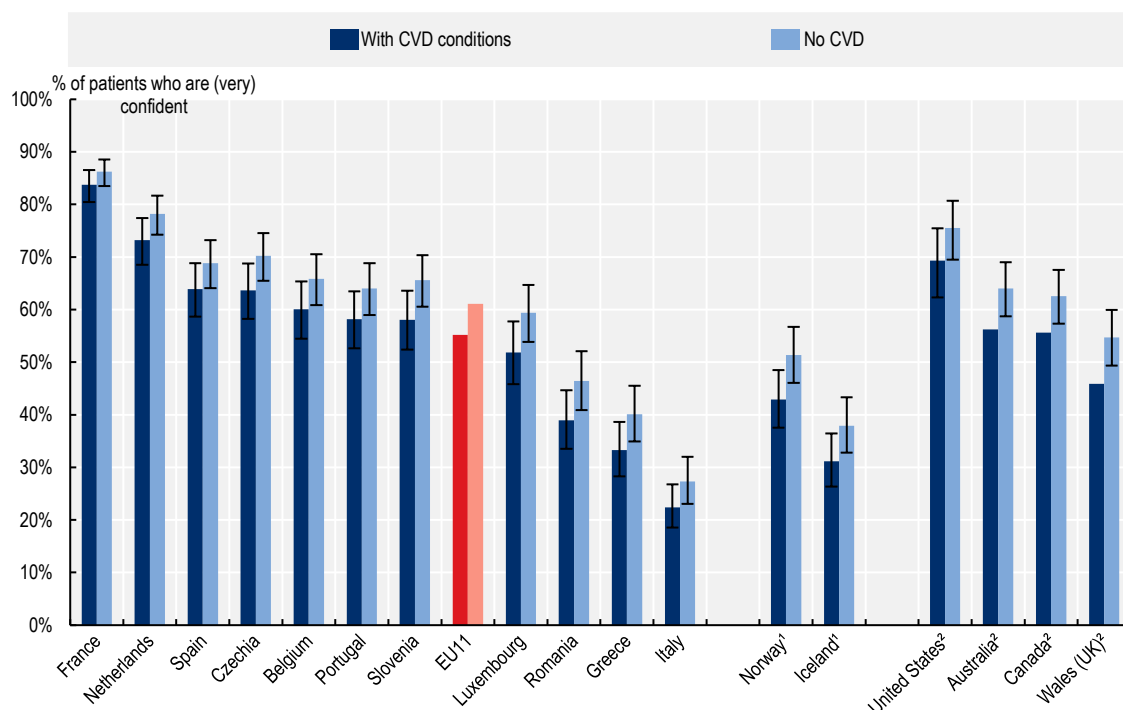
4.1.2. Care co-ordination and self-management support for people with CVD is key in primary care

While healthcare policy, research, professional training and clinical guidelines have traditionally focussed on single diseases, multimorbidity – people living with two or more chronic conditions – is a major challenge in healthcare, particularly in primary care. Multimorbidity affects the majority of people living with CVD, and imposes numerous management challenges for patients and their care providers, especially to co-ordinate care and self-management support (Violán et al., 2016^[2]). A majority of primary care patients experience sub-optimal care co-ordination – though, encouragingly, the percentage of patients with care plans is higher in the case of certain co-morbidities.¹ PaRIS data shows that only two out of five (44%) of people aged 45 and older with CVD or hypertension report having a care plan, a tool which enhances co-ordination and can lead to improved outcomes (OECD, 2025^[3]). For people living with diabetes, in addition to CVD or hypertension, over half of people (55%) report having a care plan (Annex 4.A).

Individuals with CVD must actively and routinely manage their condition to prevent complications and improve outcomes. Self-management is an important contributor to admission reduction and improvement in patient quality of life (Jaarsma et al., 2021^[4]). Effective self-management involves a holistic approach that includes behaviour modification (e.g. exercise, adherence to medication regimens, managing fluid and salt intake), self-monitoring (symptoms, thirst, blood pressure, weight, mood), and practical responses to early signs of deterioration (medication adjustment, clinical review). The proportion of primary care users with CVD reporting confidence to self-manage is similar to that of those without these conditions, 55% and 61%, respectively, see Figure 4.2. Confidence in self-management among people aged 45 and older with CVD varies more than three-fold across countries – from 23% in Italy, to 73% in the Netherlands, and up to 84% in France. These findings suggest that many people with CVD may be inadequately prepared to handle the demands of their complex health needs.

Figure 4.2. Fewer CVD patients are confident to manage their health compared to other primary care patients, with inter-country differences of up to double the confidence rates

Percentage of patients that are confident or very confident (compared to somewhat confident or not confident at all) to manage their own health



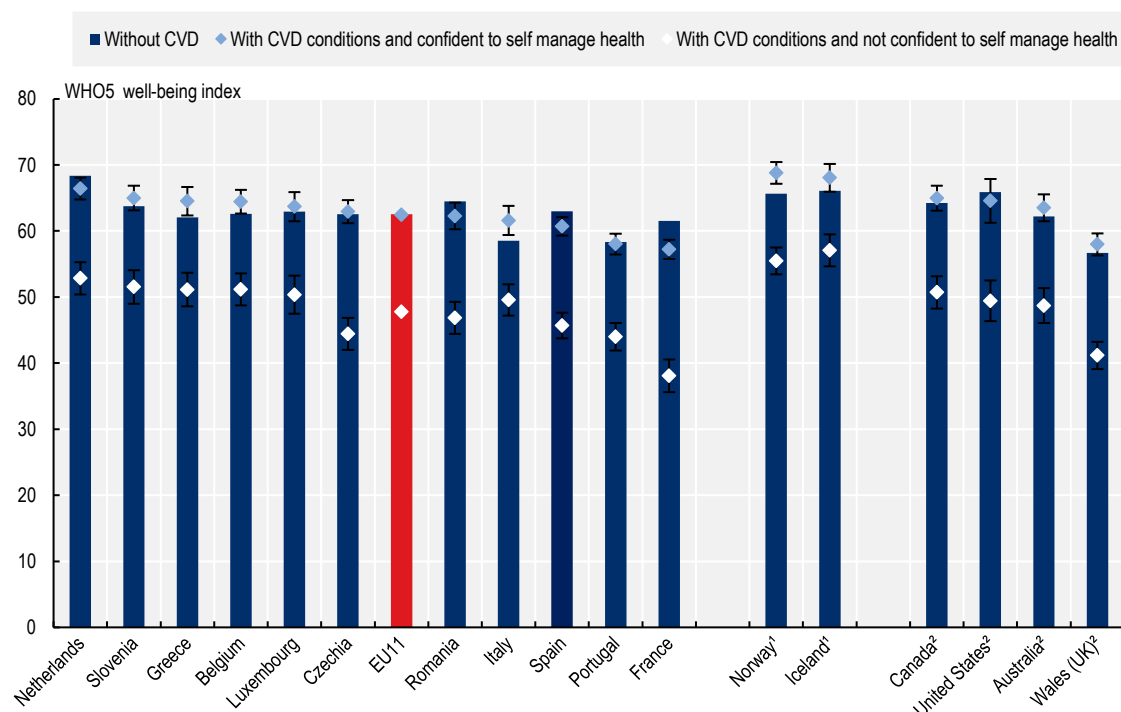
Note: 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. CVD status is self-reported using the question: "Have you ever been told by a doctor that you have any of the following health conditions?" and answer: "Cardiovascular or heart condition". Confidence to self-manage; Response to question: "How confident are you that you can manage your own health and well-being?", response options range from not confident at all (0) to very confident (3). Percentage of patients that are confident or very confident (compared to somewhat confident or not confident at all). Error bars correspond to comparative intervals (84%CI).

Source: OECD PaRIS 2024 Database.

Effective self-management support – particularly when it resonates with and empowers patients – can enhance quality of life and health outcomes. According to OECD PaRIS survey, CVD patients who are confident in managing their own health report higher levels of well-being and are more likely to assess their general health as good or very good, compared to those who lack such confidence. For instance, Figure 4.3 shows that the average WHO (World Health Organization) well-being score among CVD patients that have confidence to self-manage was 62 similar to non-CVD patients (63), but for CVD patients lacking confidence to self-manage it dropped to 48. Similarly, the share of individuals reporting good or better general health was 69% among non-CVD patients, 58% among confident CVD patients, and only 34% among CVD patients lacking confidence to self-manage. These findings suggest that confidence to self-manage may mitigate the adverse effects of CVD on quality of life.

Figure 4.3. Patients who are confident in self-managing their health minimise the negative effects of CVD on quality of life

WHO5 Well-being index



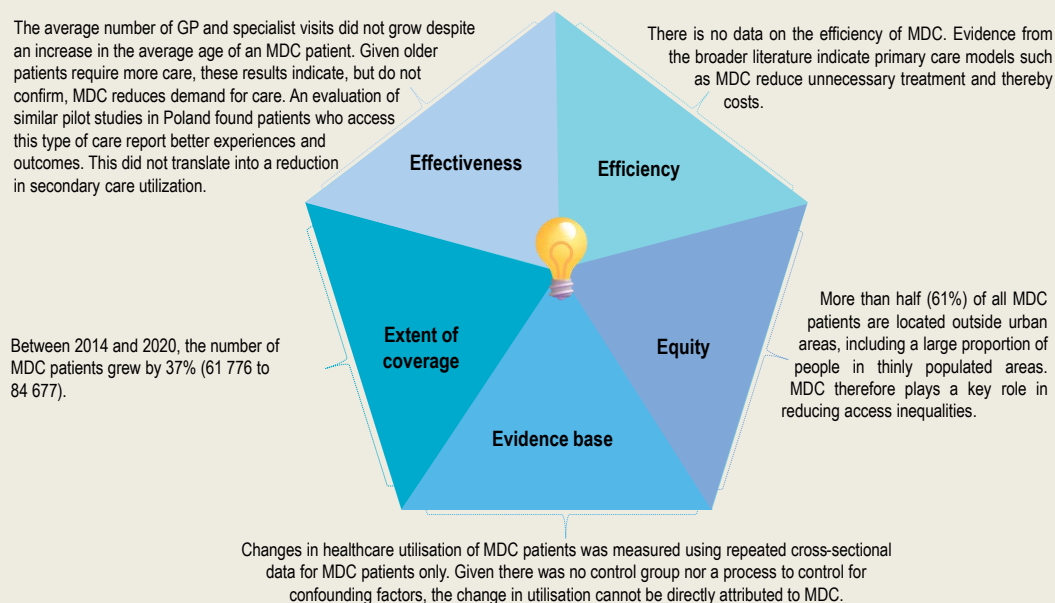
Note: 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. CVD status is self-reported using the question: "Have you ever been told by a doctor that you have any of the following health conditions?" and answer: "Cardiovascular or heart condition". WHO-5 well-being index; Response to five questions measuring well-being. raw scale 0-25 converted to 0-100 scale, higher scores represent higher well-being. General health; response to question: "In general, would you say your health is ..." where response options range from poor (1) to excellent (5). Percentage of patients that responded good, very good or excellent (as compared to fair or poor). Error bars correspond to comparative intervals (84%CI).

Source: OECD PaRIS 2024 Database.

Box 4.1. Best practices for advancing cardiovascular health: Medical and Diagnostic Centre (MDC): Case study overview

Description: MDC is a primary care model for patients with chronic conditions. Patients who access MDC obtain an Individual Medical Care Plan based on a comprehensive assessment by a General Practitioner. Results from the comprehensive assessment are used to stratify patients into risk groups, which helps health professionals proactively manage patient needs. Following the comprehensive assessment, patients receive care by a multidisciplinary care team, which is co-ordinated through a case manager. MDC resembles a new model of primary care growing increasingly popular amongst OECD countries.

Best practice assessment:



Enhancement options: To *enhance the effectiveness* of MDC, continued efforts by policymakers are required to promote the use of digital tools across the healthcare sector, including primary care. Digital tools such as electronic health records (EHRs) play an important role in providing co-ordinated care, which is one of MDC's key objectives. Sophisticated digital methods to collect patient data can subsequently be used to stratify patients into risk groups, as seen in countries such as Canada and Spain. To enhance the evidence-base, more robust evaluation methods are necessary, for example, by including data for a control group as well as controlling for confounding factors.

Transferability: New models of primary care, such as MDC, operate in 17 OECD countries, including EU Member States such as Austria, Greece, Ireland, Italy, the Slovak Republic and Slovenia. This indicates that MDC, and the type of care it provides, is highly transferable.

Conclusion: MDC provides patients with patient-centred care delivered by a multidisciplinary care team. This model of care is considered “best practice” and is therefore increasingly popular amongst OECD countries. At present, the real impact of MDC on patient health outcomes and utilisation is unknown given data availability constraints. However, a study looking at similar primary care models in Poland concluded patients reported better experiences and outcomes. To enhance the impact of MDC, policymakers can benefit from policy options outlined in this case study.

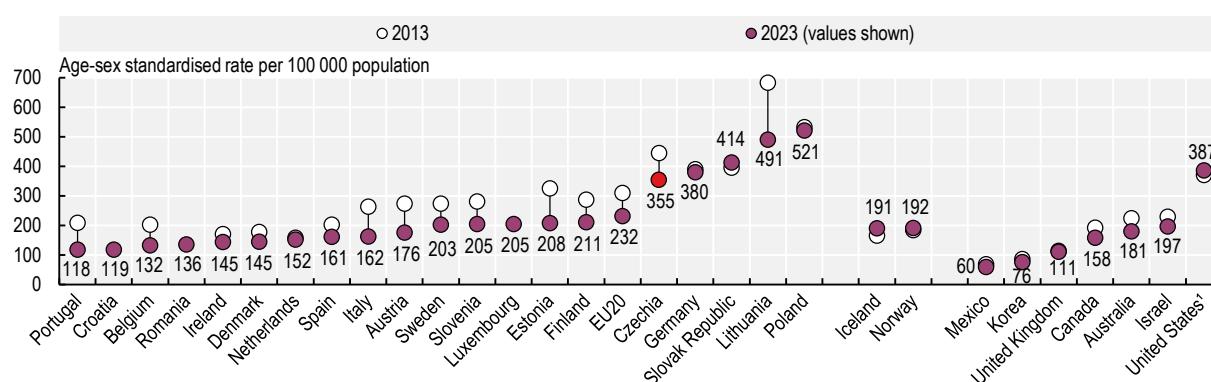
Source: OECD (2023^[5]), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, <https://doi.org/10.1787/9acc1b1d-en>.

4.1.3. Hospital avoidable admission can be reduced through better access to high-quality primary care

Congestive heart failure (CHF) and diabetes are common, chronic health conditions with potential for severe complications and rapid deterioration. However, these conditions can also be effectively controlled in primary care using evidence-based management practices. A well-performing primary care system can reduce acute deterioration of people living with chronic conditions related to CVD such as CHF or diabetes, thereby preventing unwanted and costly avoidable hospital admissions (OECD, 2020^[6]).

However, the effectiveness of primary care varies greatly, and hospital admissions for CHF and diabetes that are largely avoidable through well-performing primary care continue to be high in some countries. Hospital admission rates for CHF varied over four-fold across EU countries in 2023, averaging 232 per 100 000 population (Figure 4.4). Portugal and Croatia had the lowest rates, while Poland and Lithuania reported rates over twice the EU average. The average CHF admission rate across EU countries fell by 25% between 2013 and 2023 – and over 30% in Austria, Belgium, Estonia, Iceland, Italy and Portugal. Admissions for CHF increased in several countries over this period, including Iceland, Norway and the Slovak Republic. In Germany, high rates of admission may relate to high access to hospital care given its high number of hospital beds, suboptimal functioning of primary care and insufficient care integration due to separation of ambulatory and hospital care. Recognising these challenges, the Government Commission responsible for hospital reform, has proposed a reorganisation of care structures to avoid misdirection of patients who could be treated effectively in primary care to acute care in hospitals and emergency rooms (OECD/European Observatory on Health Systems and Policies, 2023^[7]; Regierungskommission, 2022^[8]). In the Slovak Republic, high rates of avoidable admissions have led to reforms in primary care, focussing on strengthening the competencies of General Practitioners (GPs) and improving accessibility and availability of GPs based on the General Outpatient Care Strategy to 2030 (OECD/European Observatory on Health Systems and Policies, 2023^[9]). Steep reductions in hospital admissions between 2019 and 2021 have been largely attributed to disruptions in hospital services and hesitancy among patients to seek hospital care during the COVID-19 pandemic and not due to improved quality of primary care, hence pointing to the need to improve its accessibility and resilience. Additional information on avoidable admissions for diabetes can be found in Annex 4.A.

Figure 4.4. Congestive heart failure hospital admission in adults, 2013 and 2023 (or nearest year)



Note: The EU average is unweighted. 1. Latest data from 2021-2022.

Source: OECD Health Statistics 2025.

Reducing avoidable admissions through improvements in primary care and effective delivery can result in significant potential health system savings and improve patient outcomes. According to OECD estimates, EU countries as a whole would have reduced hospital spending by EUR 45 billion, if all countries could

reduce hospital admissions for CVD to the lowest level in the OECD (944 per 100 000 population in Canada). The cost-saving was estimated at up to 5.9% of health spending in Poland, 5.2% in Hungary and 4.9% in Lithuania, followed by 4.0% in Latvia and Romania and between 3.6 and 3.8% in Austria, Bulgaria, Germany and the Slovak Republic (see Annex 4.B). Beside cross-country differences, multiple studies also point to disproportionately high avoidable admissions among disadvantaged populations with CVD within countries (Löfqvist et al., 2013^[10]; Pongiglione, Torbica and Gusmano, 2020^[11]; Sowden et al., 2020^[12]), so focussing on reducing inequalities in access to effective primary care, countries can further improve health outcomes of overall population and, in turn, increase cost-saving.

4.1.4. Access to urgent primary care has improved in some countries

For patients with chronic conditions including diabetes requiring urgent care, many OECD countries have developed a wide range of primary care services in the community including 24/7 services for patients in need of urgent care but with low emergency level. In Norway, for example, GPs provide emergency primary care services during and outside of office hours (OOH) and are supported by on-call services provided by specialists. In smaller municipalities, on-call services are also organised in emergency wards in community hospitals, and in very sparsely populated areas, municipal home nursing facilities provide pre-hospital emergency care, sometimes with the support of telemedicine (OECD/The Health Foundation, 2025^[13]). Other countries, such as Belgium, France, Germany and the United Kingdom, have a designated telephone number for medical non-emergency care, which people can call the weekends or if the GP is unavailable (OECD/The Health Foundation, 2025^[13]). In Estonia, in addition to family health centres and health centres, Family Doctor's Helpline (1220) is available for after hour services and 32% of residents used it in 2021 (Kasekamp et al., 2023^[14]).

In a number of OECD countries, primary care doctors are required to provide emergency care for people with less acute condition. In Belgium, GPs and specialists are required to maintain a 24-hour service for ambulatory emergency (Platz, Bey and Walter, 2003^[15]) while in Denmark, GPs are required to participate in out-of-hours care, and GP co-operatives run an advice line (with options for home visit, referral to usual doctor or referral to hospital) in four regions and a municipal 1813 line in Copenhagen is open 24/7 (Kalda et al., 2023^[16]). In the Netherlands, all GPs must maintain an emergency phone line that patients may use to contact the GP who will call an ambulance if necessary (Kroneman et al., 2016^[17]). In Germany, urgent and out of office hours care is the primary responsibility of the Regional Association of Statutory Health Insurance (SHI) physicians including GPs which provide both office-based care and home visits (Miriam Blümel et al., 2020^[18]). However, the availability of emergency care in the primary care setting is low in some countries. In Spain, primary healthcare centres (PCCs) are encouraged to provide emergency care, but opening hours are not standardised (Bernal et al., 2024^[19]).

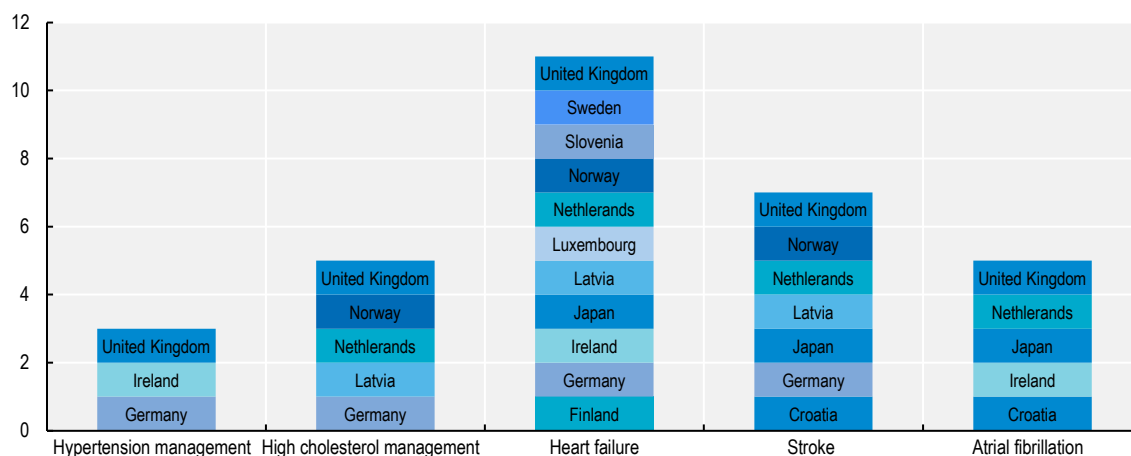
4.1.5. Affordable, effective medicines have played a key role in driving down CVD mortality in high-income countries

In addition to lifestyle management, which is critical for primary and secondary prevention to reduce CVD risk, medications play a vital role in preventing and controlling CVD. Over recent decades, access to affordable, effective medicines has been central to sharp declines in CVD mortality in high-income countries. In the United States, coronary heart disease (CHD) mortality fell by more than 40% between 1980 and 2000, with approximately 47% of this decrease attributed to medical treatments (Ford et al., 2007^[20]). Other studies suggest medical treatments contributed between 23-46% of CVD mortality reductions across various countries and periods (Hotchkiss et al., 2014^[21]; Ford and Capewell, 2011^[22]; Laatikainen et al., 2005^[23]; Bots and Grobbee, 1996^[24]; Capewell et al., 2000^[25]). Statins, for instance, are a cornerstone of lipid management, lowering low-density lipoprotein cholesterol (LDL-C) and cutting heart attack and stroke risk. The Scandinavian trial showed a 30% mortality reduction in CHD patients treated with simvastatin (Scandinavian Simvastatin Survival Study Group, 1994^[26]). Likewise, antihypertensives –

including angiotensin-converting-enzyme (ACE) inhibitors, beta-blockers, calcium channel blockers, and thiazide diuretics – have a pivotal role for controlling blood pressure, a leading modifiable risk factor for CVD. Meta-analyses indicate that ACE inhibitors alone can reduce mortality by about 10% among patients with hypertension and heart failure (Van Vark et al., 2012^[27]; Bangalore et al., 2017^[28]).

Figure 4.5. Changes in first-line treatment mainly affect heart failure, but recommended treatments for hypertension and high cholesterol remained largely unchanged in most countries

The recommended first-line treatment has changed for the following conditions in the last 5 years



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OCED Cardiovascular Policy and Data Survey.

High systolic blood pressure and LDL-C are two of the most significant modifiable CVD risk factors (see Chapter 3). Guidelines support managing these risks with antihypertensive and lipid-lowering medications (Heart Protection Study Collaborative Group, 2002^[29]; Adler et al., 2021^[30]; ESC Guidelines, 2019^[31]; ESC Guidelines, 2024^[32]). Strong evidence confirms these treatments significantly reduce the risk of major cardiovascular events – including stroke, heart failure, and ischaemic heart disease – and lower CVD mortality, making them the cornerstone of CVD care (Cholesterol Treatment Trialists' (CTT) Collaboration, 2010^[33]; Rahimi et al., 2021^[34]; Thompson, 2011^[35]). As a result, few countries have altered first-line therapies for hypertension (3/18) or high cholesterol (5/18) in recent years (Figure 4.5). Implementation of such affordable, effective, standard treatment is a key. However, over 60% of surveyed countries reported recent updates in heart failure management, reflecting the introduction of new pharmacological treatments (see Section 4.9 and Box 4.2).

Box 4.2. Recommended uses of cardiovascular medications

Anti-hypertensive drug classes with robust evidence of efficacy in reducing CVD events include angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), diuretics, and beta-blockers (see Table 4.1). Among these, the first four classes are recommended as first-line therapies for hypertension management, either as monotherapy or in combination (Ettehad et al., 2016^[36]). The ESC (European Society of Cardiology) guidelines recommend low-dose combination therapy as the preferred initial approach. Monotherapy is generally indicated for individuals with mildly elevated blood pressure (120/70 to 139/89 mmHg), moderate to severe frailty, orthostatic hypotension, or those over 85 years of age (ESC Guidelines, 2024^[32]). Importantly, anti-hypertensive medications are also frequently prescribed for other indications, such as certain arrhythmias, cardiac failure, left ventricular dysfunction, and certain renal conditions (Jackson and Bellamy, 2015^[37]). While these drug classes are central to hypertension management, they are also used to treat a range of other cardiovascular and renal conditions. Moreover, patients are often prescribed two or more anti-hypertensive agents concurrently. As a result, drug consumption data – such as the number of defined daily doses (DDDs) – do not provide an accurate estimate of hypertension treatment coverage at the population level.

Table 4.1. Major classes of cardiovascular medications for primary and secondary prevention of CVD

Risk Factor	Therapeutic Drug Class (ATC)	Mechanism	Reduces the risk of	Primary Prevention	Secondary Prevention
Hypertension	ACEi, ARBs, CCB, Beta-blockers, Diuretics	Reduces blood pressure	Stroke, Myocardial Infarction, Heart Failure	x	x
Hyperlipidemia	Statins	Reduces low-density lipoprotein (LDL), also known as the “bad cholesterol”	Myocardial Infarction, Stroke, Atherosclerosis progression	x	x

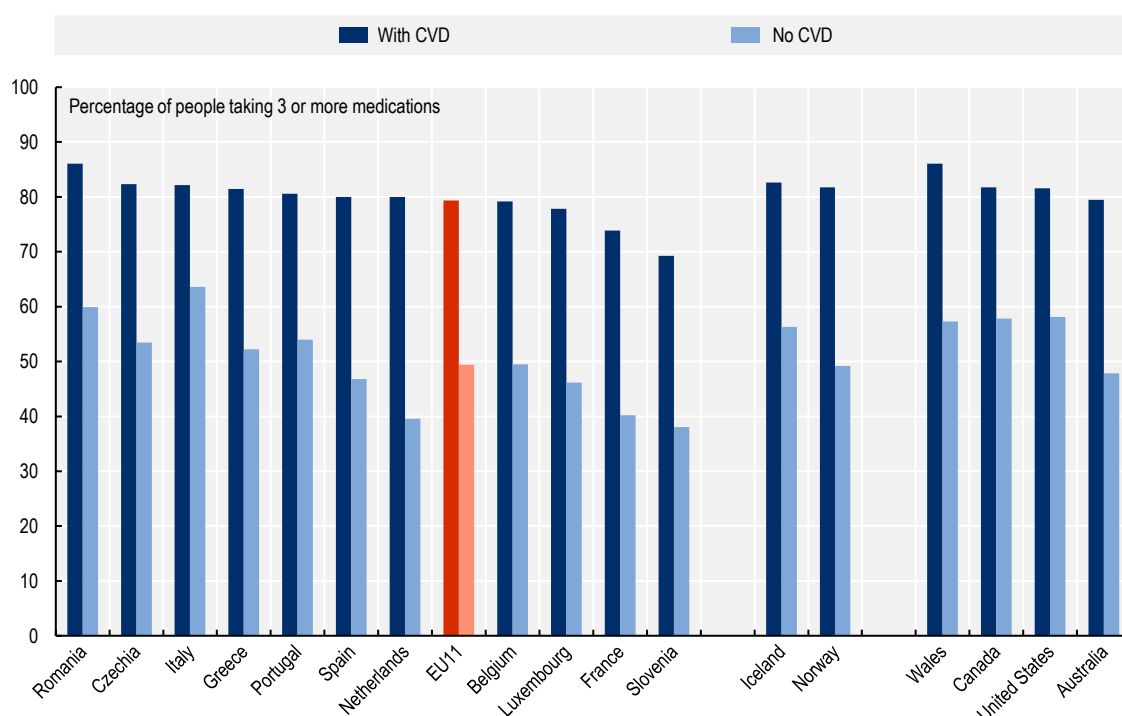
Source: ESC Scientific Document Group (2023^[38]), *2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes*, <https://doi.org/10.1093/eurheartj/ehad192>; Developed with the special contribution of: European Association for Cardiovascular Prevention & Rehabilitation et al. (2011^[39]), *ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)*, <https://doi.org/10.1093/eurheartj/ehf158>; ESC Guidelines (2024^[32]), *2024 ESC Guidelines for the management of elevated blood pressure and hypertension*, <https://doi.org/10.1093/eurheartj/ehae178>.

For lipid modifying therapy, the primary treatment option is hydroxy-methylglutaryl-Coenzyme A (HMG-CoA) reductase inhibitors, commonly known as statins. Statins are classified as high-intensity or moderate-intensity based on their capacity to reduce LDL-C. However, there is significant inter-individual variability in LDL-C reduction, even when the same drug and dosage are administered (Boekholdt et al., 2014^[40]). For patients who cannot tolerate the recommended statin intensity due to adverse effects or fail to achieve target LDL-C levels, adding a non-statin lipid-modifying agent – such as ezetimibe, bile acid sequestrants, or proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors – to the maximally tolerated statin is recommended (See Section 4.9 for more detail) (Moriarty et al., 2015^[41]). Unlike antihypertensive medications, which are often prescribed in combination or for indications other than hypertension, lipid modifying agents specifically target dyslipidaemia and treatment usually begins with statin monotherapy (Preiss et al., 2020^[42]). New oral anticoagulants are discussed in Box 4.3.

Source: Excerpted from OECD (forthcoming^[43]), *Benchmarking Medicine Utilisation to Improve Health Outcomes*.

CVD patients often require complex medication regimens involving multiple drugs, which can make it challenging to accurately interpret prescribing patterns when analysing consumption data from individual therapeutic classes. Almost 80% of primary care users with CVDs surveyed through the OECD PaRIS survey reported taking three or more medications – compared to 50% of all other primary care users (Figure 4.6). OECD data on post-discharge care after ischaemic stroke (see Section 4.7) also reveals inappropriate prescribing across a regimen that includes antihypertensives, antiplatelets, anticoagulants, and relevant combinations of cardiac or lipid-lowering agents containing aspirin. International guidelines highlight the complexity of tailoring treatment to specific CVD patient subpopulations. For instance, recommended post-discharge regimens for patients with heart failure with reduced ejection fraction (HFrEF) include RAAS² inhibitors, beta-blockers, mineralocorticoid receptor antagonists (MRAs), and sodium-glucose cotransporter-2 inhibitors (SGLT2i) (Heidenreich et al., 2022^[44]; Haydock and Flett, 2022^[45]).

Figure 4.6. Primary care users with CVD are 30% more likely to be taking three or more medications compared to people without CVD



Note: *Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. **United States sample only includes people aged 65 years or older. Sorted by people living with CVD. Differences between people living with CVD and people living without CVD are statistically significant ($p < 0.05$) for all countries.

Source: OECD PaRIS Database, 2024.

4.1.6. Established, low-cost cardiovascular medicines remain underused in some EU countries – better prescribing could deliver substantial population health gains

The underuse of evidence-based cardiovascular medications – such as antihypertensives, lipid lowering agents, and anticoagulants – is a persistent and well documented gap in care, and represents a missed opportunity to improve population health. These treatments, along with lifestyle and behavioural changes, are proven to reduce the risk of major cardiovascular events such as heart attacks, strokes, and other major events. Yet large segments of at-risk populations remain untreated or undertreated (Bansilal et al.,

2016^[46]). For example, in Germany, 69% of older patients at high CVD risk were not prescribed at least one recommended medication – more than half lacked statins or antiplatelet agents, with further substantial gaps in beta-blockers and antihypertensives (Meid et al., 2015^[47]). Closing this treatment gap could yield substantial gains in life expectancy and quality-adjusted life years, while reducing the overall burden on health systems.

Box 4.3. Direct oral anticoagulants show modest reduction in CVD mortality

Direct oral anticoagulants (DOACs) have demonstrated modest clinical added benefit when compared with standard of care – warfarin. DOACs offer important cardiovascular benefits, particularly for patients with non-valvular atrial fibrillation (AF) and venous thromboembolism (VTE). In stroke prevention for patients with AF, several DOACs have demonstrated non-inferior or superior efficacy compared to warfarin. For example, a consistent benefit of DOACs across trials is the **lower risk of intracranial haemorrhage**, often cited as one of their key safety advantages. Reductions in this risk typically range between **50-70%** compared to warfarin, as seen in multiple large-scale studies. For instance, apixaban was associated with a **58% lower risk of intracranial bleeding** in the ARISTOTLE trial (Rao, Lopes and Granger, 2013^[48]). Reflecting these benefits, current American and European guidelines recommend DOACs over VKAs (vitamin K antagonists) as first-line therapy for non-valvular AF and pulmonary embolism (ESC Guidelines, 2020^[49]).¹

However, evidence regarding **cardiovascular mortality** is more nuanced. While some individual trials and pooled analyses suggest modest reductions – such as a **10% relative reduction** in cardiovascular death observed in a meta-analysis of four major trials (RE-LY, ROCKET-AF, ARISTOTLE, and ENGAGE AF-TIMI 48) – the overall effect appears limited and varies by drug and patient subgroup (Ruff et al., 2014^[50]).

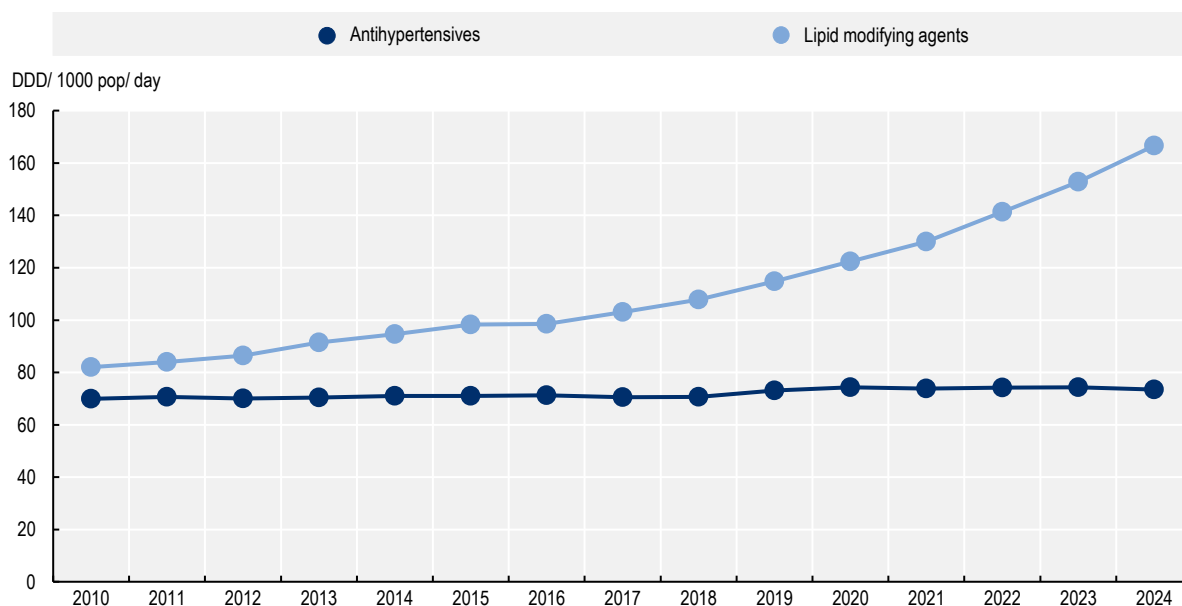
1. In Singapore, DOACs are now also favored over warfarin due to their more favorable benefit-risk profile, fewer drug interactions, and the convenience of not requiring routine coagulation monitoring (2025 OECD Cardiovascular Policy and Data Survey).

Despite evolving demographics and CVD risk profile across Europe (see chapter 3), the use of many common anti-hypertensive drugs – such as diuretics, beta-blockers, and calcium channel blockers – has remained stable in recent years (Figure 4.7). In contrast, the use of lipid modifying agents has seen an over two-fold (103%) increase between 2010 and 2024, suggesting changing treatment patterns. OECD Health Statistics confirm growing use of these medications overall but reveal large variations across OECD countries.

OECD analysis attributes much of this variation to underuse of core therapies like antihypertensive and statins (OECD, forthcoming^[43]). Underuse reflects varying barriers to access by therapy type: older, off-patent medications often face poor adherence, clinical inertia, and system-level implementation gaps (AHA/AMA, 2023^[51]; OECD, forthcoming^[43]). Meanwhile, access to newer, high-cost treatments – such as PCSK9 inhibitors, SGLT2 inhibitors, and GLP-1 receptor agonists – is often limited by health technology assessments and cost-effectiveness. These newer therapies are not always clinically superior to established standard of care, except in select high-risk subpopulation groups (see Section 4.9).

Figure 4.7. Cardiovascular pharmaceutical trends in EU: antihypertensive drugs remain stable while use of lipid modifying agents increases, 2010-2024

Average pharmaceutical consumption (DDD/1 000 population/day) of indicated drug classes between 2010 and 2023 across EU countries



Note: Bulgaria, Cyprus, Ireland, Malta and Romania are not included as data were unavailable. Data for 2024 is only represented by 12 countries. Antihypertensives refer to for the annual average of consumption of antihypertensives, agents acting on the renin-angiotensin system, calcium channel blockers, beta-blocking agents and diuretics.

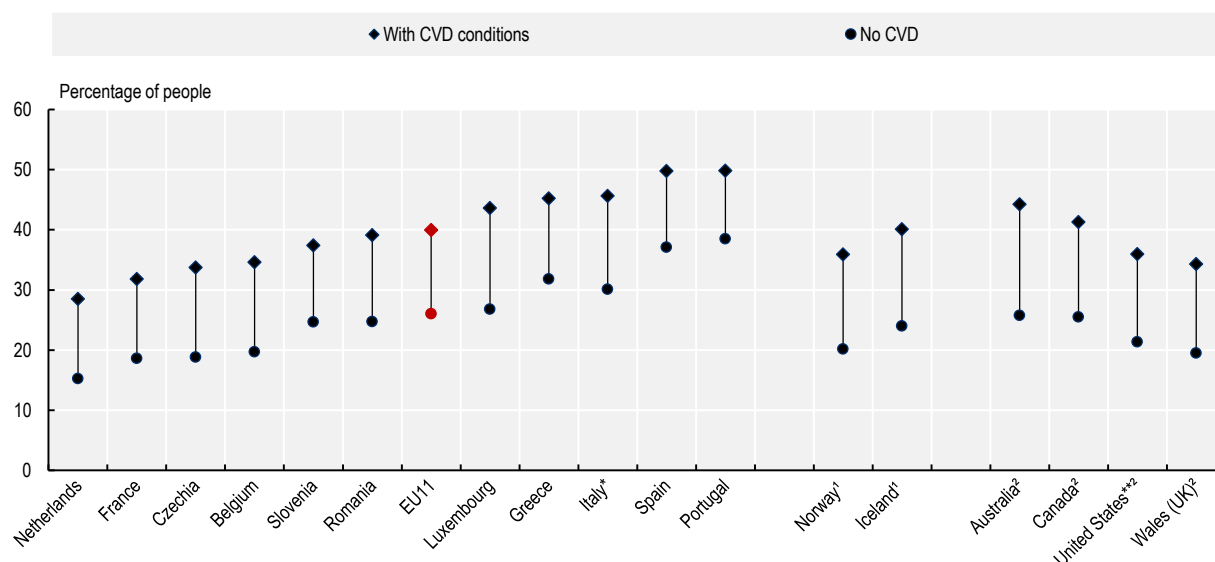
Source: OECD Health Statistics, 2025.

4.2. Improving the quality of emergency care for better CVD outcomes

Primary care users with CVD report having visited the Emergency Department (ED) almost twice as much as those without CVD (40% and 26% respectively, Figure 4.8). The higher share of CVD patient visits to ED is observed across all countries participating in the PaRIS survey: in the Netherlands, where fewer than a third (29%) of primary care users with CVD reported having visited the ED, it is still 14 p.p. higher than those without CVD. Self-management support can play an important role in how people with CVD manage their health concerns (Section 4.1.2). In the Netherlands and France, where primary care users with CVD report lower rates of ED visits (29% and 32%, respectively), more than 70% of them report feeling confident that they can manage their own health (Figure 4.2).

Figure 4.8. People with CVD are almost twice as likely to report having gone to the ED in the past 12 months

Percentage of primary care users aged 45 and older that report having been to the ED in the past 12 months

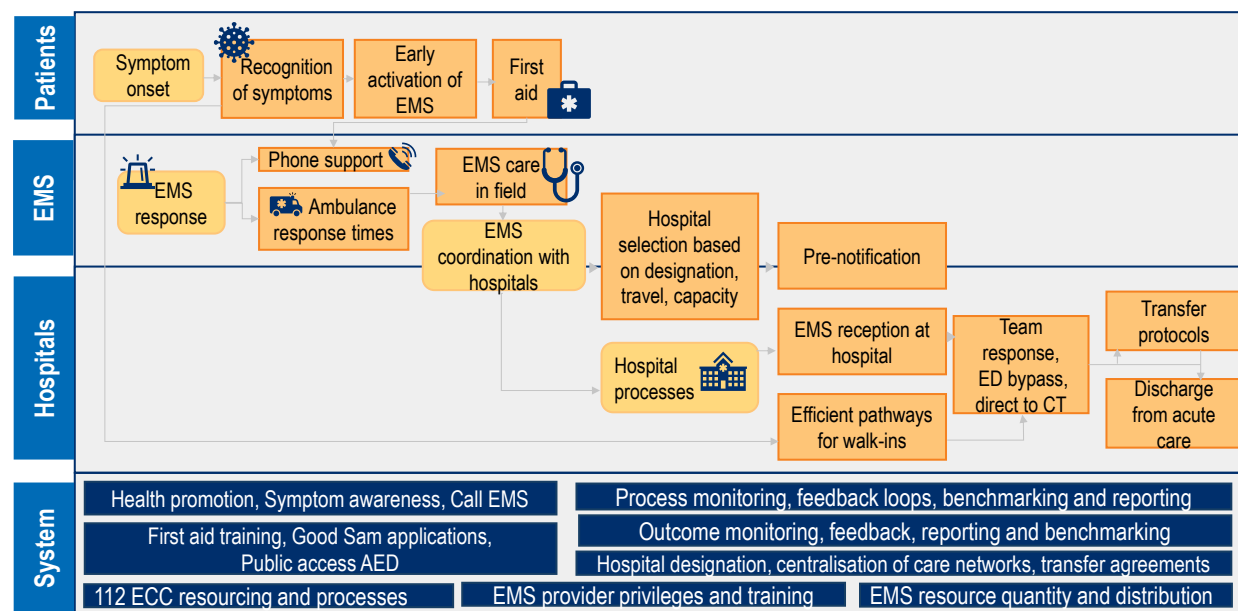


Note: The EU11 average is unweighted 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to the questions: "In the last 12 months, have you been to a hospital ED for your own medical care?" (Yes). * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. Hence, they are expected to have higher risk levels than the patient sample of other countries who had contact with primary care. ** the United States sample only includes people aged 65 years or older. All within country differences are statistically significant.

Source: OECD PaRIS 2024 Database.

Acute CVD refers to those manifestations that develop or deteriorate suddenly, which have the potential to become rapidly worse, but which may be reversed or significantly mitigated by timely, short-term treatment. Three of the most important acute manifestations of acute CVD – stroke, AMI/ACS, and cardiac arrest – occur extremely suddenly and have treatment windows measured in minutes to hours (in the case of cardiac arrest, minutes only). Provision of sophisticated, high-quality, emergency and acute care equitably across people in need, responsively following the onset of a disease process that manifests without warning, requires integration of patient and citizen first aid response, co-ordinated ambulance dispatch, acuity identification and treatment initiation in the field, distribution of patients to hospitals most capable of providing the required diagnostics and treatments, and smooth transition through ED, interventional care and admission to specialist wards (see Figure 4.9).

Figure 4.9. Effective and timely emergency care requires important inputs from patients, emergency services, hospitals, and health systems



4.2.1. Speeding up access to lifesaving care starts with patients and bystanders. Much has been achieved but there are gains to be made

Women often wait longer to call for emergency services than men

Women often wait longer than men after experiencing symptoms to call for help. The Irish National Heart Attack Audit (IHAA, 2024^[52]) has shown steady improvement in the proportion of patients with STEMI³ who call for help within 60 minutes of symptoms between 2017 and 2020. However, since this data has been disaggregated by sex (starting in 2021), it has become apparent that improvements have been entirely among men, with fewer women calling within 60 minutes each year. Likewise, an analysis of the e-MUST register, which captures data from STEMI patients cared for by the SAMU (Service d'Aide Médicale Urgente) units in the greater Paris area, has shown that older age, female sex, and symptom onset at night are all associated with a longer delay to call EMS and that these are synergistic, with a much greater delay at night, for older, female patients than for younger females, or for males of any age, and a greater effect of age on time for call for female patients than male patients (Lapostolle et al., 2021^[53]). A similar phenomenon has been reported from the STEMI registry of a major Swiss hospital, persistent for over 15 years, with patient delays 21-53% longer (25-50 minutes) for women during the three periods studied (Meyer et al., 2019^[54]) and in a Swedish study in which women were found to have a delay to first healthcare contact of 90 minutes compared to 66 minutes for men, as well as the first health contact for women being the nursing advice line rather than primary care, EMS or ED in 28% of cases compared to 18% for men (Sederholm Lawesson et al., 2018^[55]). Outside of Europe, the phenomenon is noted in Korea, where, in 2019, 22.9% of men and 15.7% of women with AMI had an onset to arrival time of under one hour and 37.1% of men and 48.6% of women had a prolonged onset to arrival time of over six hours (Kim, Kim and Hwang, 2022^[56]). These are likely related, at least in part, to the fact that living alone is more common among women than men.

Health decision-makers should understand that living with cardiovascular disease—especially alongside multiple chronic conditions—is not just a medical challenge, but a full-time personal and emotional burden. It means managing complex symptoms, medications, side effects, and appointments with multiple specialists, all while trying to maintain some quality of life.

As a woman, I often feel that I have to fight to be heard—sometimes even scream—just to have my symptoms taken seriously or to get clear answers... Patients like me need coordinated, personalised care that considers the full picture—not just isolated diagnoses. We need faster access to disability support, better communication between specialists, and more investment in gender-aware, preventive, and mental health care. Without these changes, people like me are left to navigate a fragmented system—often alone and unheard.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Citizen engagement can help facilitate an early response during acute events

Some countries, including Austria, Hungary, Italy, Germany and the United Kingdom, have implemented policies to encourage the engagement of citizen first responders for cardiac arrest as a pre-hospital care resource. Citizen first responders are trained citizens and provide first assistance at the emergency scene (Fredman, Berglund and Dardel^[57]; for the ESCAPE-NET Investigators, 2019^[58]). Several European countries have app-based notification systems for first responders and many of which are integrated with automated external defibrillators (AED) registration and mapping systems (see Box 4.4).

Box 4.4. Digital solutions can support an engaged citizenry to make huge improvements to cardiac arrest survival – the Danish success story

In Denmark, when a bystander witnesses someone collapse, they call 112, the Europe-wide toll-free number that routes automatically to an operator with the Danish police. The operator quickly clarifies the nature of the emergency and connects them with the regional Emergency control centre (ECC) where a nurse or paramedic operator identifies a potential cardiac arrest, if needed. The operator then sets in trained ambulance logistics to dispatch the nearest ambulance resource and also a mobile emergency care unit. A signal goes to the national first responder organisation Trygfonden which automatically sends out notifications to nearby citizens who have completed mandatory cardiopulmonary resuscitation (CPR) training as part of drivers licencing and are registered as basic life support (BLS) trained first responders. Trygfonden also maintains the national automated external defibrillators (AED) register and the first responder receives details of the location of nearby AEDs also. Meanwhile the ECC is providing telephone CPR guidance to the original caller, including by video connection. Rates of bystander CPR provision have increased from 19.3% in 2001 to 76% in 2023, AED use has increased from 1.4% to 23% over the same period, and survival rates from 1.4% to 23%.

Source: Dansk HjerTESTopregister (2024^[59]), Danish Cardiac Arrest Registry.

Access to automated external defibrillators (AEDs) plays a critical role in improving survival rates after out-of-hospital cardiac arrest (Baldi et al., 2021^[60]). Early defibrillation has been consistently associated with higher rates of return of spontaneous circulation and favourable neurological outcomes at the time of hospital discharge – meaning the patient is admitted, treated, and ultimately discharged alive (Weisfeldt et al., 2010^[61]; Kishimori et al., 2020^[62]). A meta-analysis of six observational studies without critical risk of bias showed that bystander AED use significantly increases the rate of survival to hospital discharge (Holmberg et al., 2017^[63]). Importantly, the technical skills required to operate an AED are minimal since modern AEDs are designed for layperson use, with clear audio and visual instructions, and their use poses no risk to rescuers (Baldi et al., 2021^[60]). Since 2015, international guidelines have explicitly encouraged AED use by untrained laypersons (Perkins et al., 2015^[64]).

However, despite these recommendations, AED use rates remain heterogeneous across countries – with especially low uptake observed in parts of Europe. Survey results show that the percentage of AED use before emergency medical services arrival remain highly variable, with only five countries reporting pre-EMS AED use exceeding 10%, with large variation between them: France 72%, the Netherlands 46%, Switzerland 23%, Sweden, 20%, and Norway 12% (Baldi et al., 2021^[60]).

Publicly Accessible Defibrillators (PAD) play a vital role in enabling early intervention. Since 2015, guidelines have recommended PADs be publicly registered and integrated into emergency dispatch systems so that first responders and bystanders can be directed to the nearest AED quickly (Perkins et al., 2015^[64]). Yet, research continues to show significant gaps in AED registration, mapping, and integration into emergency response frameworks. According to the 2021 ENSURE survey, an AED mapping system was only available in a little over half of countries surveyed – with some countries having a nation-wide AED mapping available: Finland, Italy, Luxembourg, Norway, the Slovak Republic and Slovenia, Sweden, and Switzerland, and others with AED mapping available in certain regions – France, Germany and the Netherlands (Baldi et al., 2021^[60]).

Legislation can support AED usage. In countries where legal restrictions require a certification for AED use, utilisation rates remain low (around 2.4% to 5%). In contrast, countries that have adopted “Good Samaritan” laws – allowing any citizen to use an AED without prior training – report much higher usage

rates (15-20%) before emergency medical services arrive. According to the 2021 ENSURE survey, 80% of responding European countries allowed unrestricted AED use by all citizens, with only Greece, Italy and Spain requiring a certificate (Baldi et al., 2021^[60]).

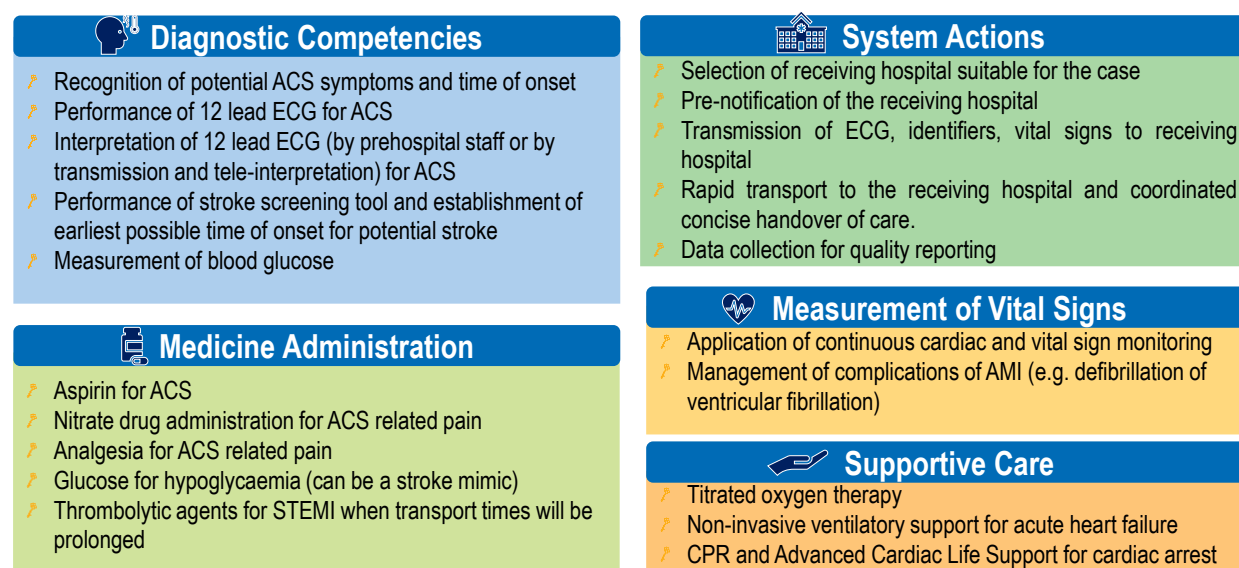
4.2.2. Pre-hospital emergency care organisation varies across countries and some countries provide more highly specialised ambulance care

Ambulance systems are critical to delivery of emergency CVD care, both through bringing lifesaving care to the patient, and through moving patients efficiently to hospitals capable of providing advanced interventions. Ambulance operations include a wide spectrum of medical rescue and critical care but also routine patient transport, and countries have different systems of both prioritising allocation of ambulance resources and of labelling different types of cases. Data collected from OECD countries show that circulatory diseases (defined as AMI and other acute coronary syndrome (ACS), stroke, and cardiac arrest) account for a significant share of emergency (high priority) ambulance transports, but with wide variation across countries, ranging from 1% in Belgium, to 6% in Poland, 18.5% in Estonia and over 30% in Canada (OECD, 2024^[65]).

The first step to effective ambulance care is prioritisation and distribution of resources in response to emergency calls. In some countries (e.g. Norway and Denmark), trained nurses at an Emergency Control Centre triage calls based on structured questionnaires. In other countries, a non-clinical operator applies a tool with support from nurses, paramedics or doctors available as needed (the United Kingdom, Ireland, Australia and Estonia). In France, calls to SAMU15 (*Service d'Aide Médicale Urgente*) emergency number are first assessed by a trained medical assistant who then routes the call to either a generalist physician (for low acuity cases) or an emergency physician (for high acuity cases). Each of these systems has significantly different workforce requirements. Despite this variation, there are commonalities. For example, the pre-hospital triage systems employed in Norway, Denmark, Slovenia, Estonia, Sweden and Israel are all adapted from the Seattle/King County EMS Criteria Based Medical Dispatch System and all applications of it separate cases into those for immediate response, those for urgent response, and those that can wait or be scheduled, with what variation there is occurring in the handling of the low acuity cases (OECD, forthcoming^[66]).

High-quality pre-hospital care for CVD emergencies depends on effective integration with hospital care to minimise delays to delivery of time critical, high-complexity interventions (like revascularisation for STEMI and stroke) and ensure a prompt and guideline compliant response to cardiac arrest (Figure 4.10). Diagnosis and prescription and administration of medicines in many countries are protected activities belonging to the scope of physicians (and in the case of administration, nurses). Countries may have to overcome regulatory hurdles to allow non-medical pre-hospital staff to perform these tasks as ensuring a doctor and nurse are at the scene of every critical case in the time required is proving very difficult. In some countries (e.g. Australia), EMS/ambulance officers began administering medications under protocols many decades ago. These protocols have progressively increased in scope as has the sophistication of the training of the workforce. The first bachelor's degree programme in paramedicine started in Australia in 1994 and the British NHS has required a degree for entry into the profession since 2013 (Makrides et al., 2022^[67]). Currently, most ambulance providers in these countries are paramedics or above. Many EU countries are creating paramedic qualifications also, for example in Germany, a federal law was passed in 2014 (Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen, 2018^[68]) to create the role of *Notfallsanitäter* (Paramedic) and to define educational standards and a scope of practice including administration of key medications and therapies. These changes are allowing countries to redirect the physician workforce to activities where they are more needed.

Figure 4.10. Key elements of prehospital care for acute CVD

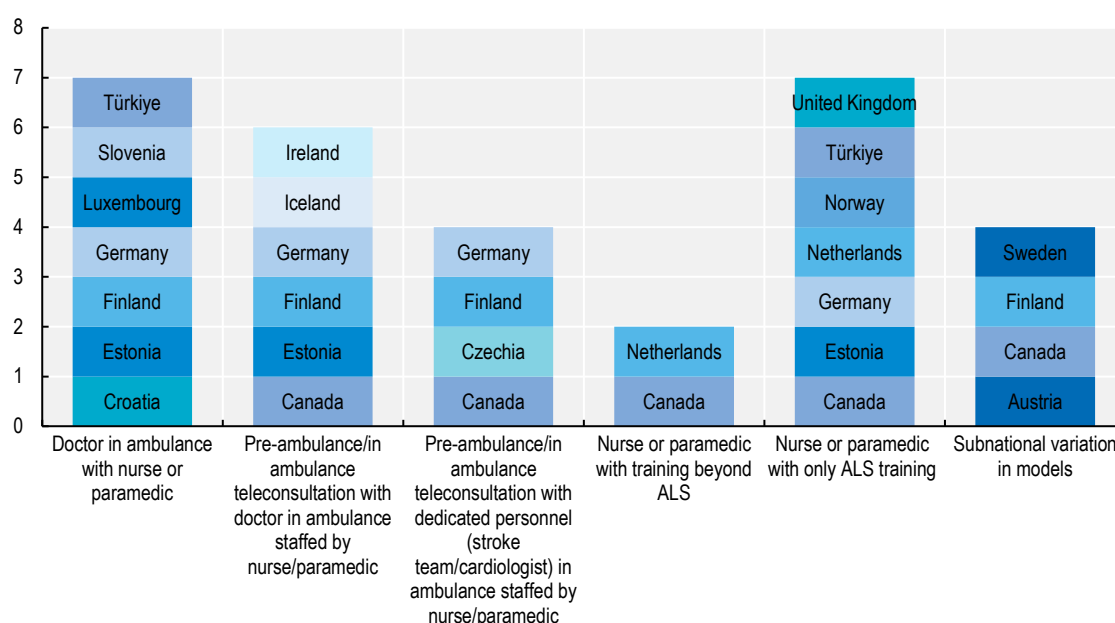


Pre-hospital diagnosis and treatment contribute to higher survival of patients. Pre-hospital decision support and electrocardiogram (ECG) transmission to the receiving facility can be associated with significant reductions in door-to-balloon times (Nelson et al., 2025^[69]). Similarly, pre-hospital screening tools can assist with identification of potential ischaemic stroke and of large vessel occlusion stroke and allow for hospital selection and prenotification by EMS teams (Zhao et al., 2018^[70]). Aspirin administration reduces death from AMI as much as revascularisation does, and is additive in effect to those more invasive therapies, making its prompt use on suspicion of acute coronary syndrome essential.

Some countries are employing specialised vehicles and teams to deliver high-level care to patients with specific conditions. Norway, Poland, and several non-EU countries are employing Mobile Stroke Ambulances with on-board CT (computed tomography) scanners and the ability to diagnose and treat acute ischaemic stroke in field (Navi et al., 2022^[71]). Norway also utilises pre-hospital thrombolysis of STEMI in rural areas where transport times can be long. In smaller countries with shorter transport times, priorities are different. Denmark is moving away from use of physicians on board of ambulances and delegating more authority to paramedics and teams are typically composed of a paramedic and an emergency medical technician. Estonia has extended significant autonomy to pre-hospital nurses and is trying to reduce physician use in ambulances.

The staffing model approach for bringing high level critical care to the patient varies between countries (Figure 4.11). According to the OECD Cardiovascular Policy and Data Survey, seven countries (Healthcare quality and outcomes) have a physician on board in the ambulance when possible for high acuity cases like stroke and STEMI. Three of these countries and three others utilised physician telehealth support to EMS crew members treating these cases. In four countries, there was a system for telehealth consultation between EMS and specialty staff (cardiology or stroke clinicians). Seven countries reported using paramedics or nurses trained to Advanced Life Support (ALS) level and three using nurses or paramedics trained to a higher level than that. It should be noted that some larger countries have significant local variation in models of service delivery and identified more than one of these models as being in use.

Figure 4.11. Different staffing models are employed to deliver expert care in the field



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

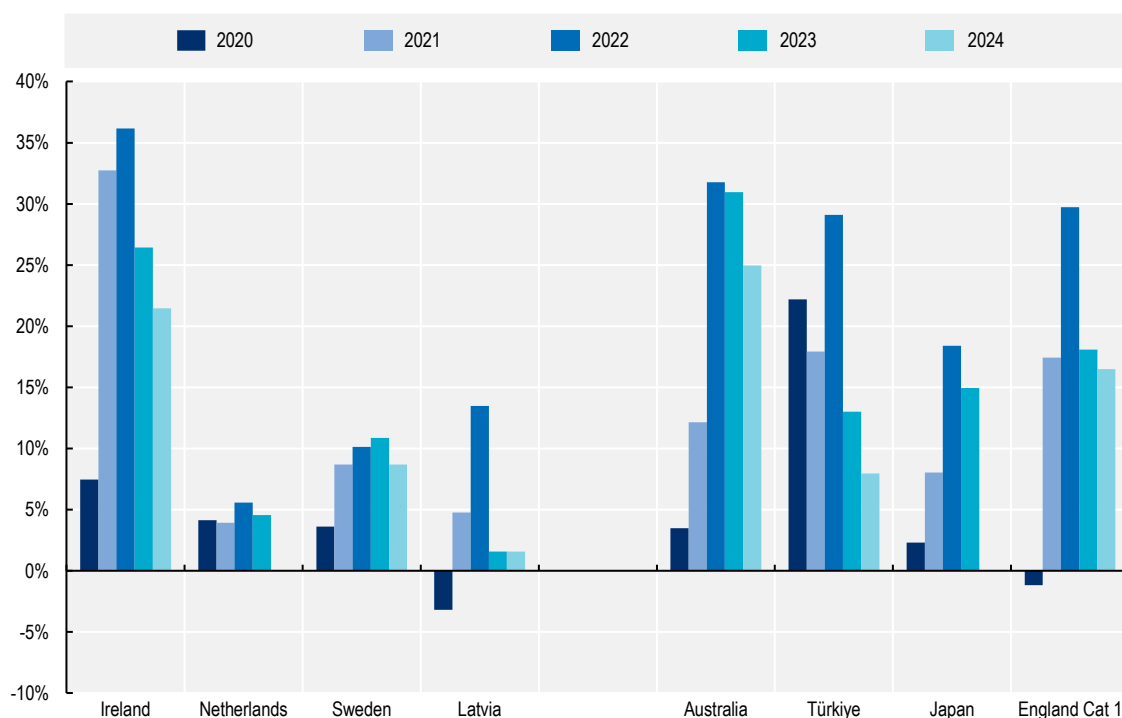
Ambulance response time targets are introduced in many countries in Europe to promote timely and effective emergency care

Many European countries have introduced ambulance response time targets (examples in Annex 4.C), which act both as a driver of responsiveness in the EMS system and as a measure of adequacy of resourcing and organisation. Some are maximum acceptable times, but most are targets for mean, median or a specific centile of responses. There are also differences between countries in the degree of complexity of targets. In England, for example, there is an 8-minute target for the most urgent (cardiac arrest or immediate risk of cardiac arrest) cases and an 18-minute target for the next category (which includes potential stroke and STEMI) while some other countries set a single target time for all emergency transports. Using different targets for rural and urban environments is another consideration, for example as Norway and Estonia do. In Singapore, ambulance response time is monitored primarily for internal reporting purposes, with specific measures implemented to address the root causes of delayed responses.

The pandemic significantly impacted ambulance response times in several countries (Figure 4.12) and recovery seems to be starting, but progress is slow. In England, the mean and 90th centile response times for Category 1 (potential cardiac arrest) cases peaked in 2022 at 31% and 30% above the 2019 figure respectively. Category 2 response times (for potentially serious cases like heart attack and stroke symptoms) were even more impacted, peaking the same year at 150% and 130% above the 2019 figures (not shown in figure). Data prior to the pandemic had demonstrated consistent performance close to targets for at least 2 years. In other countries, peaks relative to the 2019 results occurred in 2022 in Ireland (36%), the Netherlands (6%), Latvia (13%), Australia (32%), Türkiye (29%) and Japan (18%) and in Sweden in 2023 (11%). Sweden and Australia also had very little variation reported in the years before the pandemic. Data from Norway on the other hand shows a consistent response time from 2019 and Danish data (only available from 2020) has also been consistent.

Figure 4.12. Ambulance response times have been significantly impacted since the pandemic in several countries

Response times presented as percentage change in average response time. Reference year 2019



Note: Ireland, the Netherlands, Sweden, Latvia and Türkiye report median response times, Japan reports the mean. Australian data represents the weighted averages of the medians for each jurisdiction (state or territory). England reports the mean.

Source: 2025 OECD Cardiovascular Policy and Data Survey; Australian Government Productivity Commission (2025^[72]), *11 Ambulance services – Report on Government Services 2025*, <https://www.pc.gov.au/ongoing/report-on-government-services/2025/health/ambulance-services>; Nuffield Trust (2024^[73]), *Ambulance response times*, <https://www.nuffieldtrust.org.uk/resource/ambulance-response-times>.

4.2.3. Specialised treatment and timely care are essential to improve CVD outcomes related to acute events

Patients experiencing hyper-acute CVD events often benefit significantly from specialised treatment when therapies are initiated early after symptom onset. The importance of well-organised care systems which can deliver highly specialised care to AMI and stroke patients has been internationally recognised and many countries have established, or are in the process of establishing organised care networks to respond to cardiac and stroke patients' acute treatment needs (see Section 4.3). More detail on the specific care pathways needed for stroke, AMI, and cardiac arrest is discussed in more detail in Annex 4.D.

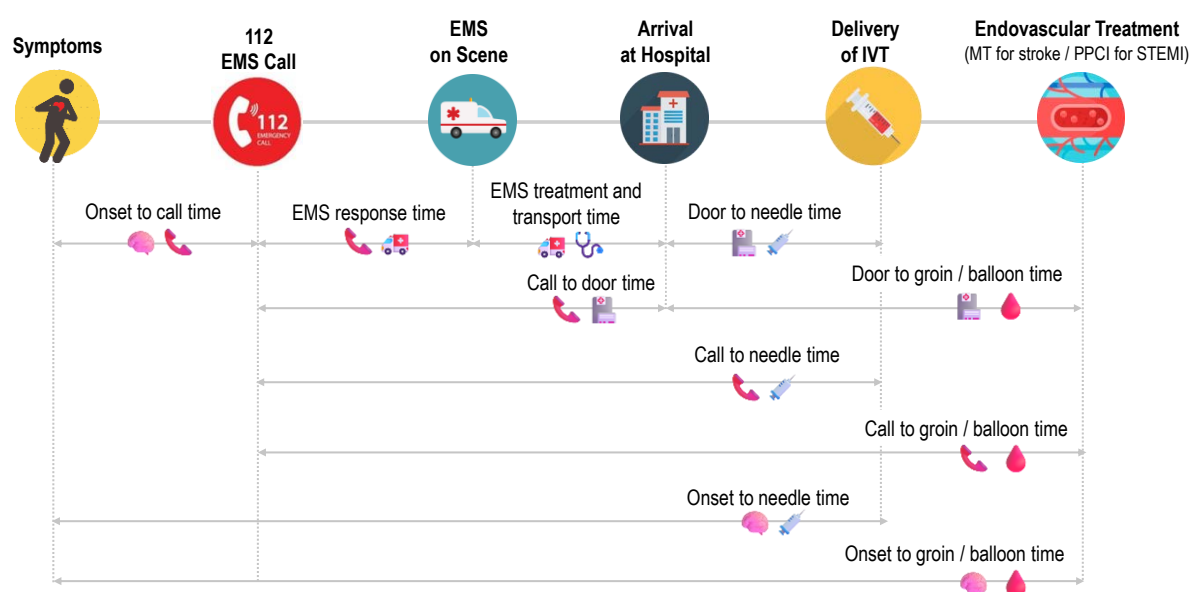
A door-to-balloon time in STEMI of over 90 minutes is associated with a significantly higher short- or medium-term risk of death (odds ratios of 1.52 and 1.53 respectively) as compared to more rapid procedures. Every 30 minutes' delay adds 15% to those odds ratios (Foo et al., 2018^[74]). The reduction in disability achieved through stroke revascularisation is also time dependant with thrombolytic therapy required within 4.5 hours to show a benefit and a more convincing benefit evident when patients are treated within three hours (The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group, 1995^[75]; Hacke et al., 2008^[76]). National evidence from Denmark shows that longer intervals between symptom onset and thrombolysis (longer than 90 minutes) also lead to worse long term outcomes, such as death or subsequent stroke withing three years (Yafasova et al., 2021^[77]).

Bodies including the European Society of Cardiology (ESC Guidelines, 2023^[78]), the European Stroke Organisation (Berge et al., 2021^[79]), the National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand (Brieger et al., 2025^[80]), the American Heart Association (Gulati et al., 2021^[81]) and the United Kingdom National Institute for Health and Care Excellence (National Institute for Health and Care Excellence, 2024^[82]) develop and provide expert, evidence based, consensus guidelines on the management of the full spectrum of CVD with good agreement across key recommendations among the various bodies. From these, national healthcare quality agencies define quality standards and key performance indicators.

Based on these guidelines, time from first clinical contact to ECG interpretation for acute coronary syndrome patients should be less than 10 minutes. STEMI patients with symptom onset within 12 hours should have percutaneous coronary intervention (PCI) as soon as possible – with the alternative of thrombolysis if PCI will be delayed more than 120 minutes. For high-risk non-STEMI patients there is less urgency, however PCI treatment is recommended within 24 hours of symptom onset (ESC Guidelines, 2023^[78]). Process indicators for acute CVD care include the proportion of eligible patients receiving the recommended treatments, the time delays to those treatments (or the proportion treated within target times) and supporting indicators like the proportion of patients delivered directly to a facility designated for that condition (Figure 4.13).

Figure 4.13. Key time intervals in the hyperacute phase of stroke and STEMI treatment are monitored to drive system improvements

Subintervals of these may be defined to address specific process elements and disaggregation by age, sex and other determinants of access to care may assist with improving equity



In the case of STEMI management, there is significant diversity of reporting of process measures. Ireland reports revascularisation times starting from first medical contact (ambulance, GP or hospital) while NHS England reports time from EMS call to revascularisation. Starting the clock at first medical contact focusses the attention on the ability of the system to react to a diagnosis of STEMI, while starting it at the ambulance call includes the ability of the system to respond to the call in a timely fashion. In the case of cardiac arrest, response needs to be immediate, provided within minutes of symptom onset and the participation of first responders as well as availability of AED is crucial (see Section 4.2).

Monitoring complex timeliness indicators remains a challenge for many EU countries, and international benchmarking needs further work. In 2022, only 11 EU countries were able to report the median onset-to-needle times for IVT and median onset-to-groin times for MT in ischemic stroke patients for the ESO Stroke Service Tracker Data. Of the countries that could report (Austria, Czechia, Denmark, Estonia, Greece, Hungary, Latvia, the Netherlands, Romania, the Slovak Republic and Sweden), many had a longer history of formalised centralisation of highly specialised CVD care. Catalonia in Spain also reports the onset-to-needle and onset-to-groin time data to the ESO Stroke Service Tracker Data (European Stroke Organisation (ESO), 2025^[83]).

Other time intervals may be measured to monitor other elements of the chain of care. In non-EU countries such as the United Kingdom (England), the mean average time from call until hospital arrival (an indicator of EMS performance) for stroke was one hour and 32 minutes in February 2022 (NHS England, 2023^[84]), and the mean average time from call to catheter insertion (a measure of integrated EMS and hospital care) was 2 hours 57 minutes in December 2022 (NHS England, 2023^[85]). In Korea, the average time from symptom onset to ED visit (an indicator of community awareness as well as EMS performance) for AMI was 153 minutes in 2019 for STEMI and 196 minutes for NSTEMI, 20.7% arriving in under one hour, 39.4% within two hours, and 40.6% taking over six hours (Kim, Kim and Hwang, 2022^[56]) (See also Section 4.2 for discussion of gender differences in time to arrival).

During acute cardiac events, timely intervention was crucial. I have witnessed the life-saving impact of rapid emergency response and treatment in my own and family members' experiences. However, delays due to system inefficiencies or lack of awareness can cause critical setbacks. It is vital that emergency pathways and public education continue to improve to ensure prompt care.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

4.2.4. Time-sensitive intravenous thrombolysis use for stroke treatment differs substantially between EU countries

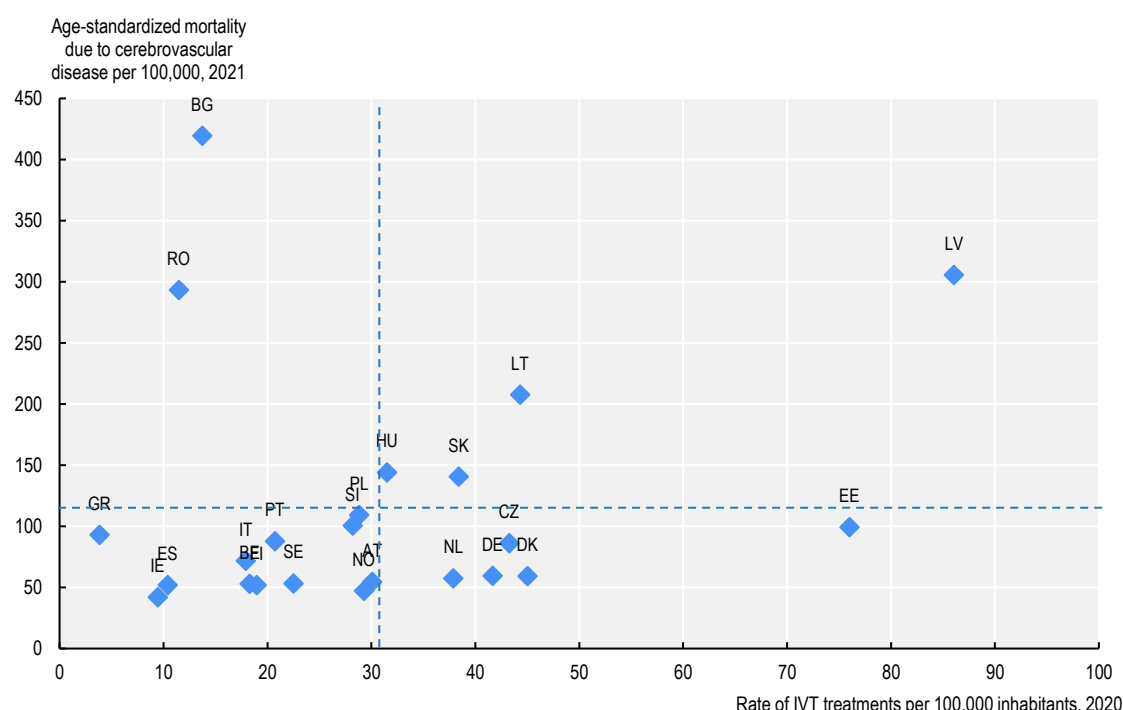
IVT and MT in stroke are reserved for those patients in whom the potential benefit outweighs the risk of harm from the treatment. For this reason, eligibility for IVT is dependent on arrival of the patient at hospital and completion of diagnosis and assessment including neuroimaging and certain laboratory markers within the treatment window.⁴ ESO and AHA-ASA (American Stroke Association) guidelines define the treatment window for IVT in ischaemic stroke as 4.5 hours from symptom onset (after which the prospects of a benefit decline too much), and provide recommendations for patients with symptoms on awakening from sleep or with a longer time from onset but certain favourable imaging findings (Berge et al., 2021^[79]; Powers and et al, 2019^[86]). MT has a longer treatment window of six hours after symptom onset, and up to 12 hours in certain patients with favourable imaging findings but is limited in use to subset of ischaemic stroke patients with stroke due to occlusion in one of the larger arteries (Turc et al., 2019^[87]).

Time to diagnosis and assessment is modifiable by improvements at every stage in the process from the call for help through to the decision to treat. The ESO-SAFE collaboration has set a target of 15% of ischaemic stroke patients in Europe to receive IVT by 2030, to drive improvements in the chain of care from onset to delivery of treatment. Achieving IVT rates above 15% is considered a feasible and attainable

target because studies have shown that several countries are already meeting or exceeding this level, while others have demonstrated steady improvements in IVT uptake since 2017 (Mikulik et al., 2021^[88]). Moreover, evidence suggests that the earlier treatment with IVT is administered, the greater the benefit for patient outcomes, further underscoring the importance of timely and widespread access to IVT (Norrving et al., 2018^[89]).

IVT use in Europe has been increasing since its debut in the mid-1990s and remains the only approved systemic reperfusion treatment in Europe for patients with acute ischaemic stroke (Berge et al., 2021^[79]). The use of IVT varies across Europe and exemplifies the “inverse care law” – in regions where mid-life stroke-related disability is highest, IVT use is among the lowest (Berge et al., 2021^[79]). Rate of IVT varies by a magnitude of 20 between European Countries – from over 75 per 100 000 population in Latvia and Estonia to below 10 in Ireland and Greece (Figure 4.14). Furthermore, some countries with high mortality rates due to cerebrovascular disease have notably low rates of use of IVT, including Bulgaria and Romania. Latvia stands out as a country where there is high use of IVT and high cerebrovascular mortality, while Estonia, has lower than average cerebrovascular mortality and high rate of use of IVT.

Figure 4.14. Rate of Intravenous Thrombolysis varies by a magnitude of 20 between European countries and is not always correspond to burden



Note: Dotted lines indicate the average (31 IVT treatments per 100 000 inhabitants and age-standardised mortality of 117 due to cerebrovascular disease).

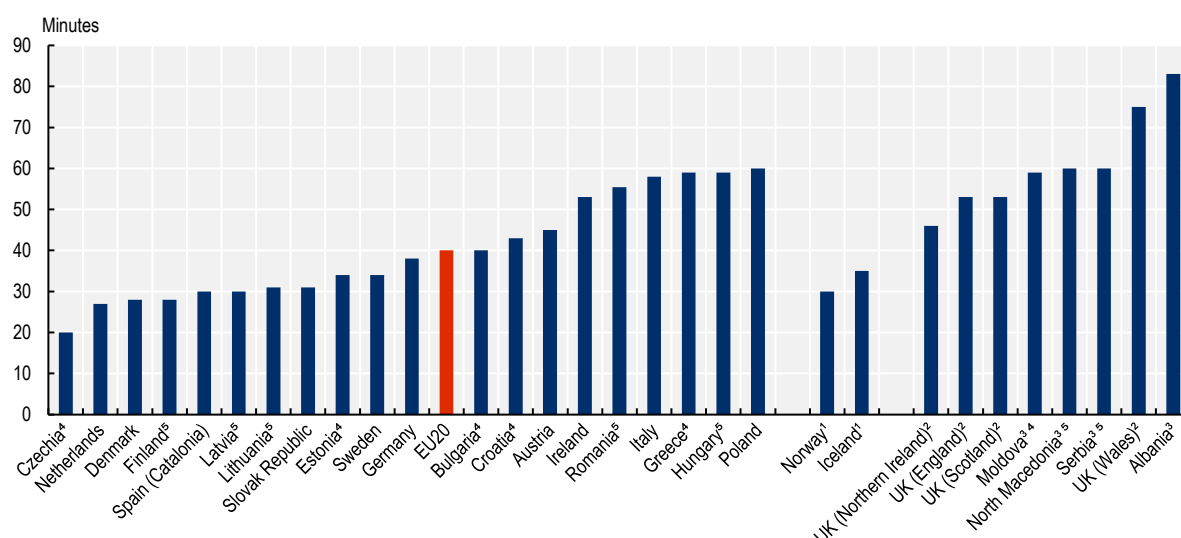
Source: Aguiar de Sousa et al. (2023^[90]), “Delivery of acute ischaemic stroke treatments in the European region in 2019 and 2020”, <https://doi.org/10.1177/23969873231186042>.

The proportion of *eligible* patients treated with IVT is likewise an indicator of the ability of that facility to assess the patient, obtain and interpret imaging studies and relevant laboratory studies, and administer treatment before the window for treatment closes. “Eligible patients” are defined as those with a confirmed ischaemic stroke arriving within the treatment window (4.5 hours from onset). The ESO Stroke Action Plan for Europe has (SAP-E) set a target of delivery of IVT to 15% of all ischaemic stroke cases (note that this

denominator is not limited to those arriving within 4.5 hours and so improvements depend on whole of system action). According to ESO Data, 13 out of 22 EU countries with available data reported providing IVT to more than 15% of their admitted ischaemic stroke patients in 2023 (ESO-SAFE, 2025^[91]), yet the data reveal significant variation among EU countries. While some EU countries reported administering an IVT to just above 8% of their stroke-unit admitted patients (and Bulgaria just 3%), Czechia, Estonia, the Slovak Republic, Austria and the Netherlands reported rates above 20%. Czechia improved their rate of IVT treatment from 1.3% in 2005 to 23.5% in 2018 with implementation of an integrated stroke system (Mikulik et al., 2021^[88]).

Door-to-needle time for IVT in stroke as reported to the ESO Stroke Service Tracker shows a wide variability across Europe (see Figure 4.15), ranging from 20 minutes in Czechia to 60 minutes in Poland. The highest performing countries have a door-to-needle time of around 30 minutes or less – and the EU average is 40 minutes. International comparisons must be made cautiously as many countries are reporting data from nationally non-representative registries that collect data from significantly less than 100% of hospitals and which rely on hospital staff for the completeness of reporting of their own cohorts of patients.

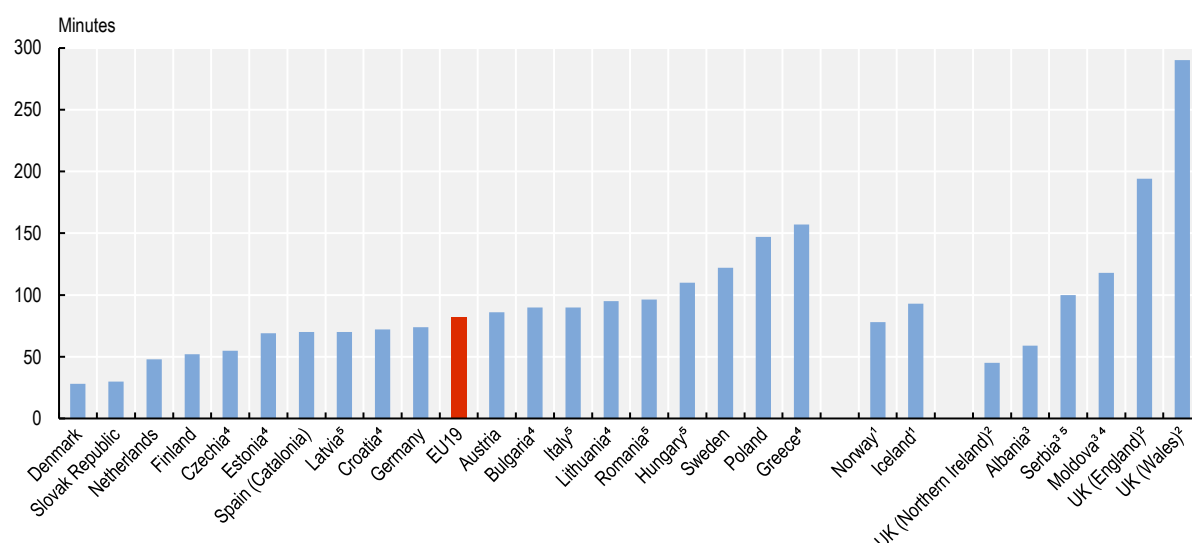
Figure 4.15. Median door-to-needle time for intravenous thrombolysis, 2023



Note: Data refer to median door-to-need time for ischaemic stroke patients treated with intravenous thrombolysis, measured from entering a hospital door to the start of administering the treatment. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. 4. Estimate based on nationally non-comprehensive RESQ database. 5. Estimate through ESO-SAFE contacts to facilities. Source: ESO Stroke Service Tracker Data (<https://actionplan.eso-stroke.org/kpi/kpi-7c>).

Median door-to-groin time for MT delivery to patients with stroke similarly shows significant variability in national performance, ranging from 28 minutes in Denmark to 157 minutes in Greece, with an EU average of 82 minutes (see Figure 4.16). The same caveats apply. A potential risk of excessive focus on a single indicator like door-to-needle time is that other patients competing for the same or similar resources (for example haemorrhagic stroke patients) may not see similar improvements in care.

Figure 4.16. Median door-to-groin time for endovascular treatment, 2023



Note: Data refer to median door-to-groin time for ischaemic stroke patients with endovascular treatment, measured from entering a hospital door to the start of the mechanical thrombectomy procedure. 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. 4. Estimate based on nationally non-comprehensive RESQ database. 5. Estimate through ESO-SAFE contacts to facilities. Source: ESO Stroke Service Tracker Data (<https://actionplan.eso-stroke.org/kpi/kpi-7d>).

Some studies also point out socio-economic inequalities in access to specialised CVD care within countries. One study in Sweden found that the median time from a call to emergency medical services to start of brain CT scan in hospital was 3 hours and 47 minutes for stroke patients with the lowest socio-economic status (SES), and 30 minutes shorter for stroke patients with the highest SES (Niklasson, Herlitz and Jood, 2019^[92]). One Danish study found that thrombolysis and thrombectomy treatment rates vary by socio-economic background (Buus et al., 2022^[93]) and one study in England found that the likelihood of receiving complex ED care and hospitalisation was lower among people with lower SES (Turner et al., 2022^[94]). Relatedly, survival rates of people who had stroke and heart attack are lower among people with lower socio-economic background (Hyldgård et al., 2022^[147]; (Jonsson et al., 2021^[95]). A systematic review also found research findings on poorer access and health outcomes among people with heart failure in lower SES groups compared to those with higher SES groups (Shakoor et al., 2024^[96]). These research findings suggest that there are obstacles to ensure timely and high-quality emergency care to people with low SES exist within countries, although their impact and possible solutions appear to vary across countries.

International collaboration is helping European countries improve their delivery of timely high quality stroke care

Providing a rapid treatment to ischaemic stroke patients requires a well-functioning healthcare system, including emergency dispatch centres, ambulance services, EDs, radiologists, and stroke teams co-ordinated by a vascular neurologist or a stroke physician (Berge et al., 2021^[79]). Many EU countries including Denmark, the Netherlands, Norway and Czechia have organised their stroke care providers into comprehensive networks to drive timely transport of stroke patients to the facilities capable of treating them (see Section 4.3). A study in 2017 surveying access to stroke care units and their delivery rates found major inequalities in acute stroke treatment between and within 44 European countries, with regional differences reported in 28 countries, and 28 countries lacking full-country endovascular treatment coverage at that time (Aguar de Sousa et al., 2018^[97]).

In response to the study, the Stroke Action Plan for Europe 2018-2030 (SAP-E) was launched in 2018 by ESO in co-operation with the Stroke Alliance for Europe (SAFE) (Norrving et al., 2018^[89]). The SAP-E plan aims to support the improvement of stroke care in Europe through a development of integrated stroke care across care settings, and provides targets for several domains, including for management of acute stroke care. For example, a target has been set for 2030 of median onset-to-needle time of less than 120 minutes for patients receiving IVT and median onset-to-groin time of less than 200 minutes for patients receiving MT. In 2022, only a handful of those EU countries with available data were reaching, or close to reaching, these SAP-E targets, with Denmark and the Netherlands consistently performing the best (ESO-SAFE, 2025^[91]). See Box 4.5.

Box 4.5. The ESO-SAFE collaboration and the Stroke Action Plan for Europe 2018-2030

A joint activity of patients and scientific organisations

The Stroke Action Plan for Europe 2018-2030 (SAP-E) is a joint action of physician and scientific community of the European Stroke Organisation (ESO) and of stroke patients of the Stroke Alliance for Europe (SAFE), which unites some 40 patient support organisations. The SAP-E is a key project of the ESO, aiming to reach a broad consensus on what care should be available in European countries for stroke patients, and on monitoring its accessibility and quality. The project builds on the assumption that moving forward in implementing national stroke action plans and enhancing quality of stroke care requires broad involvement of relevant stakeholders, including healthcare professionals and patient support organisations, but also governments and third-party payers.

The four overarching targets to be reached by 2030 include:

- Reduction in the absolute number of strokes in Europe by 10%
- Treating 90% or more of all patients with stroke in Europe in a dedicated stroke unit as the first level of care
- Having national plans for stroke encompassing the entire chain of care from primary prevention to life after stroke
- Fully implementing national strategies for multisector public health interventions to promote and facilitate a healthy lifestyle and reduce environmental, socio-economic and educational factors that increase the risk of stroke.

Source: (Tomek et al., 2024^[98]; Norrving et al., 2018^[89]; ESO^[99]).

4.3. Addressing gaps in the quality of hospital care for CVD

For most people with CVD, hospitals play a key part in their care – either as a place for care following acute events (emergency response after chest pain), for advanced diagnosis and screening (magnetic resonance imaging (MRI) following stroke), or for elective or emergency care (implantation of a pacemaker). Despite playing a central role in all health systems as a care setting for CVD, hospital access, capacities, and outcomes vary and are not always sufficiently matched to disease burden and demand.

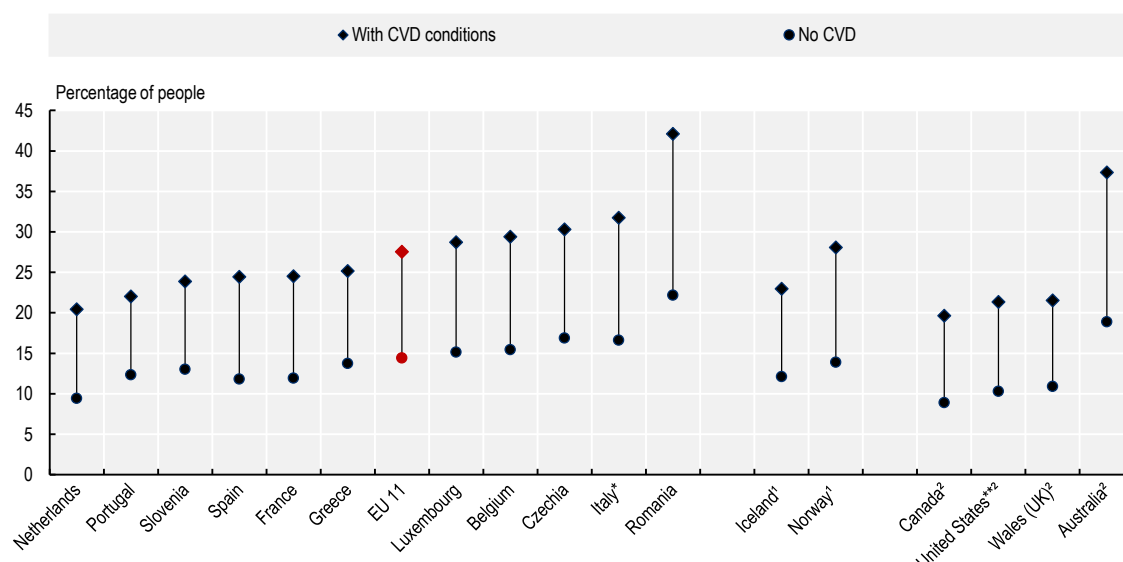
4.3.1. Access to hospital care varies across countries

People with CVD-related conditions are twice as likely to be hospitalised than other people

Reflecting difficulties in managing CVD-related conditions, among people aged 45 and over attending primary care, those with cardiovascular conditions are twice as likely to be hospitalised than those without CVD-related conditions (Figure 4.17). This highlights that accessibility and high-quality emergency care and hospital care are critical for treating CVD, although some CVD-related hospital admissions could be avoided with effective primary care. The likelihood of hospitalisation among people with CVD conditions varies greatly across countries. Among people with CVD conditions who use primary care services, 20% in the Netherlands, 22% in Portugal and 23% in Iceland report being hospitalised in the last year, but the share is much higher at 42% in Romania, followed by 32% in Italy and 30% in Czechia.

Figure 4.17. People with CVD are twice as likely to report having been hospitalised in the past 12 months

Percentage of primary care user aged 45 and older that report having been in a hospital for more than one night in the past 12 months



Note: The EU11 average is unweighted 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. Response to the question: "In the last 12 months, have you been in a hospital for one night or longer?" (Yes). * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. Hence, they are expected to have higher risk levels than the patient sample of other countries who had contact with primary care ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS 2024 Database.

A large share of hospital care is provided to people with CVD and some countries in Europe heavily rely on hospital care

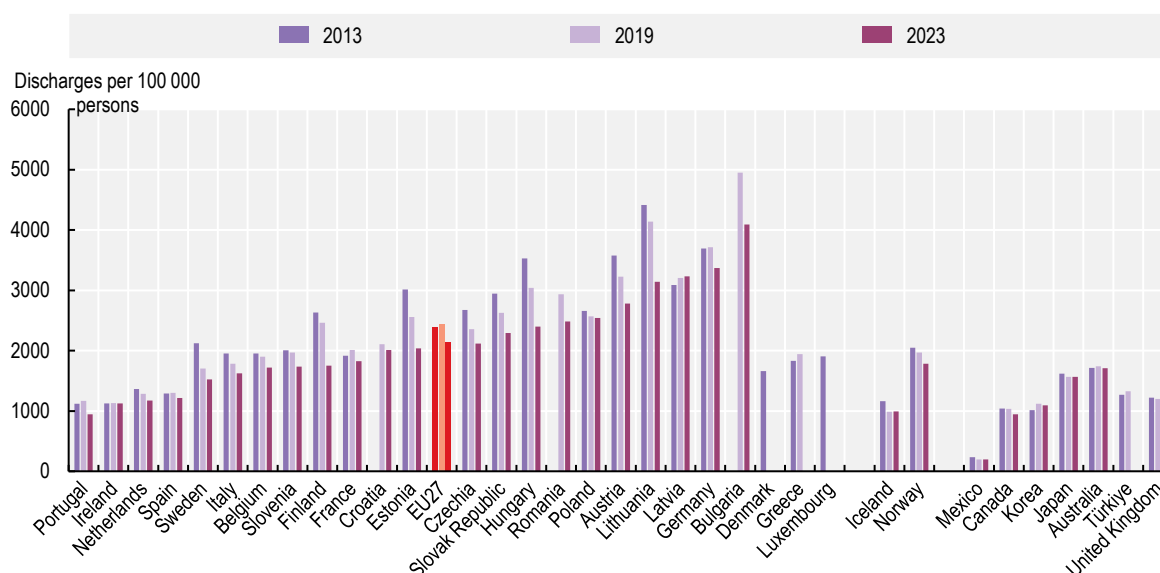
In almost all countries in OECD, circulatory diseases are the most common cause for inpatient care, and in 2023, 14% of hospital discharges across Europe were associated with cardiovascular diagnosis requiring planned surgical procedures and acute care after acute CVD events. The share varies two-fold, ranging between 9% in Ireland to 18% in Latvia and Lithuania. Hospital discharges for circulatory diseases vary over four-fold in the EU. They are less than 1 000 discharges per 100 000 populations in Portugal and Iceland, but exceed 3 000 in Lithuania, Latvia and Germany, and stand at more than 4 000 in Bulgaria (Figure 4.18).

Timely care was critical in my case. After my initial heart attack, delays in seeking medical attention led to complications like ventricular tachycardia and an electrical storm. However, the swift decision to transfer me to Budapest for catheter ablation saved my life. This experience underscores the importance of rapid response systems and well-coordinated care pathways for acute cardiovascular events.

Caius, artist, researcher, patient advocate, and heart attack survivor

High reliance on hospital care is marked in Bulgaria, Germany, Lithuania, Latvia and Austria. In Bulgaria, this is related to an oversupply of acute hospital beds and a shortage of GPs (OECD/European Observatory on Health Systems and Policies, 2023^[100]). To shift away from hospital care, in Lithuania, a major restructuring was initiated in 2022 that aims to create a new model of service provision in primary care and reorganise the hospital network, with a view to improving the quality and accessibility of services (OECD/European Observatory on Health Systems and Policies, 2023^[101]). Latvia has reduced the number of hospital beds but plans to undertake reform to improve access to high quality primary care through the use of digital health tools and better workforce planning (OECD/European Observatory on Health Systems and Policies, 2023^[102]). Hospital discharges for circulatory diseases have decreased over the past decade – with an average decline of 243 discharges per 100 000 population between 2013 and 2023 in EU countries – despite a peak in several countries already preceding the COVID-19 pandemic. Latvia and Ireland, notably, have plateaued or increased over this time period. The general downward trend is likely to be associated at least partly with improved quality of primary care in managing CVD risks for needing specialised care across countries (see Section 0) and streamlined delivery of hospital care through care concentration (see Section 4.3.2).

Figure 4.18. Hospital discharges for circulatory diseases, 2012, 2019 and 2023 (or nearest year)



Note: The EU average is unweighted.

Source: OECD Health Statistics 2025.

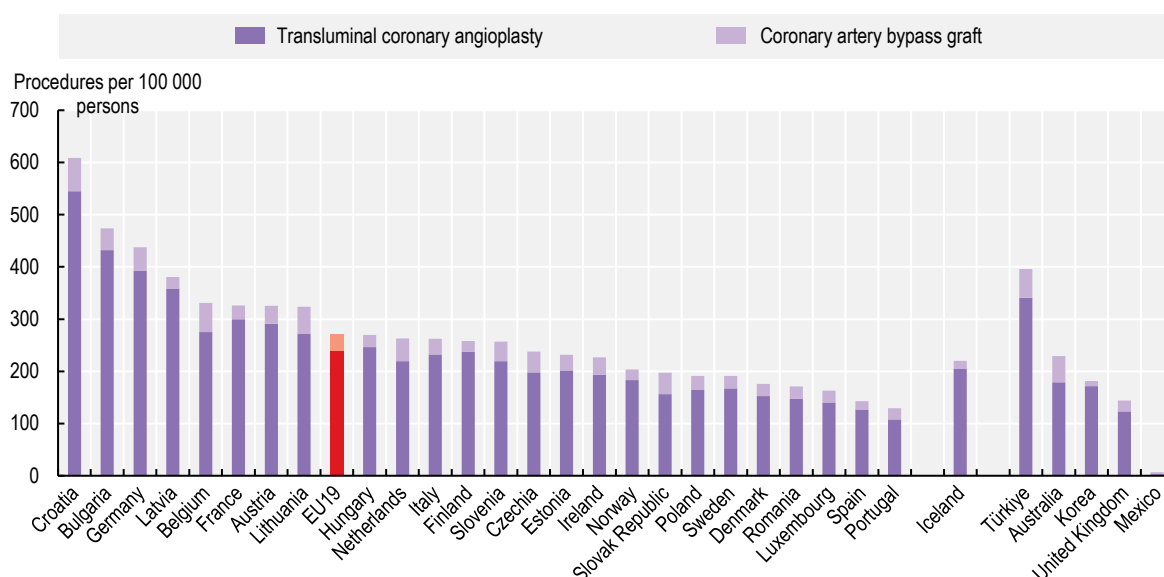
Use of minimally invasive procedures, such as transluminal coronary angioplasty, vary substantially by five-fold in Europe

Patients with coronary artery disease may undergo transluminal coronary angioplasty including percutaneous transluminal coronary angioplasty (PTCA) and percutaneous coronary intervention (PCI) or coronary artery bypass graft (CABG) to improve blood flow. PTCA and PCI are provided in emergency care or planned in advance and it is a minimally invasive non-surgical procedure. CABG, an invasive surgical procedure, replaces arteries to the heart by blood vessels from another part of the body and this surgery is given to people with severe blockages in multiple coronary arteries. However, with improved techniques and technologies, PTCA and PCI have been used increasingly to patients with multiple blockages and narrowing of coronary arteries, although CABG still remains an optimal option for certain patients.

The number of transluminal coronary angioplasty per population varies five-fold across countries and for CABG, the variation is lower at four-fold (Figure 4.19). The number of transluminal coronary angioplasty (with or without insertion of stent) is less than 140 per 100 000 population in Luxembourg, Spain and Portugal. In these countries the number of CABG per is also low. Similarly, countries with a high number of transluminal coronary angioplasty per population tend to have a relatively high rate for CABG. Germany, a country with high reliance of hospital care, has high rates for both PTCA and CABG.

But there are some exceptions. In the Slovak Republic, Czechia, Slovenia and the Netherlands, the rate of transluminal coronary angioplasty is lower than the EU average while the rate for CABG is high. In the Netherlands, this pattern may be related to the fact that CABG is found more clinically effective and cost-effective than drug-eluting stent PCI in a long term in its health system (Osnabrugge et al., 2015^[103]). On the other hand, the rate for PTCA in Latvia is among the highest in Europe, but the rate for CABG is less than the EU average, suggesting transluminal coronary angioplasty is overused although medications are also available to manage risk factors and treat symptoms. France also has relatively a high rate of transluminal coronary angioplasty but the rate for CABG is lower than the EU average.

Figure 4.19. Transluminal coronary angioplasty and coronary artery bypass graft, 2013 and 2023 (or nearest year)

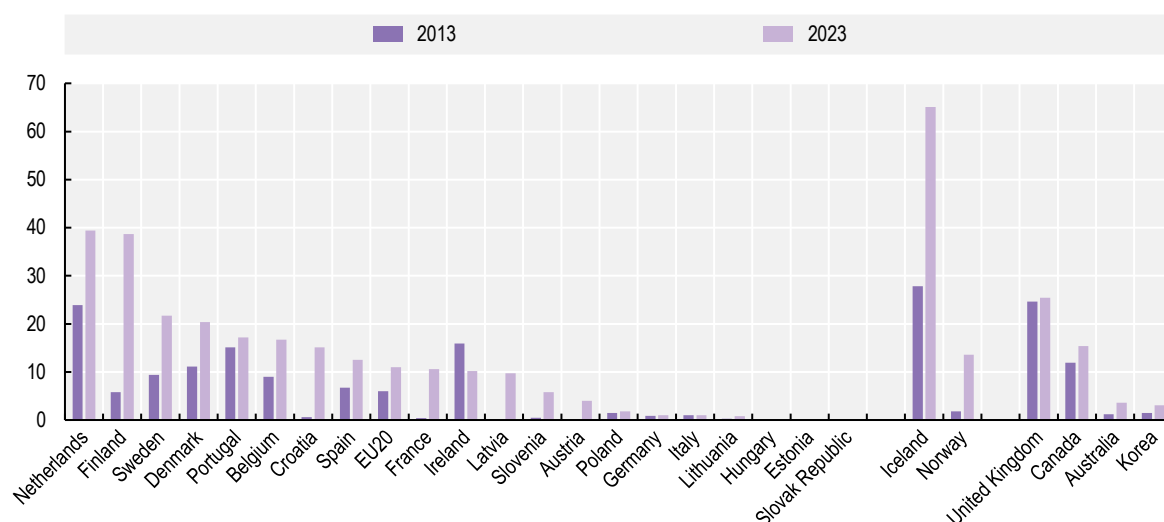


Note: The EU average is unweighted.

Source: OECD Health Statistics 2025.

Following progress in medical technologies and demonstrated safety in same day discharge, an increasing share of less invasive surgical procedures is performed in day case across countries. In view of providing cost-effective high quality CVD care, about half of countries provide elective transluminal coronary angioplasty in day care but the extent of day cases varies across countries. On average in the EU, 11% of transluminal coronary angioplasty procedures are provided in day care – increasing from 6% in 2013. The value of this is more than 65% in Iceland, followed by 39% in Finland and the Netherlands, and 25% in the United Kingdom. But in several countries in Europe including Hungary, Estonia and the Slovak Republic, it is provided only in inpatient care. The share of transluminal coronary angioplasty in day cases has increased substantially in Finland over the past decade and the increase was also large in Denmark, Sweden, Iceland, France, Norway and Croatia (Figure 4.20).

Figure 4.20. Shift towards transluminal coronary angioplasty in day care, 2013-2023



Note: Break in time series for Denmark and Ireland.

Source: OECD Health Statistics 2025.

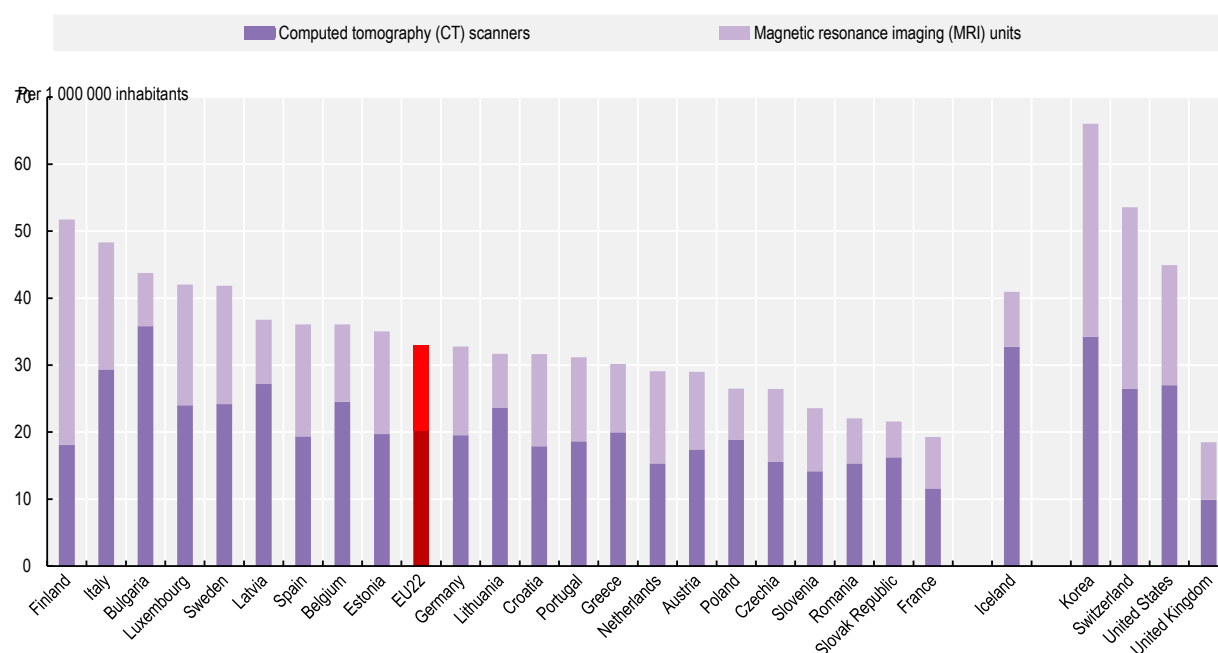
4.3.2. Hospital resources for treating CVDs vary across countries

Availability of medical technologies is increasing but substantial variation exists across countries

CT scanners and MRI units are used for diagnosing and identifying treatment options for various diseases including CVD particularly for stroke. CT scanners are commonly used to patients with suspected stroke to identify if areas of abnormalities in the brain are caused by ruptured blood vessel (haemorrhagic stroke) or insufficient blood flow (ischaemic stroke). Across countries, the majority of these technologies are located in hospital settings. This may be related to the concentration of specialised care taking place in an increasing number of countries. In Finland, Sweden and Denmark, all CT scanners and MRI units are located in hospitals and in Belgium all MRI units are in hospitals (Birk et al., 2024^[104]).

However, there is less care concentration and a lower share of MRI and CT technologies available in hospital settings in some countries including France, Germany and Greece. In 2023, more than 90% of CT scanners are available in the hospital setting in Belgium, Czechia, Denmark, Luxembourg and the Netherlands (opposed to the ambulatory setting). More than 80% of MRI units are located in the hospital setting in Czechia, Ireland and the Netherlands. The availability of CT scanners and MRI units in hospitals vary by a factor of almost 2.7 across EU countries (Figure 4.21).

Figure 4.21. CT scanners and MRI units in hospitals, 2023 (or nearest year)

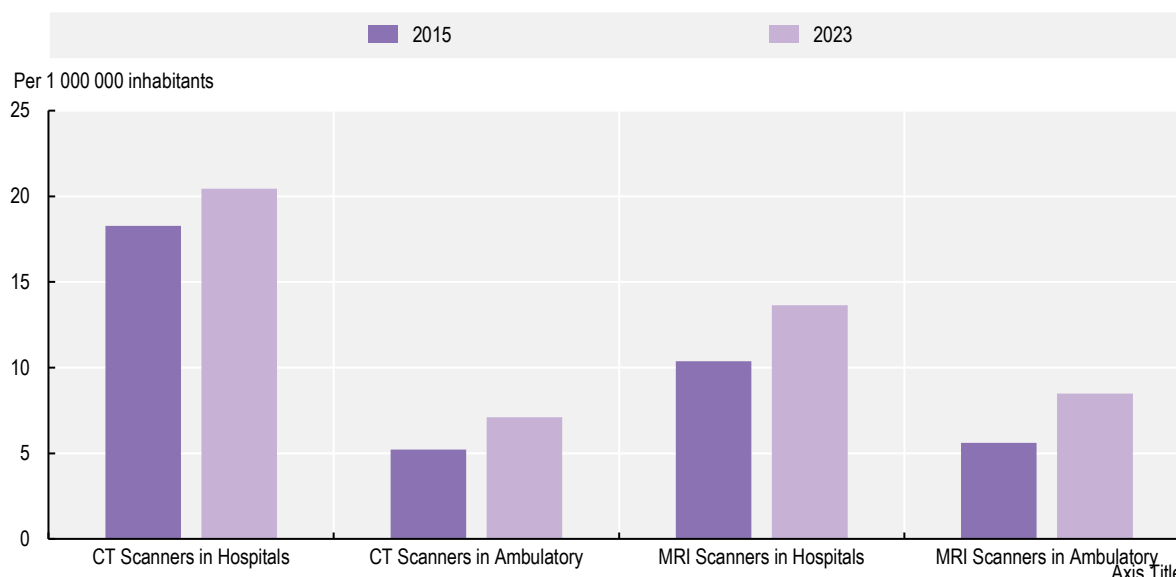


Note: The EU average is unweighted.

Source: OECD Health Statistics 2025.

While the availability of medical technologies has increased in ambulatory settings, the availability of CT scanners and MRI units in hospital settings has also increased on average in EU countries, and Norway and Iceland, in recent years, demonstrating expanded access to diagnostic tools (Figure 4.22). Total availability of MRI units per million people has increased by over 30% in Lithuania and Luxembourg between 2015 and 2023, and total availability of CT scanners has increased by over 40% in Lithuania, Luxembourg and Greece over the same period. Austria and Finland have observed a decline in availability of CT scanners over this period, and Belgium saw a decline in MRI units.

Figure 4.22. Availability of CT and MRI units is increasing in both the hospital and ambulatory settings in European countries



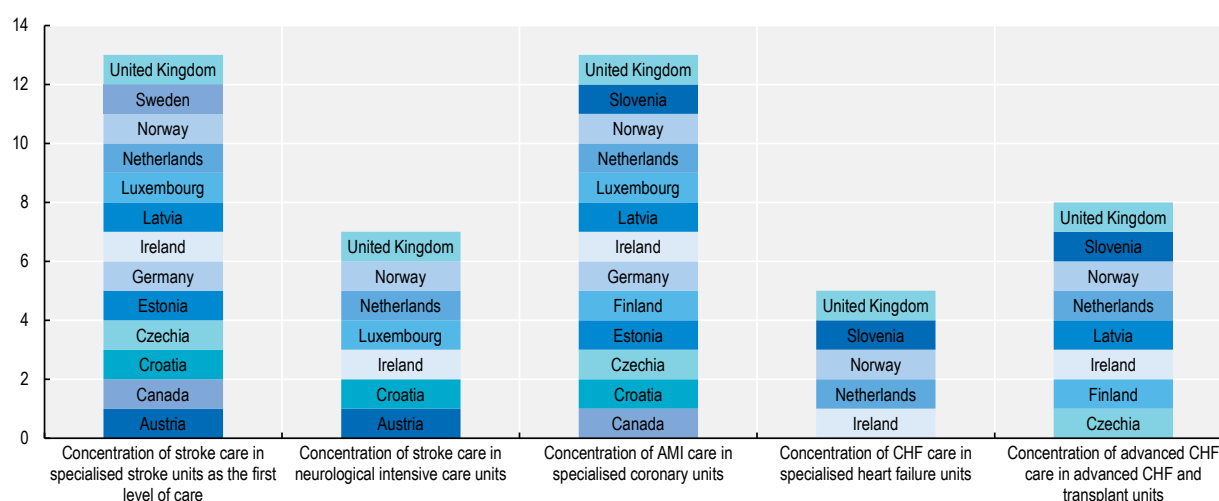
Note: Data pertains to Austria, Belgium, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, the Slovak Republic, Slovenia, Spain, Sweden.

Source: OECD Health Statistics 2025.

4.3.3. Countries are advancing in organising highly specialised acute care and ensuring their access

Besides a general shift towards concentration of hospital care, many countries have concentrated delivery of CVD care at highly specialised care centres or larger hospitals. While many countries are centralising care for CVD in coronary care units and centralised stroke units, fewer have centralised care for CHF, either in specialised heart failure units or transplant units (Figure 4.23). Coronary care units or intensive cardiac care units are typically have access to needed diagnostic and treatment facilities with a health workforce trained to diagnose and co-ordinate all aspects of acute coronary syndromes (ACS) care, such as management of arrhythmias and heart failure, as well as haemodynamic, ventilation and temperature monitoring and control, among others (ESC Guidelines, 2023^[78]). On average, in the EU, there are 4.7 coronary care units per million people (see Figure 4.24). In 2022, the Slovak Republic, Bulgaria and Ireland had the highest number of dedicated coronary care units, with over 9 units per 1 million people. In contrast Lithuania, the Netherlands, Romania and Spain had the lowest number, with less than 2 units per 1 million people.

Figure 4.23. Many countries centralising CVD care within specialised care units



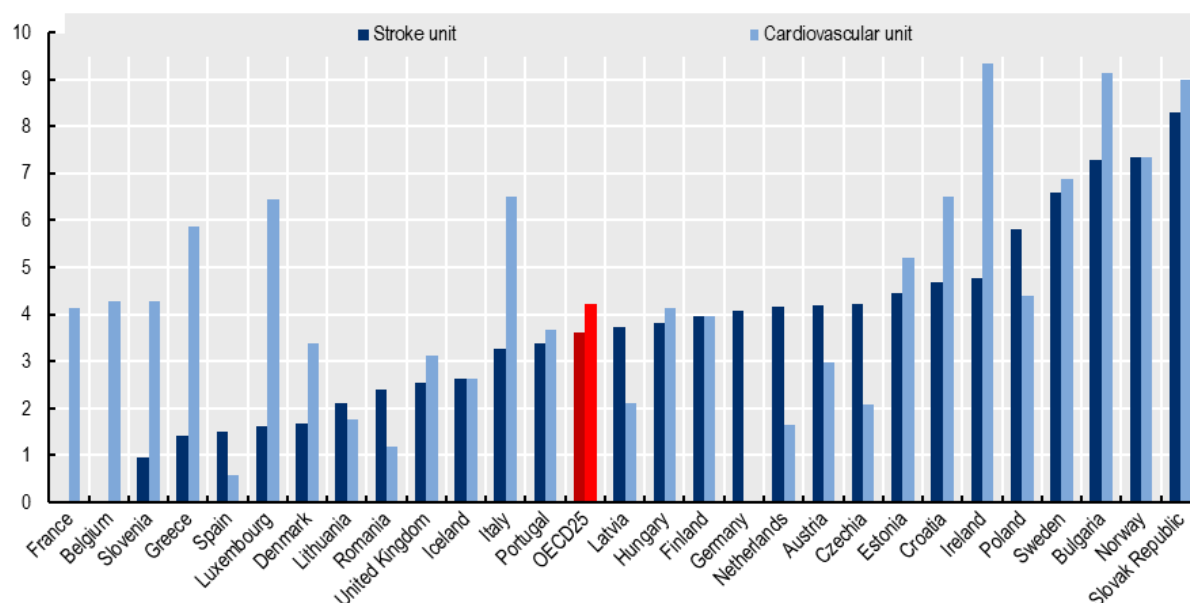
Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Stroke units are organised inpatient care provided by a multi-disciplinary team to manage patient with stroke. Patients treated in stroke units are more likely to be alive and independent compared to those treated in a general ward, according to a Cochrane systematic review (Langhorne and Ramachandra, 2020^[105]). On average in the EU, there are 3.6 hospitals with dedicated stroke units per million people (Figure 4.24).

Stroke care unit also plays an important role in reducing disability and disability from stroke in some countries. In Czechia, since the start of concentration of care in 2007, and the accreditation of stroke centres, access to high quality and safe care for stroke and ischaemic heart disease has improved. Through concentration of care, designated networks for cardiology and stroke care were developed throughout the country. In 2021, it also improved criteria for stroke centre (Bryndová et al., 2023^[106]). In Sweden, national guidelines recommend patients to be admitted to a stroke unit directly upon hospital arrival. In recent years, the share of patients admitted and treated in a stroke unit has increased, reaching 84% in early 2020. However, regional variations range widely between 50% and 93% in 2020, and only two regions attained the level above the national target of 90% (Janlöv et al., 2023^[107]).

Figure 4.24. Hospitals with dedicated stroke and coronary care units in 2022 (or nearest year), per million people



Note: Total number of hospitals, public or private, with dedicated stroke or coronary care units, ranked by stroke unit. The OECD average for stroke units is calculated over 24 OECD countries and includes France and Belgium but excludes Germany. The average for CVD units includes France and Belgium but excludes Germany due to data availability. Where 2022 data was unavailable, the most recent year was used. Bulgaria, Croatia and Romania are countries in process of accession to the OECD.

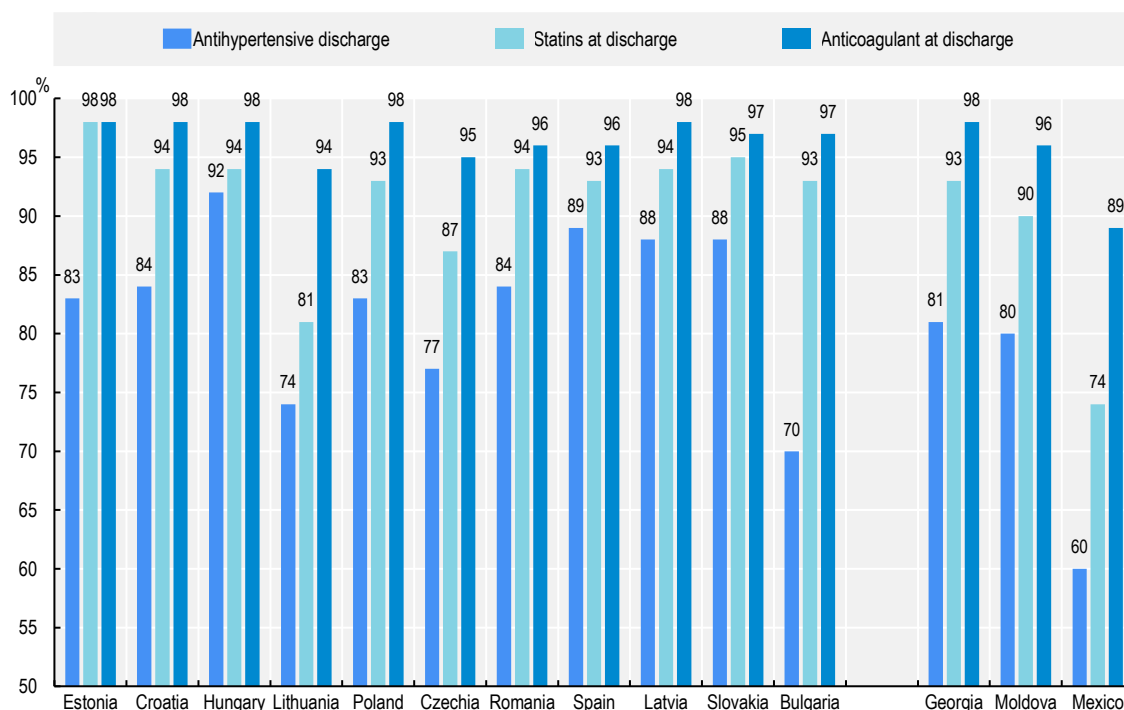
Source: ESC Atlas in General Cardiology (<https://eatlas.escardio.org/>).

4.3.4. Prescribing practices at hospital discharge generally conform to standards but adherence drops off in the long term

When someone is discharged from the hospital following a stroke, they are often prescribed a combination of medications aimed at preventing another stroke and managing underlying conditions. Commonly prescribed medications include anticoagulants, to reduce the occurrence of blood clots and statins to lower cholesterol levels. Blood pressure medications are also frequently used, especially if high blood pressure contributed to the stroke. Almost all (97%) of stroke patients receive anticoagulating drugs at discharge in countries that report data, while fewer receive statins (92%) and antihypertensive drugs (82%) (see Figure 4.25). While appropriate prescribing at discharge is key, effective co-ordination with primary care is needed to ensure that medicines are taken consistently – and in most cases there is a steep drop between discharge and prescribing practices more than a year after the event. Findings from the OECD's work on integrated care show that antihypertensive prescriptions within 18 months following stroke range from 83%-68% in EU countries that are able to report the data (Figure 4.26), and antithrombotic prescriptions from 94% to 31%, with Sweden showing particularly strong performance – attributed, in part, to comprehensive diagnosis recording and co-ordinated follow-up (Dahlgren et al., 2017^[108]).

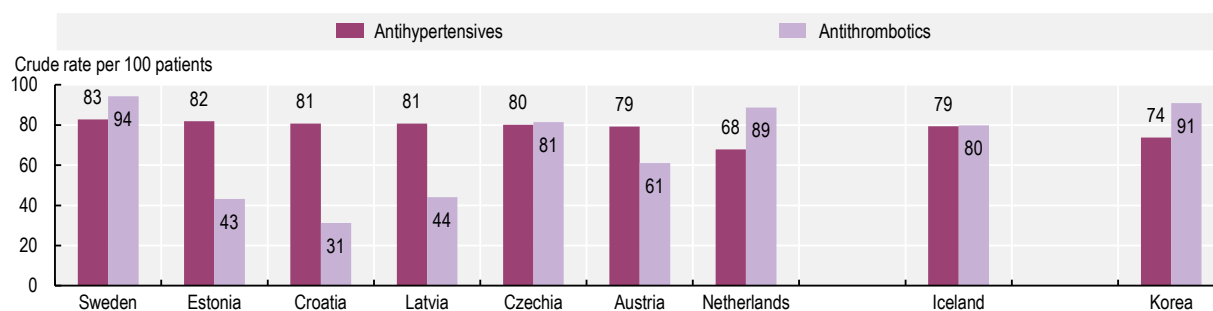
Figure 4.25. Almost all stroke patients receive anticoagulants at discharge

Percentage of Ischaemic Stroke Patients Receiving Medication at Discharge, 2024



Source: ESO (2024^[109]), RES-Q, <https://stroke.qualityregistry.org/>.

Figure 4.26. Patients receiving at least one antihypertensive and antithrombotic prescription in the 18 months following discharge after ischaemic stroke, 2023 (or nearest year)



Source: Data Collection on Integrated Care 2022-2023, and OECD Health Statistics Database 2025.

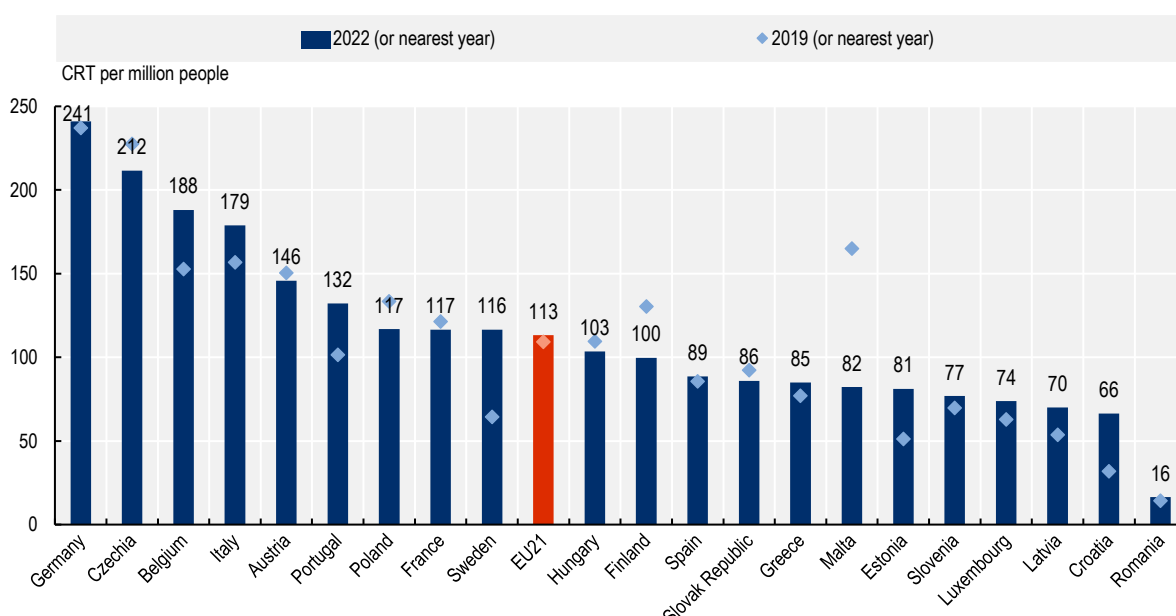
4.4. The scope of access and use of CVD related medical devices varies across countries

Cardiac implantable electronic devices (CIED) – such as cardiac resynchronisation therapy (CRT) devices, implantable cardioverter defibrillators (ICDs), and transcatheter aortic valve implantations (TAVI) – are important tools in the prevention of sudden cardiac death, treatment of advanced heart failure, and in offering improved survival and quality of life for patients.

Cardiac resynchronisation therapy (CRT) devices (also known as pacemakers) function by sending small amounts of electrical energy to the heart to help restore appropriate timing of heart beats in people with heart failure. The use of CRT devices varies 15-fold across EU countries, ranging from 241 devices per million inhabitants in Germany to 16 devices per million inhabitants in Romania (see Figure 4.27). Between 2019 and 2022, the average number of CRT implantations rose slightly, from 109 to 113 per million inhabitants (EU21) – while decreasing in several countries such as Czechia, Austria, Poland, France, Hungary, Finland, the Slovak Republic and Malta. The limited growth of CRT procedures may be being impacted by stricter patient selection and evolving guidelines, where the patient population has been narrowed (Tymińska et al., 2022^[110]). In addition, increased use of SGLT-Inhibitors in patients with heart failure (discussed in Section 4.9.3) may reduce the need for CRT by better managing condition progression (Crispino et al., 2025^[111]).

Figure 4.27. Cardiac resynchronisation therapy (CRT) device implantations have plateaued over time, but vary widely across Europe

Rate of CRT per 1 000 000 population



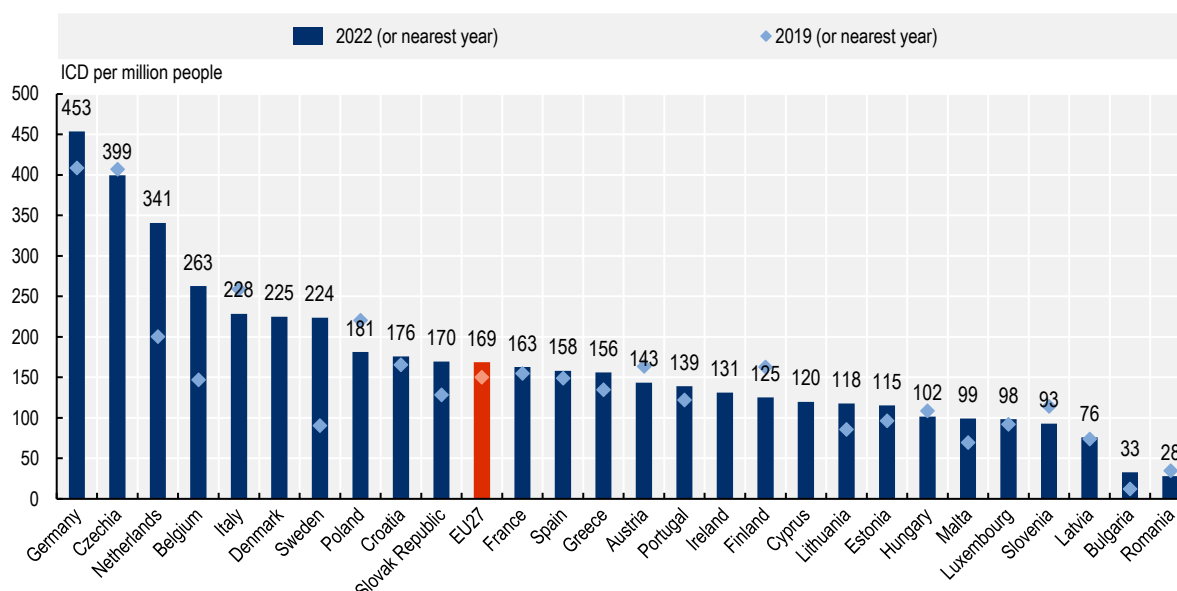
Note: The EU average is unweighted. Where data for 2019 or 2022 was unavailable, the most recent year was used.

Source: ESC Atlas of Cardiology (<https://eatlas.escardio.org/>).

The use of implantable cardioverter defibrillators (ICDs), which are used in people with serious arrhythmias, have likewise modestly increased on average across EU countries. On average, ICD implantations grew from 150 to 169 per million inhabitants (EU27) – and represent a 16-fold difference between Germany and Romania (see Figure 4.28). Costs of implementation of ICDs can be substantial – in France the healthcare costs related to ICDs were assessed at EUR 15 893 per patient-year – only a third of which were estimated to be attributed to the device itself (Piot et al., 2022^[112]). As with CRT, the indications for ICDs have narrowed over recent years, as survival benefits were not observed for patients with some forms of heart failure (Beggs et al., 2017^[113]; Køber et al., 2016^[114]). Likewise, improved medication management – for example through the use of beta-blockers and SGLT-Inhibitors, can improve management of heart failure and reduce need for ICDs by reducing the occurrence of arrhythmias (Minguito-Carazo et al., 2024^[115]).

Figure 4.28. Trends in implantable cardioverter defibrillator (ICD) implantations show relatively stable use on average, though country variations are pronounced

Rate of ICD per 1 000 000 population



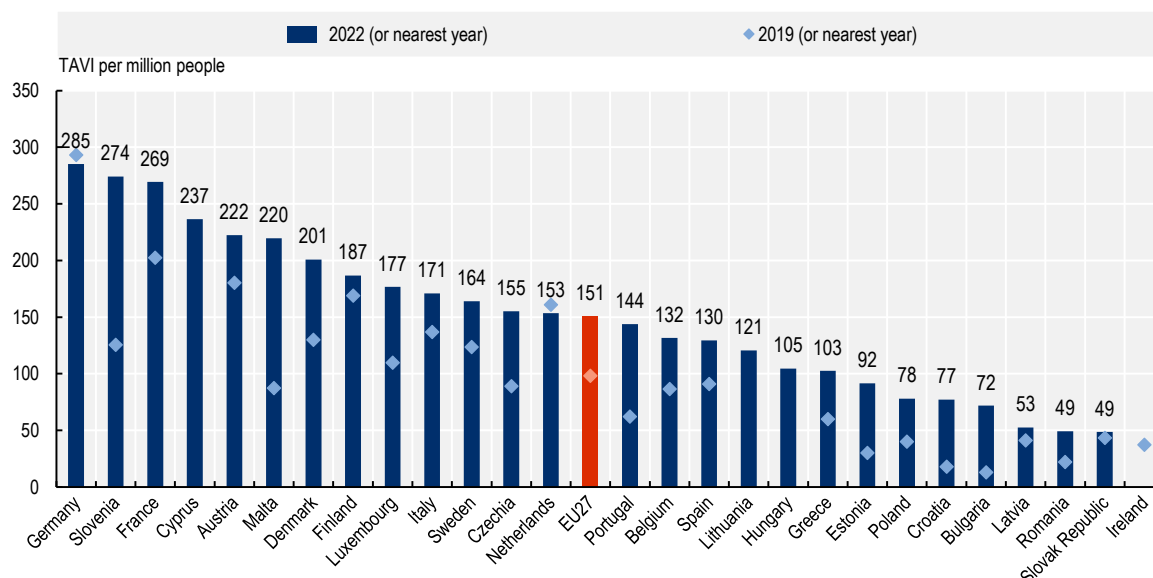
Note: The EU average is unweighted. Where data for 2019 or 2022 was unavailable, the most recent year was used.

Source: ESC Atlas of Cardiology (<https://eatlas.escardio.org/>).

TAVI is a minimally invasive procedure to replace a diseased aortic valve. It was initially developed as an alternative to open-heart surgery for patients deemed too high-risk for traditional surgical valve replacement – including older adults who are at high surgical risk. Compacted with traditional surgical options, TAVI often results in shorter hospital stays, quicker recovery and better outcomes (Lemor et al., 2019^[116]). Currently, guidelines from the European Society of Cardiology (ESC) and European Association for Cardio-Thoracic Surgery (EACTS) support the broader use in suitable patients (ESC/EACTS, 2021^[117]). European countries have rapidly scaled up the use of TAVI procedures, which have more than doubled from 98 to 151 per million (EU27) between 2019 and 2022 (see Figure 4.29). Variation between the highest and lowest use of TAVI procedures varies almost six-fold between countries, ranging from 49 TAVI procedures per million in the Slovak Republic to 285 procedures per million people in Germany. The costs of TAVI procedures are relatively high, assessed at EUR 26 684.1 in Spain and approximately USD 35 000 in Switzerland (Areces et al., 2021^[118]; Manolis, 2017^[119]).

Figure 4.29. Percutaneous aortic valve implantations (TAVI) have increased across EU countries

Rate of TAVI per 1 000 000 population



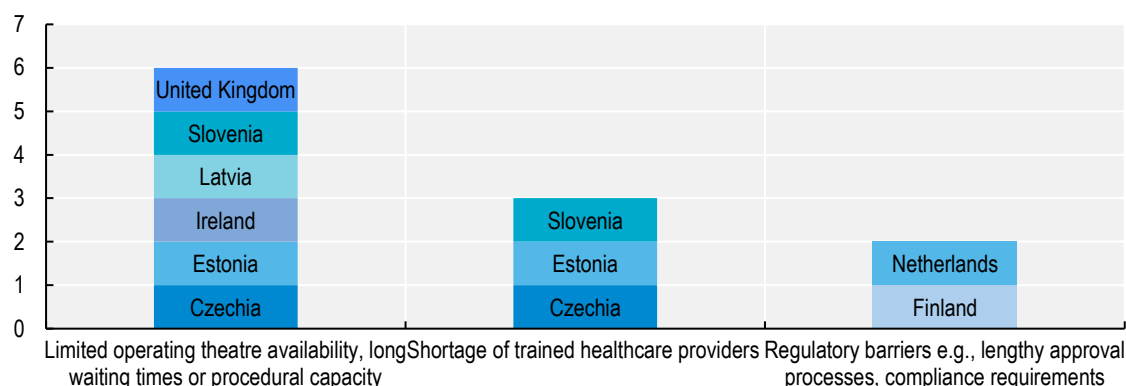
Note: The EU average is unweighted. Where data for 2019 or 2022 was unavailable, the most recent year was used.

Source: ESC Atlas of Cardiology (<https://eatlas.escardio.org/>).

Germany consistently ranks as the highest in the number of implantations, with 241 CRT implantations, 453 ICDs, and 285 TAVIs per million inhabitants in 2022. Other countries with high use of implantable devices include Czechia, Belgium and Italy, all reporting strong growth across all three interventions. In contrast, Romania has the lowest number of selected interventional devices, with 16 CRT implantations, 28 ICDs, and 49 TAVI procedures per million inhabitants in 2022. Bulgaria, Latvia and Lithuania also show persistently lower rates across all three device types.

Figure 4.30. Barriers to effective use of cardiovascular implantable devices

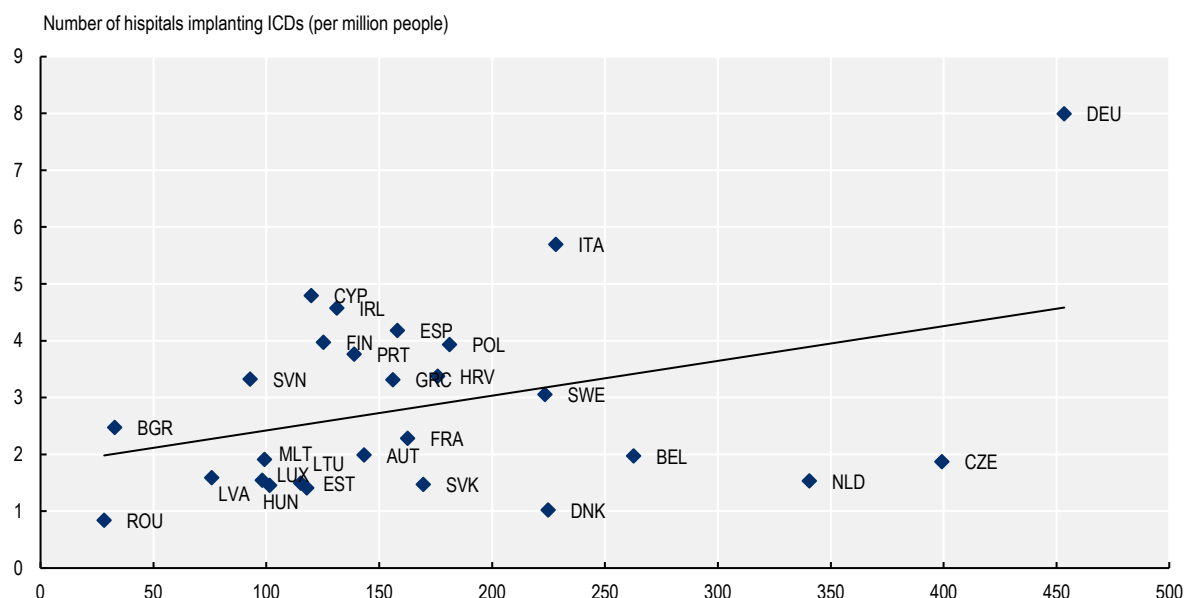
What are the main barriers in your country to the effective use of high-risk implantable cardiovascular device (ICDs, pacemakers, coronary stents, and artificial valves)



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Figure 4.31. Implantable cardiac device procedures are correlated with the availability of hospitals which conduct the procedures, 2022



Note: Where 2022 data was unavailable, the most recent year was used.

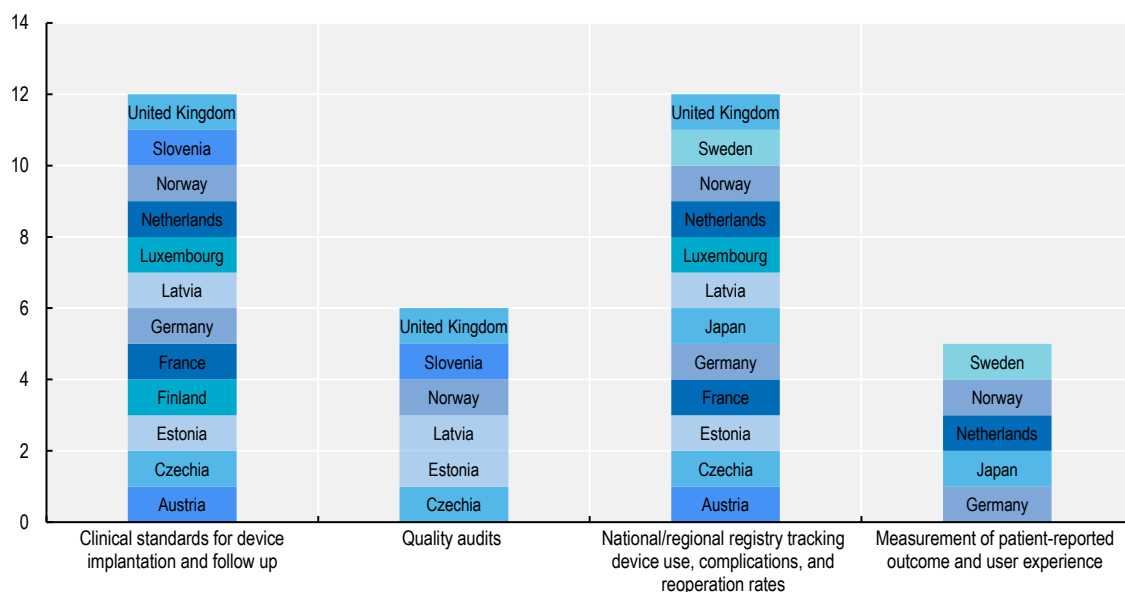
Source: ESC Atlas of Cardiology (<https://eatlas.escardio.org/>).

Research has found geographic variability of cardiac implantable electrical devices (CIED) implant rates to be correlated to the number of centres performing ICD implants, number of cardiologists, lack of infrastructure and low referral rate, thus highlighting the importance of integration of care between heart failure clinics, electrophysiology laboratories and general hospitals to facilitate CIED treatment (Valzania et al., 2016^[120]). Findings from the 2025 OECD Cardiovascular Policy and Data Survey show that just under half of responding countries (8/17) did not report barriers to the use of cardiovascular implantable devices. Those that did, indicated that limited operating theatre availability is the greatest challenge for the effective use of high-risk cardiovascular implantable devices, followed by healthcare worker shortages, and regulatory barriers (see Figure 4.30). Countries with fewer hospitals implanting ICDs tend to have lower implantation rates (see Figure 4.31). In 2022, Romania had just 0.84 implanting hospitals per million population and recorded the lowest implantation rate at 28 per million. In contrast, Germany had the highest number of implanting hospitals at 7.99 per million and also reported the highest implantation rate at 453 per million population. This suggests that hospital capacity plays a critical role in enabling access to device-based treatments – though supply induced demand should also be considered.

While having many benefits, such as improved survival and symptom relief, implantable devices also bring serious risks. For example, device-related infections remain common. A study of CIED procedure patients found that within three months of the procedure, almost 3% had developed a major infection (Baldauf et al., 2024^[121]). Other studies have shown that these adverse outcomes can exacerbate inequalities, as device related infections are found to be more common in people of non-white race and from a low-income status (Modi et al., 2023^[122]). Most surveyed countries note that there are clinical standards in place in their country for device implantation and follow-up or that there are national or regional registries in place for post-market surveillance and safety monitoring – such as for tracking device use, complications and reoperation rates, which could be useful for continuous improvements. Fewer countries have adopted systems for quality audits, such as professional peer review, compliance checks or have implemented systematic measurement of patient-reported outcomes or experiences related to CIED procedures (see Figure 4.32).

Figure 4.32. Clinical standards and registry tracking are the main mechanisms used to ensure quality and safety in high-risk implantable cardiovascular devices

What are the mechanisms used to ensure quality and safety in using high-risk implantable cardiovascular devices (i.e. ICDs, pacemakers, coronary stents, and artificial valves)?



Note: N=18 EU+2 and OECD G20 countries (Austria, Canada, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

4.5. Timeliness of interventions in the acute but non-emergency procedures is also key for improving care quality

In OECD countries, waiting times are generally determined by needs to prioritise more urgent cases, or patients whose health is more at risk of deterioration without treatment (OECD, 2020^[123]). For instance, median waiting times for coronary bypass, and transluminal coronary angioplasty are shorter than for hip and knee replacement (OECD, 2025^[124]).

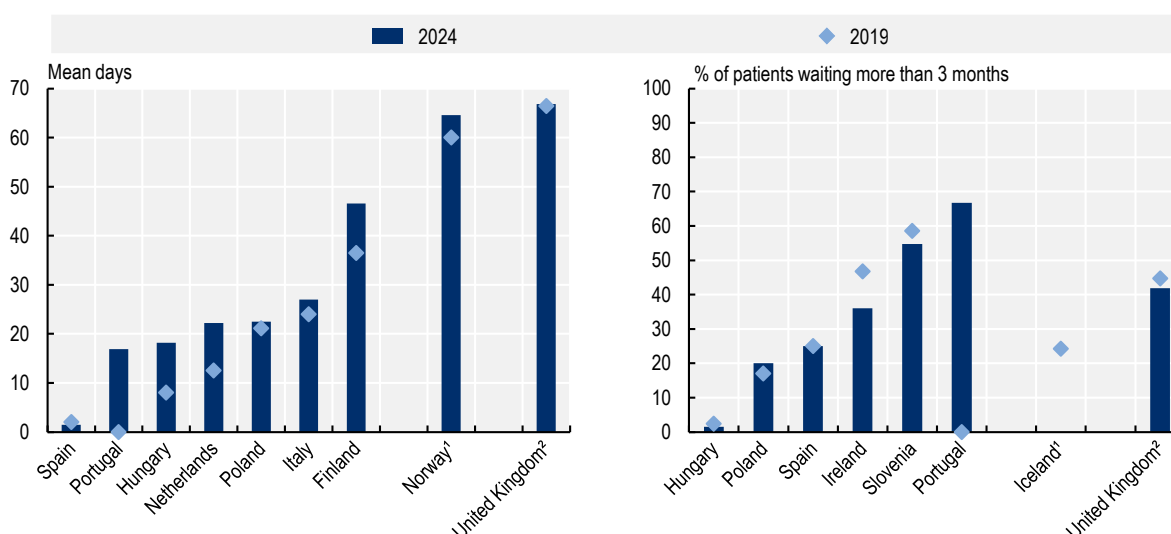
Waiting times in healthcare can lead to inequalities in access, particularly along socio-economic lines. Research from several OECD countries shows that people with higher socio-economic status often experience shorter waits for elective procedures like cataract surgery, hip and knee replacements, and coronary bypasses. This has been observed in countries such as Australia, England, Norway and Sweden (García-Corcheró and Jiménez-Rubio, 2022^[125]). Beyond fairness, long waits can also negatively affect patients' health – especially for conditions that worsen quickly or when clinicians struggle to prioritise effectively. For example, long waits for coronary bypass surgery have been linked to worse symptoms, higher chances of emergency admissions, and even pre-surgical mortality (Moscelli, Siciliani and Tonei, 2016^[126]).

Interpreting waiting times for revascularisation of chronic coronary artery disease is more difficult than for STEMI and NSTEMI. Revascularisation for STEMI is strongly agreed to be required as soon as possible; there is a treatment window measured in hours within which it is known to be useful, and there are commonly agreed targets for median waiting time measured in minutes. For NSTEMI the target is for revascularisation within 24 hours. By contrast, elective cases (for chronic coronary syndrome) should be

medically managed (with lifestyle changes and medications) in most cases, with a stepwise diagnostic strategy applied that prioritises non-invasive and functional testing (stress tests) in the first instance before moving to invasive testing (angiography) (ESC Guidelines, 2024^[127]). Canadian Guidelines recommend PCI within six weeks for patients without high-risk anatomy and offer a target for bypass surgery in those with high-risk anatomy of 14 days and for all others, six weeks (Graham et al., 2006^[128]). However, the European guidelines do not offer any guidance on timeframe, focussing instead on careful patient selection, maximising of medical management, and choice of revascularisation procedure (CABG vs. PCI) (ESC Guidelines, 2023^[78]).

Cross country comparison of waiting times for elective coronary revascularisation procedures are therefore complicated by variability in use of these procedures for this indication across countries. Figure 4.33 shows wide variation in waiting times for coronary angioplasty surgeries, ranging from 1.5 days in Spain to over 40 days in Finland, Norway and the United Kingdom in 2024. At the same time, the share of patients waiting more than three months for this procedure was just 0% in Iceland and 1.5% in Hungary in 2024, compared to over 50% in Slovenia and Portugal.

Figure 4.33. Waiting times from specialist assessment to coronary angioplasty treatment vary from several days to more than a month



Notes: 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. 3. EU candidate countries. For the **left panel** (mean days), data for the United Kingdom refer to 2021 instead of 2019. Data for the United Kingdom, Australia and Norway refer to 2023 instead of 2024. Data for Italy refer to 2022 instead of 2024. Data for Spain refer to 2020 instead of 2024. For Italy, Norway, Australia and the United Kingdom there was a change in definition. For the Netherlands and Australia there was a time series break in 2019.

For the **right panel** (% of patients waiting more than 3 months), data for Portugal and the United Kingdom refer to 2021 instead of 2019. Data for Spain refer to 2020 instead of 2024. For Slovenia and the United Kingdom there was a change in definition. For Norway, waiting times are over-estimated because they start from the date when a doctor refers a patient for specialist assessment up to the treatment (whereas in other countries they start only when a specialist has assessed the patient and decided to add the person on the waiting list for treatment).

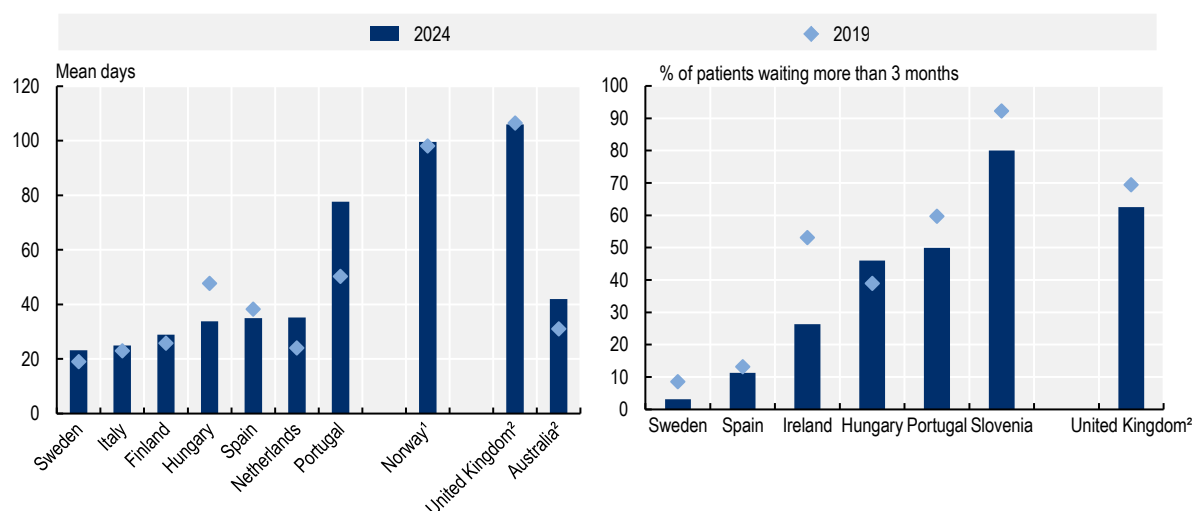
Source: OECD Health Statistics 2025.

Figure 4.34 also shows large cross-country variation in waiting times for coronary artery bypass graft surgeries. In 2024, average waiting times were below 25 days in Sweden and Italy, while patients in Portugal, Norway and the United Kingdom waited more than three times as long (77, 100 and 106 days respectively). Overall reporting on timeliness indicators remains limited, and changes in definition for several countries (including Italy, Norway, Slovenia, the United Kingdom, the Netherlands and Australia) further limit the comparability of the available data. An analysis in Annex 4.E shows the relationship between waiting times and number of surgical procedures per 100 000 population in 2023. The data

suggest only a weak association for angioplasty and no relationship for bypass graft, highlight that higher procedure rates are not clearly linked with shorter waiting times.

Besides variation in the time spent on non-invasive management of these cases, there will also be differences in the first instance before moving to invasive testing (angiography) (ESC Guidelines, 2024^[127]). Approaches will vary with regard to the point in the process at which a specialist referral (the starting point of the measured time interval) occurs. Moreover, a system that appears more efficient in the delivery of reperfusion to chronic coronary syndrome cases may actually be less guideline compliant. Note also that relatively few countries are able to report on these indicators.

Figure 4.34. Waiting time for coronary artery bypass graft varies greatly across counties



Notes: 1. non-EU European Economic Area countries. 2. non-EU OECD G20 countries. For the **left panel** (mean days), data for the United Kingdom refer to 2021 instead of 2019. Data for Norway and the United Kingdom refer to 2023 instead of 2023. Data for Italy refer to 2022 instead of 2024. For the Netherlands, Norway and the United Kingdom there has been a change in definition. For the Netherlands there has been a time series break in 2019.

For the **right panel** (% of patients waiting more than 3 months), data for the United Kingdom refer to 2021 instead of 2019. For the United Kingdom there has been a change in definition. For Norway, waiting times are over-estimated because they start from the date when a doctor refers a patient for specialist assessment up to the treatment (whereas in other countries they start only when a specialist has assessed the patient and decided to add the person on the waiting list for treatment).

Source: OECD Health Statistics 2025.

4.6. Despite progress made, outcomes of CVD care still vary across countries

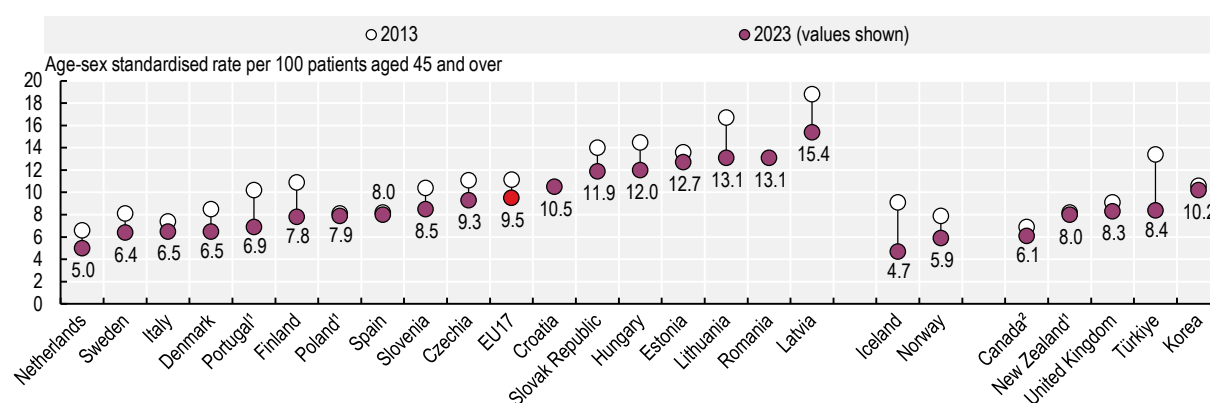
4.6.1. Mortality rates for AMI and ischaemic stroke have been falling but at different rates

Reductions in smoking and improvements in access to specialised care and treatment for heart diseases have contributed to a decline in mortality rates due to coronary heart disease over recent decades (OECD, 2015^[129]). Despite this progress, the need for further reductions in risk factors (see Chapter 3) and care quality improvements remain as AMI is still one of the leading causes of death and the main cause of cardiovascular death in many OECD countries (OECD/The King's Fund, 2020^[130]). Figure 4.35 shows the 30-day mortality rate calculated based on linked data, whereby deaths are recorded regardless of where they occurred after hospital admission (in the hospital where the patient was initially admitted, after transfer to another hospital or after being discharged). Case fatality rates for AMI decreased substantially between 2011 and 2019, falling by 13% on average in EU countries. However, more recent progress has stalled. Between 2019 and 2023, 30-day mortality plateaued on average in EU countries, increasing by 1% during

this time. There were a few exceptions, 30-day mortality rate for AMI substantial declined in Iceland between 2019 and 2013 (by 32%) but increases of more than 10% were observed in Slovenia and Poland.

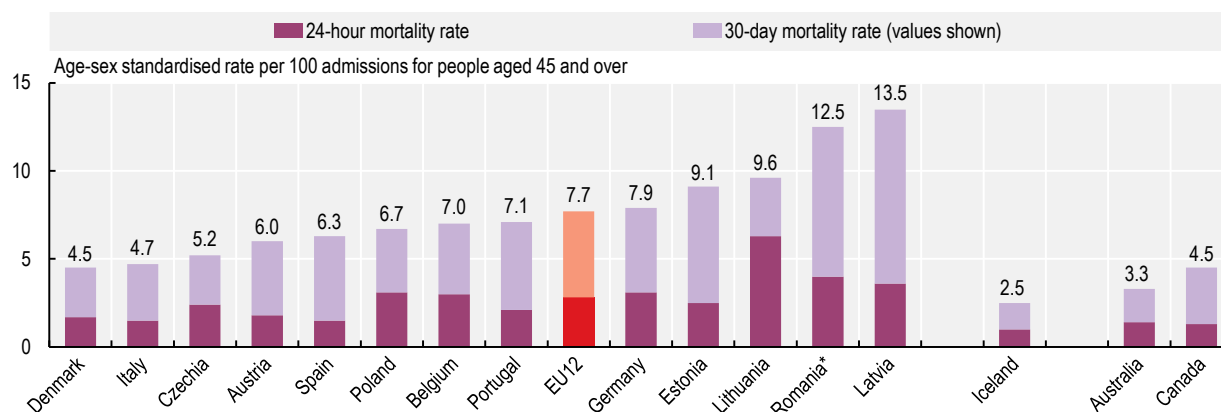
While 30-day mortality rates are widely used to evaluate hospital performance and integration of post-discharge care, 24-hour mortality rates can capture information on AMI and the effectiveness of emergency interventions. A high 24-hour mortality rate may indicate delays in treatment or lack of access to advanced care. Twenty-four-hour mortality rates are highest in Lithuania, Romania and Latvia (above 3.5 per 100 patients in 2023), while 24-hour mortality rates are lowest in Italy and Spain (1.5 per 100 patients) (Figure 4.38). In Lithuania, Czechia, Poland and Belgium, more than 40% of AMI mortality can be attributed to the first 24 hours after hospital admissions. This suggests a significance of access to and quality of emergency care to reduce mortality rates among people who had AMI.

Figure 4.35. Thirty-day mortality after admission to hospital for acute myocardial infarction based on linked data, 2013 and 2023 (or nearest years)



Note: The EU average is unweighted. 1. Latest data from 2020-2022. 2. Data do not include deaths outside acute care hospitals.
Source: OECD Health Statistics 2025.

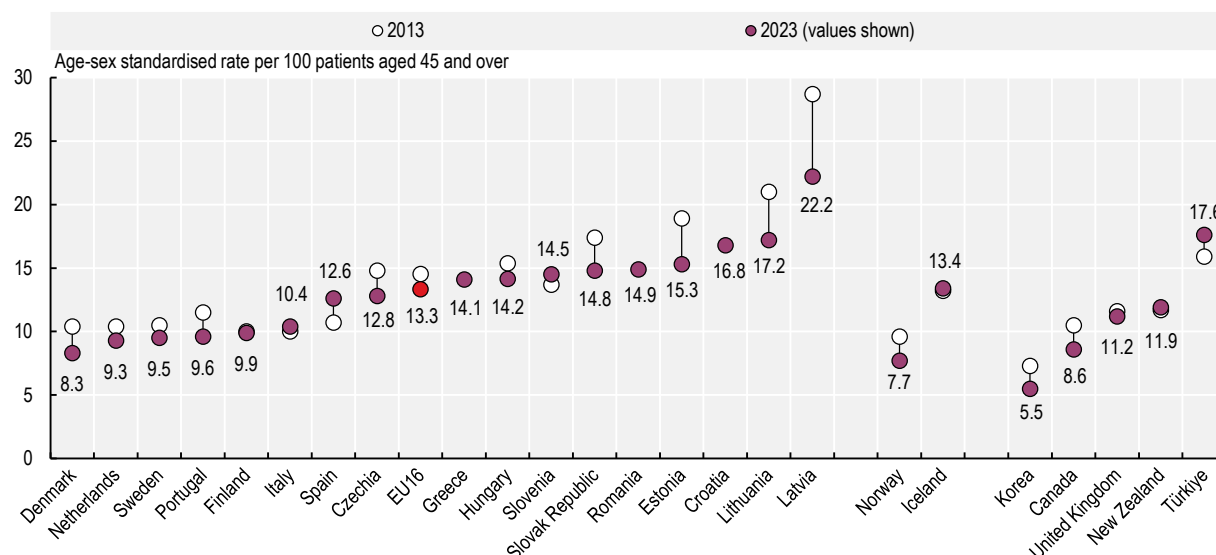
Figure 4.36. Within 24-hour and 30-day mortality after admission to hospital for acute myocardial infarction based on unlinked data, 2023 (or nearest year)



Note: The EU average is unweighted. 1. Latest data from 2020-2021.
Source: OECD Health Statistics 2025.

Treatment for ischaemic stroke has advanced dramatically over recent decades, with systems and processes now in place in many OECD countries often in stroke units to identify suspected ischaemic stroke patients and to deliver acute reperfusion therapy quickly. Figure 4.37 shows the case fatality rate where deaths are recorded regardless of where they occurred, including in another hospital or outside the hospital where the stroke was first recorded. Across EU countries, over 13% of patients died within 30 days of hospital admission for ischaemic stroke in 2023.

Figure 4.37. Thirty-day mortality after admission to hospital for ischaemic stroke based on linked data, 2013 and 2023 (or nearest year)



Note: The EU average is unweighted. 1. Latest data from 2020-2022. 2. Data do not include deaths outside acute care hospitals.
Source: OECD Health Statistics 2025.

As with heart attack, 30-day mortality rates for ischaemic stroke increased during the pandemic and a number of studies conducted in OECD countries have found that despite lower levels of admissions overall, admitted patients showed higher severity of stroke during the COVID-19 pandemic than in the pre-pandemic period, owing to delayed hospital arrival time for stroke patients due to emergency medical services processing time – particularly during the initial phase of the pandemic. Close clinical links with COVID-19 also complicate assessment and monitoring of the resilience of health systems in ensuring access to and quality of acute care.

4.6.2. Stronger monitoring facilitates improvement in quality of CVD care

Clinical guidelines support the delivery of quality care in many CVD manifestations and also support the application of clinical quality standards and monitoring programmes (Chew et al., 2016^[131]; ESC Guidelines, 2023^[78]; Gulati et al., 2021^[81]) and some countries monitor compliance to guideline recommendations. The Danish system has a comprehensive, publicly facing datasets on healthcare quality, including CVD quality, with extensive data not only on EMS but also on hospital care of CVD emergencies benchmarked against indicator targets and recent trends. An example of metrics used in Israel is illustrated in Box 4.6.

Monitoring and analysis of good quality process data can improve system performance. For example, a Dutch study showed a 9.2% reduction in door-to-groin puncture for endovascular thrombectomy in acute stroke patients with implementation of a process to provide performance feedback to hospitals and close

monitoring of guideline adherence drives quality of care in German chest pain units (Vafaie et al., 2020^[132]). The EuroHeart project – a collaboration between national quality registries and the European Society of Cardiology – aims to improve CVD care through international benchmarking based on quality indicators identified in four domains (Table 4.2). The 2024 report (ESC EuroHeart, 2024^[133]) brings together data from 63 961 patients admitted with STEMI and NSTEMI across 8 countries in 2023 and identifies areas for improvement in participating countries. For example, the median time between hospital arrival and reperfusion in STEMI patients ranged between 15-20 minutes in Sweden and 70 minutes or more in Romania, Portugal and Estonia. Reperfusion within 90 minutes of initial diagnosis in STEMI patients also varied from more than three-fourths of patients in Hungary and Sweden to fewer than one in two patients in Estonia, France and Portugal.

Table 4.2. European Society of Cardiology 2025 Quality Indicators for Acute Coronary Syndromes

Domain 1. Structural framework and logistics	The centre should be part of a network organisation with written protocols for rapid and efficient management
	Hospital availability of hs-cTn
	Pre-hospital interpretation of ECG for (i) diagnosis, (ii) decision for immediate transfer to a centre with catheterisation laboratory facilities, and (iii) pre-hospital activation of the catheterisation laboratory
	The centre should participate in a regular registry or programme for quality assessment
	Routine assessment of relevant times for the reperfusion process in STEMI patients (i.e. times from call to first medical contact, first medical contact to arrival at PCI centre, and arrival at PCI centre to arterial access)
Domain 2. In-hospital non-invasive care	Percentage of patients who have their LDL cholesterol and hemoglobin A1C (HbA1c) levels measured during hospitalisation*
	Percentage of patients who have an assessment of left ventricular ejection fraction (LVEF) before hospital discharge (LVEF should be assessed and the numerical value recorded for all patients)
	Percentage of patients on either ticagrelor or prasugrel, if not receiving triple antithrombotic therapy
Domain 3. Invasive strategy and periprocedural management	Percentage of patients with STEMI reperfused among those eligible (onset of symptoms to diagnosis <12 h)
	Percentage of patients with STEMI who receive timely reperfusion. (see below for definition)
	Percentage of patients who underwent radial access in case of invasive strategy
	Percentage of patients receiving parenteral anticoagulant on admission
	The door-to-balloon time (absolute value) in STEMI patients who underwent primary percutaneous coronary intervention (PPCI)
	STEMI diagnosis to wire crossing time in patients who underwent PPCI
Domain 4. Secondary prevention interventions	Percentage of patients needing oral anti-coagulation who receive appropriate triple antithrombotic therapy during a short time period (1 week to 1 month)
	Mention the intended duration of the antithrombotic strategy in the discharge letter
	Percentage of patients discharged from hospital on high-potency high-dose statins
	Percentage of patients with LVEF <40% who are discharged from hospital on ACEI (or ARBs if intolerant of ACEI)
	Percentage of patients with LVEF <40% who are discharged from hospital on beta-blockers
	Percentage of patients referred to an exercise-based cardiac rehabilitation and prevention programme
Domain 5. Outcomes	In-hospital all-cause mortality

Note: Percentage of patients with STEMI who receive timely reperfusion. Timely is defined as follows:

- (i) for patients presenting at primary PCI hospitals, <60 min from initial STEMI diagnosis to infarct-related artery wire crossing.
- (ii) for patients diagnosed either in a non-PCI hospital or in the out-of-hospital setting and then transferred to a PCI capable centre, <90 min from initial STEMI diagnosis to infarct-related artery wire crossing.
- (iii) for patients treated with fibrinolysis, initiation of fibrinolysis within 10 minutes after STEMI diagnosis.

Source: ESC (2025^[134]), "European Society of Cardiology quality indicators for the management of acute coronary syndromes: developed in collaboration with the Association for Acute CardioVascular Care and the European Association of Percutaneous Cardiovascular Interventions of the ESC", <https://doi.org/10.1093/ehjacc/zuaf014>.

Box 4.6. Cardiovascular healthcare indicators in Israel

In 2013 Israel has launched its National Program for Quality Indicators (NPQI), which measures outcomes at the levels of diagnosis, procedure and facility performance. Indicators are published at the disaggregated level of individual hospitals. Nationally aggregated results are released only after stable national adherence rates to a given protocol have been achieved.

Since the introduction of the program, adherence to optimal protocols has improved across several areas. For example, the median time from hospital arrival to head CT/MRI for patients with acute ischemic stroke was 55 minutes when the QI was first measured in 2015. By 2022, this had decreased to 25 minutes (MoH, 2023^[135]). NPQI adds new indicators each year. In 2025 it will introduce and report on the rate of administration of intravenous thrombolytic therapy (IV rtPA) in acute ischemic stroke within 60 minutes (MoH^[136]).

Acute myocardial infarction is one of the core goals of the program. Indicators for AMI care were developed to reflect the full care pathway – from initial patient contact and symptom recognition, through EMT treatment and triage, to coronary intervention. The primary QI in this area of care is PCI within 90 minutes for patients presenting with STEMI. This has been tracked since 2013, showing significant improvement in adherence rate, from 68% that year to 92% in 2019. The measure also captures disparities in adherence based on population features: adherence rate for older patients (over 65) and for women is lower (MoH, 2023^[135]).

Additional indicators measured for AMI care are pre-hospital administration of aspirin for suspected STEMI cases, pre-informing the hospital of ECG results in suspected cases (examining the interface between the ambulance team and the hospital's emergency department), intensive statin treatment recommendation in discharge letters of patients with ACS and dispatcher-assisted CPR in suspected cardiac arrest. For stroke care, measured indicators are pre-hospital standard stroke assessment for patients presenting related symptoms, pre-informing the hospital of incoming suspected stroke patients, intravenous thrombolytic treatment and/or mechanical embolectomy for acute ischemic stroke, carotid duplex within 72 hours of ED admission for transient ischemic attack patients, and stroke risk assessment for patients with atrial fibrillation.

4.7. The quality of post-acute and rehabilitative care varies widely, and available comparative data is limited

4.7.1. Performance varies widely in post-acute care, with one-year mortality rates after stroke varying by two-fold, and 1.5 times for heart failure

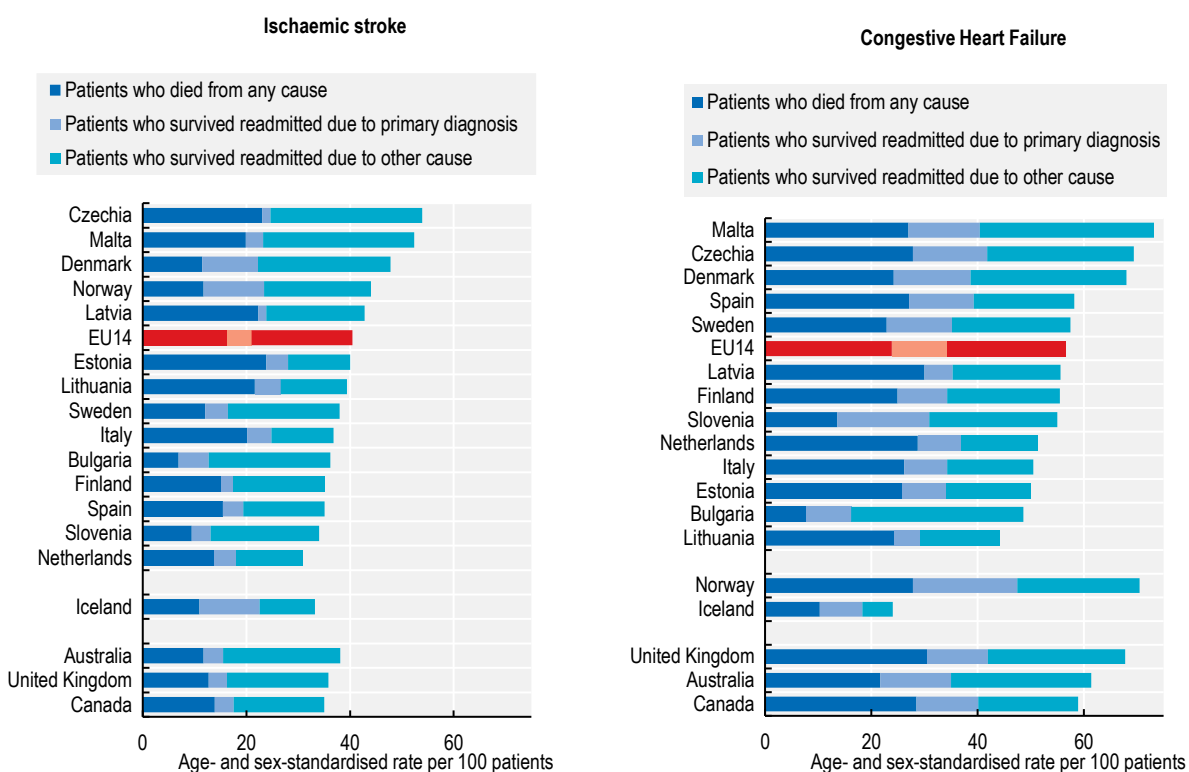
After-care for acute cardiovascular events includes commencement of secondary prevention and risk factor modification. Because heart attack (AMI) and stroke both leave lasting morbidity burden in many cases, rehabilitation is a critical final piece of CVD care. Stroke and AMI can be physically and psychologically debilitating. A goal of care is the return of the patient to as near as possible their previous level of function. This can depend on active rehabilitation, whether in hospital or in the community. Well-functioning post-acute care will shorten acute hospital length of stay, moving the patient as early as possible to a more cost-effective and targeted environment. Other important goals of this phase include optimisation of secondary prevention and complication management (medication management and lifestyle modification), integration with community and primary care, and ongoing monitoring and readmission prevention.

Medication management has been essential in controlling my heart disease. Challenges include side effects, medication complexity, and occasional difficulties in obtaining refills or adjustments. Support from pharmacists and clinicians who listen and explain treatment goals has made adherence easier. Polypharmacy remains a concern and requires careful oversight.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Long-term indicators – such as one-year mortality, hospital readmission rates, and follow-up medication prescriptions – offer valuable insights into the effectiveness of post-acute care co-ordination and the continuity of care across settings. These metrics help reveal gaps in care transitions and assess the capacity of health systems to support sustained recovery and prevent avoidable complications. For patients with congestive heart failure or ischaemic stroke, such adverse outcomes are often preventable with timely, well-co-ordinated, and integrated post-acute care (Barrenho et al., 2022^[137]).

Figure 4.38. Patients with adverse outcomes within one year of discharge after ischaemic stroke and CHF, 2023 (or nearest year)



Note: The EU average is unweighted.

Source: OECD Health Statistics 2025.

Data from 2023 show considerable variation in post-acute outcomes following hospitalisations for ischaemic stroke and CHF across EU countries (Figure 4.38). On average, 60% of stroke patients survived without readmission within a year, while 24% were readmitted (5% for stroke-related causes), and 16% died. For CHF patients, 43% survived without readmission, 33% were readmitted (11% for CHF-related causes), and 24% died within the year. One-year mortality in EU countries ranged widely, from 7% to over 24% for stroke patients, and from 8% to 30% for CHF patients, depending on the country. Stroke-related readmission rates varied from less than 2% to over 10%, and CHF-related readmissions from 5% to 17%.

Box 4.7. Best Practices for Advancing Cardiovascular Health: OptiMedis regionally based integrated care model

Description: The OptiMedis integrated care model emerged in 2005 with the launch of Gesundes Kinzigtal in Baden-Württemberg, following reforms in Germany to promote care co-ordination. Since then, OptiMedis has expanded its model of care to the German states of Hesse, Hamburg and Thuringia, aiming to improve patient experiences and population health while reducing per capita costs. A key feature of the care model is its “shared savings contract”, which incentivises the delivery of high-quality, preventative care. As part of this contract, positive differences between the money sickness funds receive from the country’s central payment authority and the mean costs of all enrolees is shared between the sickness funds and OptiMedis. In November 2023, Optimeddis transferred its shares in Gesundes Kinzigtal GmbH and now focusses its activities on other German regions.

Best practice assessment:

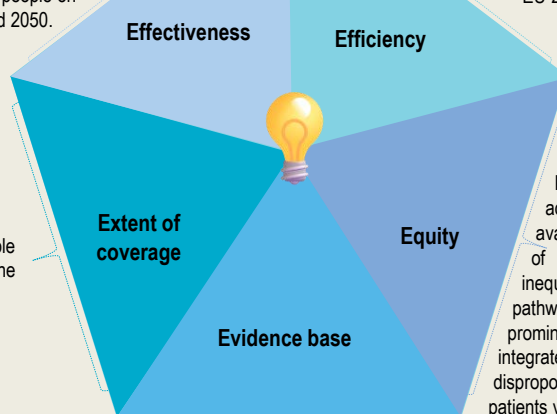
Implementing the OptiMedis integrated care model across Germany is estimated to lead to an increase of 146 441 life years (LYs) and 97 558 disability-adjusted life years (DALYs) by 2050.

Transferring OptiMedis to the eligible population across EU27 countries is estimated to result in 9.7 LYs and 6.5 DALYs gained per 100 000 people on average per year between 2022 and 2050.

Despite projected benefits, a 2021 evaluation based on 101 indicators from health-insurance data found no significant differences in the quality of care between the intervention and control regions.

Approximately one-third of eligible residents are enrolled in the OptiMedis integrated care model.

Over the modelled period, 2022-50, the OECD-SPHeP NCD model estimates that OptiMedis would lead to cumulative health expenditure savings of EUR 3 470 per person. Average annual health expenditure (HE) savings as a proportion of total HE is estimated at 4%, on average, across EU-27 countries.



The OptiMedis model of care offers outreach services to patients through access to health coaches, healthcare navigators or access to a Health Kiosk. This Kiosk provides tailored health and social advice in multiple languages (currently only available in the City of Hamburg). Core features of the integrated care model aim to reduce inequalities, for example, by standardising care pathways. Given complex health needs are more prominent among disadvantaged groups, the integrated care model has the potential to disproportionately benefit such groups, given such patients voluntarily enrol.

Studies evaluating the effectiveness and efficiency of OptiMedis used strong methods for data collection and analysis.

Enhancement options: To enhance the performance of the OptiMedis model and other population-based integrated care models, policymakers could consider ways to better target patients at high-risk of complex health needs. This will allow patients to access preventative programmes sooner leading to better health outcomes while lowering costs. Other policies include, but are not limited to, expanding programmes targeting disadvantaged groups and applying more rigorous methodologies to future evaluation studies.

Transferability: The OptiMedis model exists in the west (state of Hesse) and south-west (state of Baden-Württemberg) of Germany, and there are discussions to expand it to other regions in the country. Any future implementations will need to incorporate the core features of the model, such as obtaining long-term contracts. Although not yet transferred to regions outside Germany, underlying features that support the model exist in most OECD countries – e.g. preventative care, case management, and electronic patient data sharing. Further, there are active discussions to transfer this model of care to Belgium and France.

Conclusion: OptiMedis is a population-based integrated care model operating in parts of Germany. The model has the potential to increase life years and DALYs gained, while simultaneously reducing healthcare costs. Feedback from OptiMedis administrators indicates that the model can be successfully transferred in other regions with different populations and health service arrangements.

Source: OECD (2023^[5]), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, OECD Publishing, Paris, <https://doi.org/10.1787/9acc1b1d-en>.

4.7.2. Post-acute and rehabilitative care is a necessary, and increasingly emphasised, component of CVD care

Effective rehabilitative care for patients with CVD is multidisciplinary and comprehensive, addressing not only physical recovery but also psychological, social, and occupational needs. Effective cardiac rehabilitation typically includes physical training, psychological counselling, speech therapy (where applicable), and social support, with the involvement of a co-ordinated team that may include cardiologists, physiotherapists, nurses, psychologists, social workers, and occupational therapists. Best practice also requires a structured discharge plan from hospital, with clearly assigned responsibilities for ongoing rehabilitation and secondary prevention in the community. According to ESC guidelines, continuity of care and seamless transition between inpatient and outpatient rehabilitation phases are essential to improve quality of life, reduce hospital readmissions, and support long-term adherence to treatment and lifestyle changes (ESC Guidelines, 2021^[138]).

My post-acute care was a mix of challenges and triumphs. While the medical interventions I received were lifesaving, the lack of a structured rehabilitation plan made recovery more difficult. It was only through my own persistence, including taking up running and philosophical counselling, that I regained my physical and mental health. A more coordinated approach to post-acute care could significantly improve outcomes for patients like me.

Caius, artist, researcher, patient advocate, and heart attack survivor.

While 81% of European countries have cardiac rehabilitation programmes available (Turk-Adawi et al., 2019^[139]), a smaller number of countries explicitly incorporates rehabilitation and continuity of care into their national cardiovascular or noncommunicable disease (NCD) strategies. France, Ireland, Norway and the United Kingdom have well-established frameworks where cardiac rehabilitation is explicitly defined as a pillar of long-term CVD care. National regulation in France secures that all 140 dedicated cardiac rehabilitation centres are certified in multifaceted rehabilitation and patient education, and national

guidelines in cardiac rehabilitation exists since 2012 (Iliou, 2022^[140]). Ireland's National Cardiovascular Health Policy supports structured rehabilitation as part of integrated care pathways (Department of Health, 2010^[141]); Norway's NCD strategy emphasises follow-up and rehabilitation through co-ordinated services (Ministry of Health and Care Services, 2013^[142]); and England's NHS Long-Term Plan (NHS, 2024^[143]) positions rehabilitation as a key element to improve post-CVD outcomes. Similarly, Luxembourg, Slovenia and the Netherlands have integrated rehabilitation within broader chronic care strategies. Luxembourg supports Phase II and III programmes through both hospital-based and community-led services (Beissel, 2019^[144]); Slovenia offers multidisciplinary rehabilitation in specialised centres; and the Netherlands, while not having a standalone national CVD action plan, promote rehabilitation through national care standards and professional guidelines (World Health Observatory, 2021^[145]). In Switzerland, there are national strategies for promoting regional networking of existing services in the areas of cardiovascular prevention and rehabilitation (Gassner and Reinsperger, 2021^[146]).

Czechia has national coverage of rehab services through health insurance (Winnige et al., 2021^[147]), while Estonia and Latvia mention rehabilitation as part of chronic disease management, particularly for stroke (Viigimaa, 2014^[148]; Bērziņa et al., 2016^[149]). Finland reimburses cardiac rehabilitation via its Social Insurance Institution and supports physical activity through national guidelines and patient courses aimed at aiding reintegration into daily life. Meanwhile, Germany uses the statutory pension insurance to fund a multi-phase rehab system – including vocational reintegration models such as the Hamburg plan – which supports patients' gradual return to work after cardiac events (OECD/European Commission, 2025^[150]). In Iceland, early stroke rehabilitation typically takes place at the National Hospital's rehabilitation unit in the capital, or in local hospitals outside the city. Post-acute rehabilitation is provided in rehabilitation centres and outpatient clinics, offering services such as physiotherapy and speech therapy (King's College London for the Stroke Alliance for Europe, 2017^[151]).

Coordinating care between my cardiac condition and other health needs has been complex. Positive experiences involved a primary care physician who helped navigate specialist referrals and medication adjustments. Negative experiences included fragmented communication between providers and lack of shared health records, which sometimes led to duplicated tests or conflicting advice.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Other countries have made significant progress in defining the importance of post-acute care, though with more variable implementation. Canada incorporates rehabilitation via provincial programmes and the Heart & Stroke Foundation's national efforts, with guidelines supporting secondary prevention and outpatient rehabilitation. Japan recognises post-acute care in national strategies and supports its inclusion through policies on chronic disease management and health literacy, although uptake remains modest. Türkiye includes cardiac rehabilitation in national NCD programmes and hospital care packages.

4.7.3. Challenges in implementation and uptake of cardiac rehabilitation

Despite formal inclusion in national strategies, countries face widespread challenges in ensuring equitable access to and participation in cardiac rehabilitation, which is further hindered by geographical disparities, shortages of specialised staff, lack of automatic referral systems, and weak integration into primary care.

In Canada, service access varies by province, with rural areas particularly underserved (Grace et al., 2016^[152]). In Türkiye, cardiac rehabilitation remains underutilised due to low awareness among health professionals and patients, despite its inclusion in clinical guidelines (Kayıkçıoğlu and Aslanger, 2020^[153]). Czechia and Estonia offer insurance-funded rehabilitation, but participation is inconsistent, and services are not uniformly structured (Winnige et al., 2021^[147]; Viigimaa, 2014^[148]). In Latvia, while early rehabilitation for stroke is available, long waiting lists and unclear care pathways affect the timeliness of the services. Further, community-based and long-term rehabilitation are still developing, with limited co-ordination between medical, family, and social care (Bērziņa et al., 2016^[149]).

Even in countries with structured systems, uptake and continuity remain challenging. In France, Ireland and the United Kingdom, national programmes are well developed, but patient referral rates and adherence remain below targets, and there is limited long-term follow-up (HSE, 2024^[154]; BHF, 2022^[155]; Iliou, 2022^[140]). Luxembourg offers ambulatory and community-based rehab, yet coverage reaches only a fraction of eligible patients (Lion et al., 2021^[156]). In Slovenia, services are concentrated in urban hospitals, creating access barriers for rural populations. The Netherlands and Norway report gaps in participation and variable quality, despite strong professional guidelines and supportive care models (Budig and Harding, 2021^[157]; Grimsmo, 2016^[158]). Germany's system allows for extensive vocational reintegration and staged return to work, but data suggest that many eligible patients, particularly older adults, do not fully benefit due to logistical and informational barriers (Wengemuth et al., 2025^[159]). Finland, while offering community-based rehab and peer support activities, lacks comprehensive nationwide monitoring of rehab outcomes, which limits quality assurance (Lehto et al., 2018^[160]). Across most EU countries, data systems to track participation, adherence, and outcomes are often weak or fragmented, impeding evaluation and continuous improvement of rehabilitation services.

Interventions such as discharge planning, interdisciplinary care, and standardised treatment protocols have been shown to reduce hospital length of stay while maintaining care quality (Siddique et al., 2021^[161]). Investments in acute care responsiveness and the expansion of outpatient and rehabilitation services can further optimise resource use and improve patient outcomes. Integrated care has been shown to reduce mortality and hospital readmissions among patients with chronic heart failure (Yang et al., 2022^[162]). In parallel, person-centred cardiovascular care that extends beyond hospital settings is associated with improved clinical outcomes and quality of life (Ebrahimi et al., 2021^[163]). These approaches enhance the continuity and co-ordination of care, ensuring better management of chronic conditions outside hospital environments. Integrated models have demonstrated improved outcomes for patients with cardiometabolic multimorbidity (Otieno et al., 2023^[164]). Similarly, collaborative care interventions in primary settings have been associated with reductions in cardiovascular risk factors in patients with diabetes (Tu et al., 2024^[165]).

Delayed discharge is often a symptom of inaccessible rehabilitative and long-term care

Unnecessarily prolonged hospitalisations of patients that would be ready for discharge are costly to healthcare systems (Landeiro et al., 2017^[166]; Pellico-López et al., 2022^[167]). They block beds and human resources, contribute to increasing waiting times, put patients and providers under strain, can contribute to worse health outcomes, and disrupt care (Kuluski et al., 2022^[168]). A lack of availability of rehabilitation services and existing unmet needs in long-term care amid growing demand, have created shortages in long-term care capacity. As a result, long-term care providers are in high demand and long-term care facilities face long waiting lists. Even if beds are technically available, workforce shortages may prevent them from being utilised (Brazier et al., 2023^[169]). A lack of long-term care and rehabilitation structures are a common cause for delayed discharges and incorrectly blame hospitals for issues outside their control (Kuluski et al., 2022^[168]; van den Ende et al., 2023^[170]).

Due to the stroke, I developed other health problems, at the level of muscles and joints... I have many contractures because of the lack of mobility and activity.

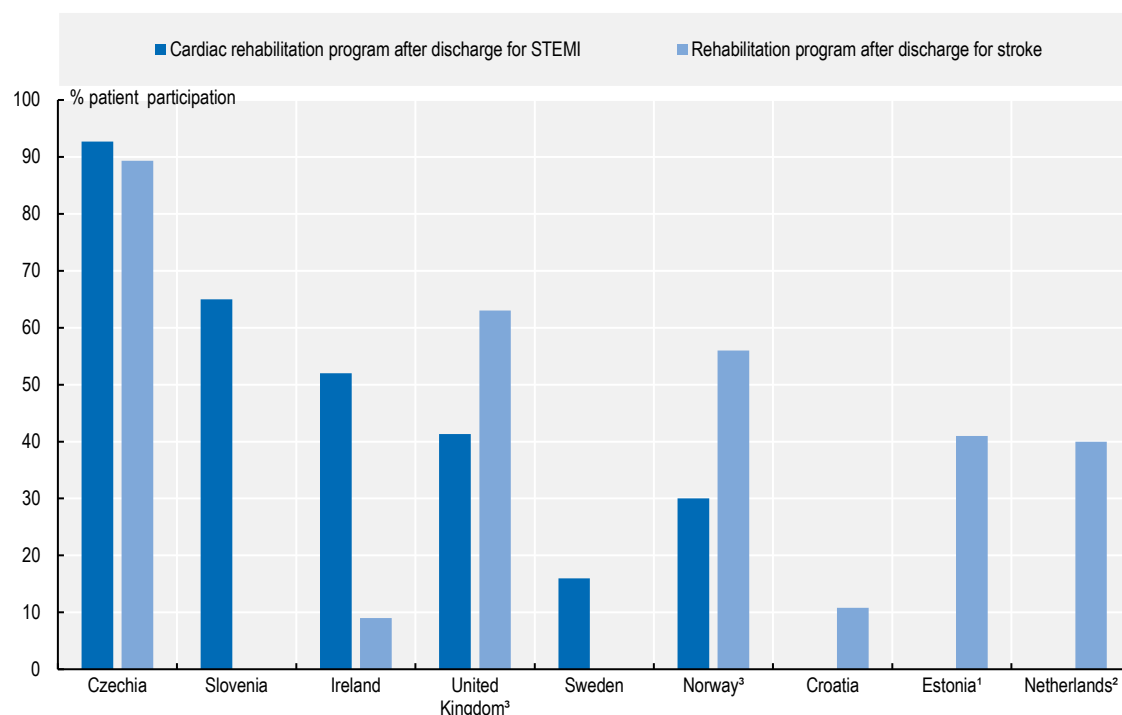
Diana, 48, stroke survivor.

Effective discharge planning is crucial to facilitate smooth transition from hospitals to post-acute care, can prevent readmissions and reduce adverse events. Poorly standardised discharge processes are linked to negative patient outcomes (Omonaiye et al., 2024^[171]). Early discharge protocols, particularly for low-risk ST-elevation myocardial infarction (STEMI) patients, have been shown to be both safe and feasible, offering a viable path to reduced hospital stay lengths (Rathod et al., 2021^[172]).

Countries can increase the supply of post-acute care structures to ensure that hospitals can transfer patients to medically appropriate and less cost-intense setting. Intermediate care structures, such as transitional care and rehabilitation services, and community-based models such as Hospital-at-Home, which aim at shortening or replacing hospital stays, have also demonstrated effectiveness. A meta-analysis showed these models are associated with a 26% lower risk of readmission compared to standard hospital care (Arsenault-Lapierre et al., 2021^[173]). Integrated stroke care pathways to improve patient-centred care have also shown potential to reduce hospital stay durations and improve outcomes. A Cochrane systematic review found that early supported discharge services for stroke patients reduced hospital stays by an average of five to six days, and significantly lowered the risk of long-term institutional care (Early Supported Discharge Trialists, 2017^[174]).

Despite strategic commitments, participation rates in cardiac rehabilitation after hospital discharge for ST-elevation myocardial infarction (STEMI) remain relatively low across countries. Rates of rehabilitation participation after stroke are generally higher than for cardiac rehabilitation – though overall data coverage related to access to rehabilitation is poor and comparability is limited (Figure 4.39). On average, 9% of patients in Ireland (2023), 56% of patients in Norway (2023) and 63% in the United Kingdom (2023), and 89% in Czechia received post-stroke rehabilitation services (King's College London, 2024^[175]).⁵ In Estonia, 31% of patients receive these services at the inpatient and 10% outpatient. Rates of cardiac rehabilitation at discharge range from 16% in Sweden to 97% in Czechia. These differences are related to the availability of rehabilitative care, coverage of rehabilitation in publicly funded healthcare, and the amount of co-payment, and a range of rehabilitation services also varies across countries. For example, inpatient rehabilitation care includes spa treatment which can be fully or partially reimbursed from social health insurance in Czechia (Bryndová et al., 2023^[106]), while in Sweden, patients can participate in a physical exercise programme, led by a physiotherapist, at least two sessions per week for at least three months.

Figure 4.39. Countries show varying rates of patient participation in rehabilitation after discharge for stroke and STEMI



Note: 1. inpatient: 31.3%; outpatient: 10.0%; 2. Estimated: Approximately 5% is admitted to a rehabilitation centre and 35% to a geriatric rehabilitation department; 3. Includes STEMI and Non-STEMI.

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Box 4.8. Innovations to improve rehabilitation and post-acute care quality

Countries are implementing policies to improve the quality and accessibility of post-acute and rehabilitative CVD care. The United Kingdom (England) has introduced task shifting, including nurse-led hypertension and cholesterol clinics, pharmacist involvement in CVD risk management, and expanded roles for allied health professionals in rehabilitation. These changes aim to optimise resource use and enhance continuity of care. In France, besides introduction of quality assurance measures for rehabilitation care in the CVD national plan, there are strategies to co-ordinate primary healthcare providers and mental health professionals during cardiac rehabilitation after stroke. Israel, Estonia, Latvia, the Netherlands, Norway, Sweden and the United Kingdom are developing health literacy programmes that support patient self-care and shared decision making, while Ireland is already implementing such a program.

Source: NHS (2024^[176]), National Audit of Cardiac Rehabilitation, <https://www.cardiacrehabilitation.org.uk/site/docs/NACR%20Quality%20and%20Outcomes%20Report%202024%20Final.pdf>; 2025 OECD Cardiovascular Policy and Data Survey.

4.8. Workforce policies are a cross-cutting issue, impacting cardiovascular outcomes

Ensuring a robust health workforce is critical for preventing CVD and improving patient outcomes. Health systems across Europe are confronting a workforce crunch that threatens care quality – a problem dubbed a “ticking time bomb” by the WHO Regional Office for Europe that, if left unaddressed, is almost certain to lead to poorer health outcomes, longer treatment waiting times and preventable deaths (WHO Regional Office for Europe, 2022^[177]).

4.8.1. Workforce shortages represent a looming challenge for CVD care

Many health systems simply do not have enough clinicians to meet current and future needs for cardiovascular care. Twenty EU countries recently reported doctor shortages and 15 reported nurse shortages. In 2022, EU countries experienced a shortfall of approximately 1.2 million doctors, nurses, and midwives, based on the recommended minimum health worker densities needed to achieve universal health coverage (OECD/European Commission, 2024^[178]). This gap reflects rising demand as populations age and chronic cardiac conditions become more common as well as constrained supply. Over one-third of European doctors and one-quarter of nurses are over the age of 55 and are nearing retirement, yet too few young graduates are replacing them. Interest in nursing careers declined in over half of EU countries from 2018 to 2022 (OECD/European Commission, 2024^[178]). The WHO projects a shortage of 4.1 million health workers in the European Region by 2030, including 600 000 physicians and 2.3 million nurses (Zapata et al., 2023^[179]; Boniol et al., 2022^[180]; WHO, 2016^[181]).

Such workforce deficits directly affect cardiac care. Inadequate staffing leads to longer waits for cardiac procedures and clinics, while treatment delays increase the risk of heart failure, complications, and death. In England, for example, record staff shortages in the National Health Service contributed to a backlog of over 380 000 patients waiting for cardiac care in 2023, with tens of thousands waiting well beyond recommended times for “time-critical” heart treatments (BHF, 2023^[182]).

Beyond aggregate numbers, maldistribution of the workforce poses another challenge. Within and between countries, there are disparities in access to qualified health professionals. Rural and remote regions often struggle to attract GPs as well as specialists, creating “medical deserts”. Hospitals in many rural areas across Europe report chronic shortages of doctors, nurses, pharmacists and technicians, leaving insufficient staffing to meet medical needs (EPHA, 2024^[183]). In primary care, maldistribution means some communities have few or no GPs, undermining preventive services for CVD risk factors. On average, only one in five physicians in the EU is a GP, suggesting a possible imbalance favouring specialists over family doctors (OECD/European Commission, 2024^[178]). Geographic inequities in provider supply can translate into inequities in outcomes. When it comes to management and secondary prevention following AMI and heart failure, a study from the United States found that low cardiologist density is associated with modestly higher 30-day and 1-year risk of mortality (Kulkarni et al., 2013^[184]).

Similarly important to the number and location of the workforce is its composition and how well teams function across settings in a co-ordinated manner through interaction and information sharing. Modern cardiovascular care relies on multidisciplinary teams: cardiologists, GPs, specialised nurses, mid-level providers, rehabilitation specialists, pharmacists, and others – and each play a critical role along the care continuum. An adequate mix of skills is indispensable for effective delivery of care, and evidence suggests that team-based approaches improve patient outcomes. For example, involving specialist nurses in cardiac care has been found to reduce hospital readmissions and improve patients’ adherence to treatments (Price, 2012^[185]). Nurse-led hypertension management has been shown to improve blood pressure control and medication adherence (Stephen et al., 2022^[186]).

Involving pharmacists in medication reviews and adherence programmes can reduce cardiovascular risk, especially in older patients with multiple prescriptions (Zillich et al., 2014^[187]). Collaborative care models that integrate pharmacists into the primary care team have demonstrated better control of key cardiovascular risk factors. Pharmacists, as accessible medication experts, help optimise therapy and improve adherence yet remain underused in many countries (Valliant et al., 2022^[188]). Strengthening the multidisciplinary “heart team concept” can yield benefits even in specialised care. A non-randomised observational study found that complex cardiac patients managed by a multidisciplinary heart team has significantly higher survival probability than those whose care was decided by a general cardiology team (Sardari Nia et al., 2021^[189]).

Expanding the skill mix through new roles is another policy lever. OECD countries are enabling advanced practice nurses or physician assistants to take on some tasks traditionally done by doctors. This can free up cardiologists for the most complex cases while ensuring routine hypertension or cholesterol management is still closely supervised by skilled providers. For example, advanced practice nurses can manage stable coronary artery disease patients or run prevention clinics, with physician oversight as needed. Such task-sharing can not only mitigate the impact of doctor shortages but can improve patient experience through more continuous support. However, not all health systems currently recognise or train specialist CVD nurses or other mid-level practitioners. Investments in training programmes to develop these roles and revise regulations to permit full use of their competencies are key. Reskilling and upskilling the existing workforce is essential to create effective multidisciplinary teams.

Scotland’s Heart Disease Action Plan (2021) explicitly prioritised workforce development – one of its four pillars is ensuring appropriate staff resources and training to deliver timely, equitable heart care across the country (Scottish Government, 2021^[190]). Spain’s cardiovascular health strategy emphasises multidisciplinary units and improved training as keys to better outcomes (Bueno et al., 2025^[191]).

4.8.2. A pivot to prevention for a “high-tech, high-touch” workforce

As healthcare evolves, so do the skills required by the workforce. Two areas stand out as particularly important for CVD care: digital health literacy and prevention expertise. The COVID-19 pandemic accelerated the adoption of telemedicine and remote monitoring for chronic diseases like heart failure (Chapter 5). Going forward, clinicians will increasingly draw on digital tools to enhance cardiovascular prevention and disease management. To be effective, these need to be integrated into clinical workflow.

Surveys from the United Kingdom and Australia show that while uptake of tools like electronic health records is near-universal, comfort with data interpretation and telemonitoring remains variable, especially among older practitioners (Socha-Dietrich, 2021^[192]), not to mention next generation advances like Artificial Intelligence (Almyranti et al., 2024^[193]). Workforce policies that support digital training and access to technology are essential, as health professionals need competencies in using electronic health records, telehealth platforms, and data analytics. For example, telemonitoring of heart failure patients can flag early warning signs and has been shown to reduce hospital readmissions and mortality (Knoll et al., 2023^[194]). To capitalise on such innovations, countries can strengthen capacity by incorporating digital health modules into medical and nursing curricula and offering continuing education so that even mid-career providers can confidently use new systems.

Harnessing digital tools can also extend the reach of scarce specialists – for instance, a cardiologist in a tertiary centre can remotely consult on patients in rural clinics, or a single heart failure nurse can manage a larger caseload via telephonic follow-ups and app-based check-ins. Embracing e-health and mobile health solutions will be essential to improve CVD outcomes without solely relying on expanding the workforce (EC, 2024^[195]). Leveraging technology is one strategy to augment health worker productivity and free up time for direct patient care (OECD/European Commission, 2024^[178]), thereby partially offsetting workforce constraints.

Soft skills will become increasingly important not only because the heavy, cognitive work will increasingly be done by algorithms and large language models, but the strong evidence pointing the comparative effectiveness of team-based prevention and care in CVD and other diseases (OECD, 2019^[196]; Socha-Dietrich, 2021^[192]; Slawomirski et al., 2025^[197]). As health systems aim to reduce inequities in cardiovascular outcomes, cultural competence and equity-oriented training are increasingly essential. CVD disproportionately affects low-income, Indigenous, and migrant populations in many OECD countries. A workforce that understands these dynamics – and is equipped to respond respectfully and effectively – is critical.

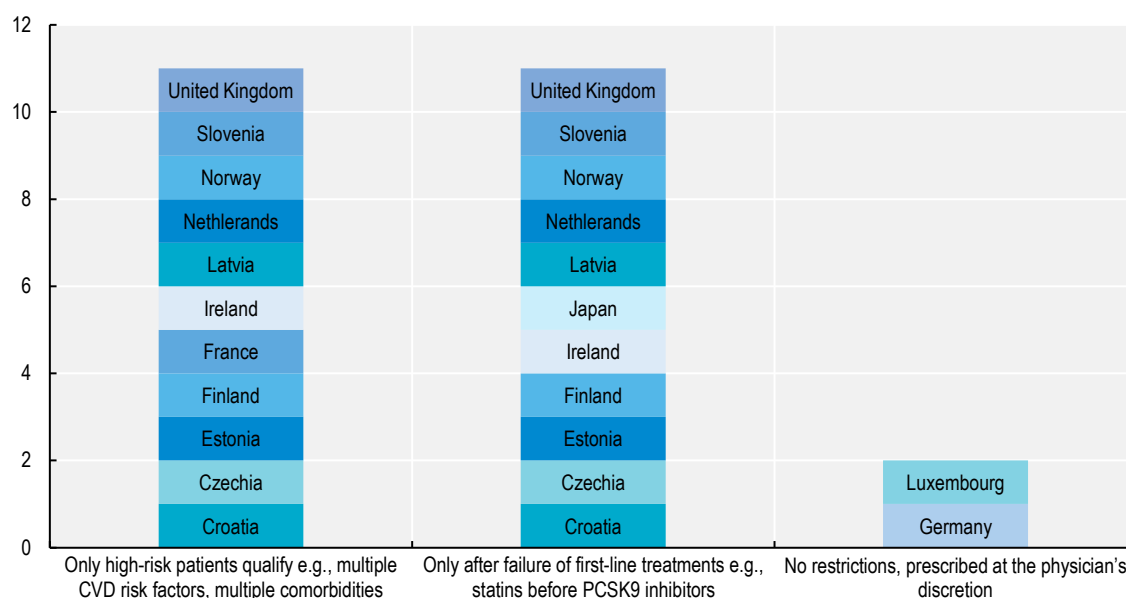
4.9. Innovations in healthcare delivery related to new medicines present both benefits and challenges

4.9.1. Several new medicines show modest improvements in cardiovascular outcomes or challenge health systems on coverage decisions

Innovation in cardiovascular medications is not just a clinical breakthrough – it is a systems-level challenge and opportunity. Recent advances in cardiovascular medication have introduced several new therapies that may offer both targeted cardiovascular benefits and broader clinical advantages, particularly for high-risk patient populations. However, many of these new medicines – such as direct oral anticoagulants (DOACs), PCSK9 inhibitors and SGLT2 inhibitors – demonstrate only **modest added clinical value** compared to the standard of care (Annex 4.F). As indications expand, so too does the potential budgetary impact, raising important questions about **cost-effectiveness and long-term system sustainability**.

As a result, health technology assessments conducted by several EU national competent authorities have evaluated the **relative clinical benefit** of these therapies and restricted their use as **first-line treatments** to select high-risk populations. As illustrated in Figure 4.40, more than half of responding countries report placing specific access restrictions to high-cost CVD medicines such as PCSK9 inhibitors and SGLT2 inhibitors. These restrictions are designed to manage uptake in line with clinical evidence, assessment of relative effectiveness compared to standard of care, and cost-effectiveness considerations. Decisions based on the assessments inform **reimbursement decisions covered by government or compulsory insurance schemes**, ensuring that access is prioritised for patients most likely to benefit, and hence, the implementation of these health authority requirements is crucial.

Figure 4.40. More than half of responding countries restrict access to high-cost innovative CVD medications such as PCSK9 inhibitors and SGLT2 inhibitors to specific patient groups



Note: N=19 EU and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

4.9.2. PCSK9 inhibitors offer only modest additional reductions in cardiovascular risk, compared to standard of care (statins and ezetimibe)

PCSK9 inhibitors are particularly beneficial for patients who fail to achieve target low-density lipoprotein cholesterol (LDL-C) levels despite receiving first-line treatments such as statins and/or ezetimibe (Mayor, 2016^[198]). PCSK9-targeting therapies including monoclonal antibodies (evolocumab, alirocumab) and the small interfering RNA (inclisiran) represent a notable advancement in lipid-lowering treatment and are increasingly used in European countries (Annex 4.G) (Tamargo et al., 2024^[199]). Large scale clinical trials have demonstrated that PCSK9 inhibitors can lower LDL-C levels by up to 60%, offering an important option for individuals with refractory hypercholesterolemia at high risk of CVD (Sabatine et al., 2017^[200]; Schwartz et al., 2018^[201]).

After about 25 years of taking statins side effects became obvious – muscle pain and shrinkage – after taking different other statins and Bepidomin acid (Nustendi) the cardiologist finally prescribed PCSK9 inhibitor (Repatha) – no side effects yet and very effective.

Ulrich, 65, retired military officer, heart attack and transient ischaemic attack survivor, living with high cholesterol, arrhythmia and heart failure.

However, the clinical benefits beyond LDL-C reduction are more limited. A Cochrane review of 24 randomised controlled trials involving nearly 61 000 participants (18 on alirocumab, 6 on evolocumab) found that when compared to placebo, both alirocumab and evolocumab demonstrate modest absolute benefits in reducing CVD events (RD (risk difference): -2%; RD:-2%), and myocardial infarction (RD:-2%; RD: -1%) (Schmidt et al., 2020^[202]). Compared to established standard of care (statins and ezetimibe), PCSK9 inhibitors offer only modest additional reductions in cardiovascular risk, with uncertain evidence of meaningful benefit in patients whose LDL-C is already well-controlled. Reflecting this, ESC clinical guidelines recommend PCSK9 inhibitors primarily for patients with primary hypercholesterolemia, mixed dyslipidemia, or established atherosclerotic CVD who are resistant to standard therapy (ESC Guidelines, 2019^[31]). Research suggests that the prevalence statin intolerance, for example, is between 8 and 10% (Bytyçi et al., 2022^[203]).

This selective use of PCSK9 inhibitors is reflected in HTA decisions. For instance, France's *Haute Autorité de Santé* (HAS) concluded that evolocumab offers no significant clinical benefit over existing therapies for the general population (HAS, 2018^[204]) and restricts reimbursement to high-risk subgroups. Similar recommendations have been issued in 2018 by the *Gemeinsamer Bundesausschuss* (G-BA), the Federal Joint Committee, in Germany (Federal Joint Committee, 2018^[205]). England's National Institute for Health and Care Excellence (NICE) also recommended restricted use of inclisiran in 2021 to those with pre-existing cardiovascular events and intolerance to statins (NICE, 2021^[206]). Several countries restrict use of PCSK9 inhibitors only after first-line treatment with statins fails to deliver health improvements as shown in Annex Table 4.F.1..

4.9.3. Wider clinical applications of SGLT2 inhibitors have accelerated uptake but questions about its economic value remain

Originally developed as glucose-lowering agents for type 2 diabetes mellitus (T2DM), SGLT2 inhibitors such as *empagliflozin* and *dapagliflozin* have rapidly evolved into key therapies for heart failure and chronic kidney disease (CKD) (Talha, Anker and Butler, 2023^[207]). Clinical trials have shown that these agents provide important cardiovascular and renal benefits, particularly for patients with HFrEF, CKD and, more recently, heart failure with preserved ejection fraction (HFpEF) (McMurray et al., 2019^[208]; Heerspink et al., 2020^[209]; Zannad et al., 2020^[210]; Voors et al., 2022^[211]). They are now widely recommended in clinical guidelines for use in management of chronic, stable HFrEF to reduce cardiovascular death and hospitalisations for heart failure, with and without diabetes (ESC Guidelines, 2023^[212]; Heidenreich et al., 2022^[44]).

Although some studies report modest reductions in cardiovascular and all-cause mortality, especially in patients with HFrEF (Svanström et al., 2024^[213]), the mortality benefit remains limited in broader populations. Nevertheless, consistent reductions in hospitalisations for heart failure and renal decline across subgroups have positioned SGLT2 inhibitors as a cornerstone in the management of chronic heart failure and multimorbidity in cardiovascular care (Talha, Anker and Butler, 2023^[207]; Usman et al., 2024^[214]).

The expanding clinical profile of SGLT2 inhibitors has broadened the population eligible for treatment and driven increased utilisation across European countries (see Annex 4.G). Originally a second-line treatment for diabetes, SGLT2 inhibitors are now frontline option for multiple chronic diseases common in ageing populations. In the Netherlands, for example, they are now first-line therapy for T2DM patients at a very high risk for cardiovascular risk. Analysis of this guideline found that the 5-year budget impact of the adoption the treatment guideline was over EUR 350 million, alongside nearly 4 400 quality adjusted life years (QALYs) gained (van Schoonhoven et al., 2023^[215]). The marked increase since 2021, in particular, can be attributed to the publication of the previously mentioned EMPEROR-Preserve trial and expanded approved indications by the European Medicines Agency the following year (Anker et al., 2021^[216]; European Commission, 2022^[217]).

4.9.4. The rising use of GLP-1s impacts both coverage decisions and financial burden for countries

Originally prescribed for diabetes treatment, Glucagon-Like Peptide-1 Receptor Agonists (GLP-1 RAs), and are now authorised to treat obesity in 13 of 17 surveyed OECD countries (Mathieu-Bolh, forthcoming^[218]). Three different molecules are being used for obesity treatment: liraglutide, semaglutide, and tirzepatide. Besides their effectiveness to reduce body mass index (BMI), studies show that obesity treatment relying on GLP-1 RAs results in a reduction of weight-related co-morbidities that are risk factor of CVDs, as well as major cardio-vascular events, particularly in diabetics at high risk.

Cardiovascular effects are commonly assessed using hazard ratio (HR), which compare the risk of events over time between a treatment and standard care groups. A key outcome measure is Major Adverse Cardiovascular Events (MACE), typically comprising cardiovascular death, non-fatal myocardial infarction (heart attack), and non-fatal stroke. Badve et al. (2025^[219]) report that in patients with type-2 diabetes, GLP-1 RAs reduce MACE by 13% (HR 0.87, 0.81-0.93) compared to placebo (Haute Autorite de Sante (HAS), 2024^[220]) and the SELECT trial findings a 20% reduction in MACE among non-diabetic obese patients with preexisting CVD (HR 0.80; 95% CI: 0.72-0.90) (Lincoff et al., 2023^[221]). The lowered risk of cardiovascular events associated to GLP-1 RAs is confirmed when each event is studied separately. Xie, Choi and Al-Aly (2025^[222]) find that against standard care, GLP-1RA use was linked to a lower risk of each cardiovascular events studied. It was associated with a reduced likelihood of myocardial infarction (HR 0.91), cardiac arrest (HR 0.78), and incident heart failure (HR 0.89). Additionally, the risk of ischemic stroke (HR 0.93) and haemorrhagic stroke (HR 0.86) was also decreased.

GLP-1 RAs have also shown significant effects on key CVD risk factors, such as high blood sugar among diabetic patients – with different medications demonstrating differing levels of effectiveness. A meta-analysis by Wen et al. (2025^[223]) finds that tirzepatide is among the most effective GLP-1 Ras in lowering blood sugar levels compared to placebo. Similarly, Yao et al. (2024^[224]) report that tirzepatide induced the largest decrease in HbA1c – an average decrease of 2.10% (–2.47% to –1.74%)—among 15 drugs, including experimental drugs, such as the combination of cagrilintide and semaglutide. Evidence from SURMOUNT-2 and SURPASS trials, reviewed by NICE (NICE, 2024^[225]) further indicates that tirzepatide yields greater reductions in both weight and blood sugar levels in patients with T2DM compared to those without. Beyond BMI reduction, GLP-1 RA's have also been associated with improvements in hypertension and dyslipidemia. According to INESSS (2022^[226]), terzepatide showed the largest reduction in systolic blood pressure among GLP-1 Ras, with a mean decrease of -6.2 mmHg (95% CI: -7.7 to -4.8) compared to the two other GLP-1 RAs. Gudzone and Kushner (2024^[227]) report an even greater reduction of -8.6mmHG. However, NICE (2024^[225]) found no statistically significant difference in systolic blood pressure improvement between tirzepatide 15 mg and semaglutide 2.4 mg, though specific data remain confidential. Regarding lipid profiles, tirzepatide appears to significantly reduce LDL-C levels and may be outperform other GLP-1 RAs. Yet, findings on its comparative effectiveness versus semaglutide are mixed, with studies from (NICE, 2024^[225]; INESSS, 2022^[226]; Yao et al., 2024^[228]; Gudzone and Kushner, 2024^[227]), yielding inconsistent results.

However, there is currently little evidence of long-term effects of GLP-1 RAs for CVD risk prevention or treatment. While side effects of GLP-1 RAs effect are frequent and essentially gastrointestinal effects, treatment discontinuation appears to be highly frequent with GLP-1 RAs. Patients regain weight after treatment is stopped and there is no evidence of durable long-term effects of those treatments. The Institute for Clinical and Economic Review (2022^[229]) explains that if patients do not have initial co-morbidities, trials show no evidence of effects of GLP-1 RAs on morbidity or mortality.

Bariatric surgery may be more effective at preventing CVDs than GLP-1 RAs. Bariatric surgery appears to yield larger short and long-term weight loss than GLP-1 RAs and is also considered the most effective treatment against type-2 diabetes mellitus (Hsu and Farrell, 2023^[230]). Bariatric surgery is associated with lower mortality compared to GLP-1RAs for patients with diabetes duration of 10 years or less (Dicker et al.,

2024^[231]). There is no difference between bariatric surgery and GLP-1 RAs regarding non-fatal MACE for patients with diabetes duration of 10 years or less (Dicker et al., 2024^[231]).

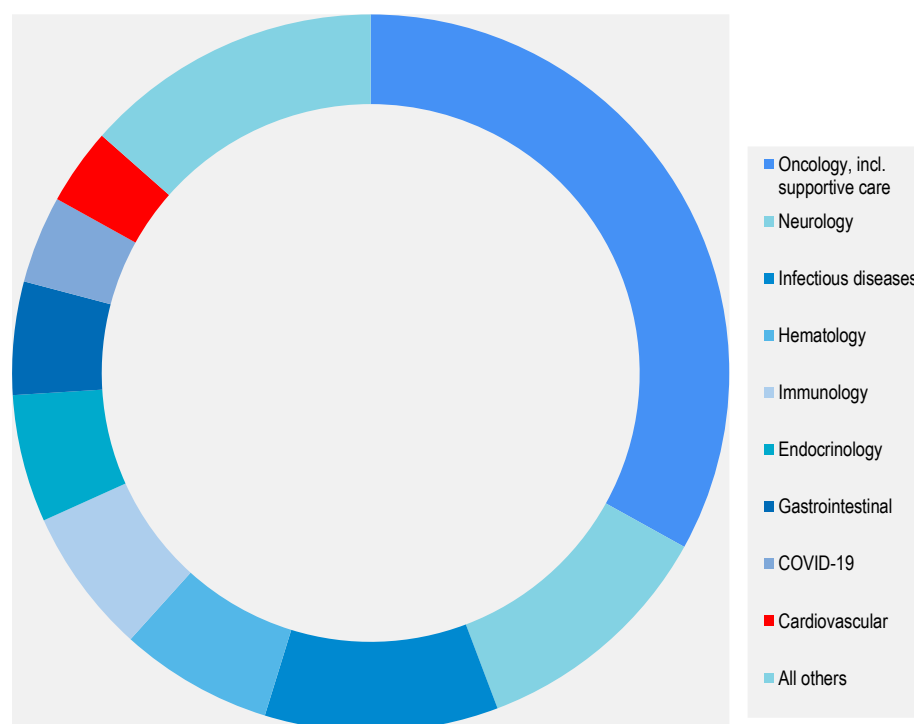
A recent OECD review on **GLP-1 receptor agonists (GLP-1 RAs)** shows these may not be **cost-effective** according to commonly used HTA thresholds (e.g. \$50 000/QALY) (Mathieu-Bolh, forthcoming^[218]). For example, in the United States, current prices for semaglutide would need to fall by nearly 90% to meet typical cost-effectiveness thresholds. Exceptions are limited, with some United Kingdom-based studies showing more favourable results. Cost effectiveness may be reached in some countries when those drugs are prescribed to limited population groups, such as patients with high BMIs and related co-morbidities. Most budget impact analyses for GLP-1 RAs used in obesity management suggest that they **may not be affordable for the entire eligible population**. The financial burden is growing rapidly, as seen in Medicare Part D spending, which jumped from USD 57 million in 2018 to USD 5.7 billion to treat T2DM with GLP-1 RAS in 2022. Other countries, like the United Kingdom and France, have also flagged concerns over the **high budget impact**, with national health systems expressing hesitation or applying access restrictions due to cost-related uncertainties.

Lowering the cost of GLP-1 RAs could significantly improve their cost-effectiveness. This may be achieved through greater availability of **generic or biosimilar versions**, especially as patents begin to expire between 2023 and 2039. Competition from new therapies is also expected to reshape the market. These include **next-generation weight-loss drugs** – such as dual- and tri-agonists, GLP-1 analogues combined with other agents like cagrilintide, and innovative oral formulations – which have shown promising early trial results with **greater weight-loss efficacy** than current treatments (Wen et al., 2024^[232]). These developments could enhance therapeutic value while increasing pricing pressure on existing GLP-1 RAs, potentially improving their affordability and public health impact over time (Mathieu-Bolh, forthcoming^[218]).

4.9.5. Cardiometabolic pipeline growth: Is innovation targeting unmet medical needs?

Despite CVD being the leading cause of mortality globally and accounting for a significant portion of the healthcare burdens in Europe, research and development investment has historically lagged fields like oncology, neurology, and infectious diseases (IQVIA Institute, 2024^[233]). This underinvestment stands in stark contrast to the scale of cardiovascular need: millions of Europeans live with heart failure, hypertension, or atherosclerosis, conditions that drive up hospital admissions and long-term care costs. In 2023, only 5% of documented clinical trials related to cardiovascular conditions – and only 21 novel active substances were introduced between 2014 and 2023 – among fewest launches per therapeutic area (Figure 4.41) (IQVIA Institute, 2024^[233]).

Figure 4.41. Only 3% of novel active substances (NASs) launched between 2014-2023 were for CVD



Source: IQVIA Institute (2024^[233]), Global Trends in R&D 2024, <https://www.iqvia.com/insights/the-iqvia-institute/reports-and-publications/reports/global-trends-in-r-and-d-2024-activity-productivity-and-enablers>.

Even so, cardiometabolic disease appears to be re-emerging in the research and development pipeline of the pharmaceutical industry with a shift to therapies targeting obesity, diabetes, kidney disease, and NASH (Non-Alcoholic Steatohepatitis) (IQVIA, 2023^[234]). While several new therapies have been developed, they only provide incremental improvements over established treatments, raising concerns about alignment between R&D priorities and the most pressing unmet medical needs. PCSK9 inhibitors only modestly reduce CVD events, particularly when used alongside statins. SGLT2 inhibitors are effective in reducing hospitalisation for heart failure for a subpopulation of patients with heart failure with HFrEF but evidence on their cost-effectiveness remains uncertain.

The key question is whether current clinical trial activity aligns with the most pressing medical needs. The industry pipeline features a wave of next-generation agents, including dual- and tri-agonists targeting GLP-1, GIP, and glucagon receptors (IQVIA, 2023^[234]). Oral formulations and novel combinations – such as GLP-1 with amylin analogues – aim to improve both efficacy and patient convenience. In heart failure, innovation is progressing with therapies like cardiac myosin activators and anti-inflammatory agents. Precision medicine is gaining traction, with treatment strategies increasingly targeting metabolic and inflammatory pathways. Lipid management is evolving beyond statins, focussing on new targets like lipoprotein(a), ApoC-III (apolipoprotein C-III), and ANGPTL3 (angiopoietin-like protein 3). RNA-based therapies, including small interfering RNAs (siRNAs) and antisense oligonucleotides, offer promising solutions for patients with genetic dyslipidemia or residual cardiovascular risk (IQVIA, 2023^[234]). Non-alcoholic steatohepatitis (NASH) remains a major unmet need with no approved treatments. The pipeline is diverse, addressing metabolic, inflammatory, and fibrotic pathways through agents such as FXR (farnesoid X receptor) and PPAR (peroxisome proliferator-activated receptor) agonists, GLP-1 analogues, and thyroid hormone receptor agonists, with the goal of preventing progression to cirrhosis and liver failure. Cross-cutting therapies – such as IL-1 (interleukin-1) inhibitors, NLRP3 (nucleotide-binding domain,

leucine-rich – containing family, pyrin domain – containing-3) inflammasome blockers, and anti-fibrotic agents – are also being explored across multiple indications, including heart failure, NASH, and atherosclerosis (IQVIA, 2023^[234]).

4.10. Conclusion

This chapter has explored the quality of cardiovascular care across the continuum – from primary, emergency and acute treatment to post-acute and rehabilitative care. While many countries have made progress in expanding access to life-saving interventions and improving adherence to recommended care practices, significant gaps remain in timeliness and quality of care, equitable access, and long-term follow-up. Post-acute care remains a critical but underdeveloped opportunity to reduce long-term mortality and improve recovery. Across all stages of care, better data is essential to monitor quality, guide improvements, and ensure accountability – an issue that will be addressed in detail in the next chapter.

References

- Adler, A. et al. (2021), “Pharmacological blood pressure lowering for primary and secondary prevention of cardiovascular disease across different levels of blood pressure: an individual participant-level data meta-analysis”, *The Lancet*, Vol. 397/10285, pp. 1625-1636, [https://doi.org/10.1016/S0140-6736\(21\)00590-0](https://doi.org/10.1016/S0140-6736(21)00590-0). [30]
- Aguiar de Sousa, D. et al. (2018), “Access to and delivery of acute ischaemic stroke treatments: A survey of national scientific societies and stroke experts in 44 European countries”, *European Stroke Journal*, Vol. 4/1, pp. 13-28, <https://doi.org/10.1177/2396987318786023>. [97]
- Aguiar de Sousa, D. et al. (2023), “Delivery of acute ischaemic stroke treatments in the European region in 2019 and 2020”, *European Stroke Journal*, Vol. 8/3, pp. 618-628, <https://doi.org/10.1177/23969873231186042>. [90]
- AHA/AMA (2023), “Implementation Strategies to Improve Blood Pressure Control in the United States: A Scientific Statement From the American Heart Association and American Medical Association”, *Hypertension*, Vol. 80/10, <https://doi.org/10.1161/hyp.000000000000232>. [51]
- Almyranti, M. et al. (2024), “Artificial Intelligence and the health workforce: Perspectives from medical associations on AI in health”, *OECD Artificial Intelligence Papers*, No. 28, OECD Publishing, Paris, <https://doi.org/10.1787/9a31d8af-en>. [193]
- Anker, S. et al. (2021), “Empagliflozin in Heart Failure with a Preserved Ejection Fraction”, *New England Journal of Medicine*, Vol. 385/16, pp. 1451-1461, <https://doi.org/10.1056/nejmoa2107038>. [216]
- Areces, S. et al. (2021), “Cost comparison between transcatheter aortic valve implantation and surgical valve replacement using individual data in a Spanish public hospital”, *Cirugía Cardiovascular*, Vol. 28/6, pp. 317-324, <https://doi.org/10.1016/j.circv.2021.07.006>. [118]
- Arsenault-Lapierre, G. et al. (2021), “Hospital-at-Home Interventions vs In-Hospital Stay for Patients With Chronic Disease Who Present to the Emergency Department”, *JAMA Network Open*, Vol. 4/6, p. e2111568, <https://doi.org/10.1001/jamanetworkopen.2021.11568>. [173]

- Australian Institute of Health and Welfare (2024), *Heart, stroke and vascular disease: Australian facts: Expenditure on cardiovascular disease*, <https://www.aihw.gov.au/reports/heart-stroke-vascular-diseases/hsvd-facts/contents/impacts/expenditure-cvd>. [236]
- Badve, S. et al. (2025), “Effects of GLP-1 receptor agonists on kidney and cardiovascular disease outcomes: a meta-analysis of randomised controlled trials”, *The Lancet Diabetes & Endocrinology*, Vol. 13/1, pp. 15-28, [https://doi.org/10.1016/s2213-8587\(24\)00271-7](https://doi.org/10.1016/s2213-8587(24)00271-7). [219]
- Baldauf, B. et al. (2024), “Prevalence of cardiac implantable electronic device infections in Germany in 2015”, *Scientific Reports*, Vol. 14/1, <https://doi.org/10.1038/s41598-024-82622-1>. [121]
- Baldi, E. et al. (2021), “The Automated External Defibrillator: Heterogeneity of Legislation, Mapping and Use across Europe. New Insights from the ENSURE Study”, *Journal of Clinical Medicine*, Vol. 10/21, p. 5018, <https://doi.org/10.3390/jcm10215018>. [60]
- Bangalore, S. et al. (2017), “Renin angiotensin system inhibitors for patients with stable coronary artery disease without heart failure: systematic review and meta-analysis of randomized trials”, *BMJ*, Vol. 356, p. 4, <https://doi.org/10.1136/BMJ.J4>. [28]
- Bansilal, S. et al. (2016), “Assessing the Impact of Medication Adherence on Long-Term Cardiovascular Outcomes”, *Journal of the American College of Cardiology*, Vol. 68/8, pp. 789-801, <https://doi.org/10.1016/j.jacc.2016.06.005>. [46]
- Barrenho, E. et al. (2022), “International comparisons of the quality and outcomes of integrated care: Findings of the OECD pilot on stroke and chronic heart failure”, *OECD Health Working Papers*, No. 142, OECD Publishing, Paris, <https://doi.org/10.1787/480cf8a0-en>. [137]
- Beggs, S. et al. (2017), “Non-ischaemic cardiomyopathy, sudden death and implantable defibrillators: a review and meta-analysis”, *Heart*, Vol. 104/2, pp. 144-150, <https://doi.org/10.1136/heartjnl-2016-310850>. [113]
- Behmane, D. et al. (2019), “Latvia: Health system review”, *Health Systems in Transition*, Vol. 21/4. [242]
- Beissel, J. (2019), *Country report of Luxembourg*. [144]
- Berge, E. et al. (2021), “European Stroke Organisation (ESO) guidelines on intravenous thrombolysis for acute ischaemic stroke”, *European Stroke Journal*, Vol. 6/1, pp. I-LXII, <https://doi.org/10.1177/2396987321989865>. [79]
- Bernal, E. et al. (2024), “Spain: Health system review”, *Health Systems in Transition: Spain*, Vol. 26/3, p. 2024, <http://www.healthobservatory.eu>. [19]
- Bērziņa, G. et al. (2016), “Living in Latvia after stroke: the association between functional, social and personal factors and the level of self-perceived disability—a cross-sectional study”, *BMJ Open*, Vol. 6/6, p. e010327, <https://doi.org/10.1136/bmjopen-2015-010327>. [149]
- BHF (2023), *Heart care waiting list rises by 63 per cent in three years in England - BHF*, <https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2023/may/heart-care-waiting-list-rises-by-63-per-cent-in-three-years> (accessed on 8 July 2025). [182]
- BHF (2022), *Cardiac Rehabilitation: A participant’s perspective. Learning from the pandemic to shape future delivery*. [155]

- Birk, H. et al. (2024), *Health Systems in Transition: Denmark Health System Review 2024*, [104]
<https://eurohealthobservatory.who.int/publications/i/denmark-health-system-review-2024>.
- Boekholdt, S. et al. (2014), "Very Low Levels of Atherogenic Lipoproteins and the Risk for [40]
 Cardiovascular Events", *Journal of the American College of Cardiology*, Vol. 64/5, pp. 485-494, <https://doi.org/10.1016/j.jacc.2014.02.615>.
- Boniol, M. et al. (2022), "The global health workforce stock and distribution in 2020 and 2030: a [180]
 threat to equity and 'universal' health coverage?", *BMJ Global Health*, Vol. 7/6, p. e009316, <https://doi.org/10.1136/BMJGH-2022-009316>.
- Bos, N. et al. (2015), *Ambulance care in Europe: organization and practices of ambulance [241]
 services in 14 European countries.*, NIVEL, <http://www.nivel.nl> (accessed on 19 March 2025).
- Bots, M. and D. Grobbee (1996), "Decline of Coronary Heart Disease Mortality in the [24]
 Netherlands from 1978 to 1985: Contribution of Medical Care and Changes Over Time in Presence of Major Cardiovascular Risk Factors", *European Journal of Cardiovascular Prevention & Rehabilitation*, Vol. 3/3, pp. 271-276, <https://doi.org/10.1177/174182679600300302>.
- Brazier, J. et al. (2023), "Examination of Staffing Shortages at US Nursing Homes During the [169]
 COVID-19 Pandemic", *JAMA Network Open*, Vol. 6/7, p. e2325993, <https://doi.org/10.1001/jamanetworkopen.2023.25993>.
- Brieger, D. et al. (2025), "National Heart Foundation of Australia & Cardiac Society of Australia [80]
 and New Zealand: Comprehensive Australian Clinical Guideline for Diagnosing and Managing Acute Coronary Syndromes 2025", *Heart, Lung and Circulation*, Vol. 34/4, pp. 309-397, <https://doi.org/10.1016/j.hlc.2025.02.102>.
- Bryndová, L. et al. (2023), "Czechia: health system review 2023", *Health Systems in Transition*, [106]
<https://eurohealthobservatory.who.int/publications/i/czechia-health-system-review-2023>.
- Budig, K. and E. Harding (2021.), *Secondary prevention of heart attack and stroke: country [157]
 profile for the Netherlands.*
- Bueno, H. et al. (2025), "Development and rollout of a national plan on cardiovascular health. [191]
 Spain's cardiovascular health strategy (ESCAV)", *Revista Española de Cardiología (English Edition)*, Vol. 78/7, pp. 628-636, <https://doi.org/10.1016/j.rec.2024.11.009>.
- Buus, S. et al. (2022), "Socioeconomic Inequalities in Reperfusion Therapy for Acute Ischemic [93]
 Stroke", *Stroke*, Vol. 53/7, pp. 2307-2316, <https://doi.org/10.1161/strokeaha.121.037687>.
- Bytyçi, I. et al. (2022), "Prevalence of statin intolerance: a meta-analysis", *European Heart [203]
 Journal*, Vol. 43/34, pp. 3213-3223, <https://doi.org/10.1093/eurheartj/ehac015>.
- Canzan, F. (ed.) (2024), "Hospital discharge processes: Insights from patients, caregivers, and [171]
 staff in an Australian healthcare setting", *PLOS ONE*, Vol. 19/9, p. e0308042, <https://doi.org/10.1371/journal.pone.0308042>.
- Capewell, S. et al. (2000), "Explanation for the Decline in Coronary Heart Disease Mortality [25]
 Rates in Auckland, New Zealand, Between 1982 and 1993", *Circulation*, Vol. 102/13, pp. 1511-1516, <https://doi.org/10.1161/01.cir.102.13.1511>.

- Cheema, K. et al. (2022), "Long-term trends in the epidemiology of cardiovascular diseases in the UK: insights from the British Heart Foundation statistical compendium", *Cardiovascular Research*, Vol. 118/10, pp. 2267-2280, <https://doi.org/10.1093/cvr/cvac053>. [239]
- Chew, D. et al. (2016), "National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian Clinical Guidelines for the Management of Acute Coronary Syndromes 2016", *Heart, Lung and Circulation*, Vol. 25/9, pp. 895-951, <https://doi.org/10.1016/J.HLC.2016.06.789>. [131]
- Cholesterol Treatment Trialists' (CTT) Collaboration (2010), "Efficacy and safety of more intensive lowering of LDL cholesterol: a meta-analysis of data from 170 000 participants in 26 randomised trials", *The Lancet*, Vol. 376/9753, pp. 1670-1681, [https://doi.org/10.1016/S0140-6736\(10\)61350-5](https://doi.org/10.1016/S0140-6736(10)61350-5). [33]
- Crispino, S. et al. (2025), "The Role of SGLT2-Inhibitors Across All Stages of Heart Failure and Mechanisms of Early Clinical Benefit: From Prevention to Advanced Heart Failure", *Biomedicines*, Vol. 13/3, p. 608, <https://doi.org/10.3390/biomedicines13030608>. [111]
- Dahlgren, C. et al. (2017), "Recording a diagnosis of stroke, transient ischaemic attack or myocardial infarction in primary healthcare and the association with dispensation of secondary preventive medication: a registry-based prospective cohort study", *BMJ Open*, Vol. 7/9, p. e015723, <https://doi.org/10.1136/bmjopen-2016-015723>. [108]
- Dansk Hjertestopregister (2024), *Årsrapport 2023 Endelig version til offentliggørelse [Danish Cardiac Arrest Registry Annual Report 2023 - Final Version]*, Danish Cardiac Arrest Registry. [59]
- Department of Health (2010), *Changing Cardiovascular Health: National Cardiovascular Health Policy*. [141]
- Developed with the special contribution of: European Association for Cardiovascular Prevention & Rehabilitation et al. (2011), "ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)", *European Heart Journal*, Vol. 32/14, pp. 1769-1818, <https://doi.org/10.1093/eurheartj/ehr158>. [254]
- Developed with the special contribution of: European Association for Cardiovascular Prevention & Rehabilitation et al. (2011), "ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)", *European Heart Journal*, Vol. 32/14, pp. 1769-1818, <https://doi.org/10.1093/eurheartj/ehr158>. [39]
- Dicker, D. et al. (2024), "Bariatric Metabolic Surgery vs Glucagon-Like Peptide-1 Receptor Agonists and Mortality", *JAMA Network Open*, Vol. 7/6, p. e2415392, <https://doi.org/10.1001/jamanetworkopen.2024.15392>. [231]
- Early Supported Discharge Trialists (2017), "Early supported discharge services for people with acute stroke", *Cochrane Database of Systematic Reviews*, Vol. 2017/7, <https://doi.org/10.1002/14651858.cd000443.pub4>. [174]
- Ebrahimi, Z. et al. (2021), "A systematic review on implementation of person-centered care interventions for older people in out-of-hospital settings", *Geriatric Nursing*, Vol. 42/1, pp. 213-224, <https://doi.org/10.1016/j.gerinurse.2020.08.004>. [163]

- EC (2024), *Horizon Europe Work Programme 2023-2027*, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-4-health_horizon-2023-2024_en.pdf (accessed on 8 July 2025). [195]
- EPHA (2024), “Addressing the health and care workforce crisis: ways forward for policymaking - EPHA”, <https://epha.org/>, <https://epha.org/addressing-the-health-and-care-workforce-crisis-ways-forward-for-policymaking/> (accessed on 8 July 2025). [183]
- ESC (2025), “European Society of Cardiology quality indicators for the management of acute coronary syndromes: developed in collaboration with the Association for Acute CardioVascular Care and the European Association of Percutaneous Cardiovascular Interventions of the ESC”, *European Heart Journal: Acute Cardiovascular Care*, Vol. 14/3, pp. 145-154, <https://doi.org/10.1093/ehjacc/zuaf014>. [134]
- ESC EuroHeart (2024), *ESC EUROHEART REPORT 2024*, European Society of Cardiology, https://www.escardio.org/static-file/Escardio/Research/Euroheart/EuroHeart_Report2024.pdf (accessed on 1 April 2025). [133]
- ESC Guidelines (2024), “2024 ESC Guidelines for the management of chronic coronary syndromes”, *European Heart Journal*, Vol. 45/36, pp. 3415-3537, <https://doi.org/10.1093/eurheartj/ehae177>. [127]
- ESC Guidelines (2024), “2024 ESC Guidelines for the management of elevated blood pressure and hypertension”, *European Heart Journal*, Vol. 45/38, pp. 3912-4018, <https://doi.org/10.1093/eurheartj/ehae178>. [32]
- ESC Guidelines (2023), “2023 ESC Guidelines for the management of acute coronary syndromes”, *European Heart Journal*, Vol. 44/38, pp. 3720-3826, <https://doi.org/10.1093/eurheartj/ehad191>. [78]
- ESC Guidelines (2023), “2023 ESC Guidelines for the management of acute coronary syndromes”, *European Heart Journal*, Vol. 44/38, pp. 3720-3826, <https://doi.org/10.1093/eurheartj/ehad191>. [246]
- ESC Guidelines (2023), “2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes”, *European Heart Journal*, Vol. 44/39, pp. 4043-4140, <https://doi.org/10.1093/eurheartj/ehad192>. [253]
- ESC Guidelines (2023), “2023 Focused Update of the 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure”, *European Heart Journal*, Vol. 44/37, pp. 3627-3639, <https://doi.org/10.1093/eurheartj/ehad195>. [212]
- ESC Guidelines (2021), “2021 ESC Guidelines on cardiovascular disease prevention in clinical practice”, *European Heart Journal*, Vol. 42/34, pp. 3227-3337, <https://doi.org/10.1093/eurheartj/ehab484>. [138]
- ESC Guidelines (2020), “2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS)”, *European Heart Journal*, Vol. 42/5, pp. 373-498, <https://doi.org/10.1093/eurheartj/ehaa612>. [49]

- ESC Guidelines (2019), “2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk”, *European Heart Journal*, Vol. 41/1, pp. 111-188, <https://doi.org/10.1093/eurheartj/ehz455>. [31]
- ESC Scientific Document Group (2023), “2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes”, *European Heart Journal*, Vol. 44/39, pp. 4043-4140, <https://doi.org/10.1093/eurheartj/ehad192>. [38]
- ESC/EACTS (2021), *2021 ESC/EACTS Guidelines for the management of valvular heart disease*, <https://www.escardio.org/Guidelines/Clinical-Practice-Guidelines/Valvular-Heart-Disease-Guidelines>. [117]
- ESO (2024), *RES-Q*, <https://stroke.qualityregistry.org/>. [109]
- ESO (n.d.), *SAP-E Action Plan Tools*, <https://actionplan.eso-stroke.org/signed-declarations> (accessed on 21 July 2025). [99]
- ESO-SAFE (2025), *ESO Stroke Service Tracker Data*, <https://actionplan.eso-stroke.org/kpi/kpi-7b>. [91]
- Ettehad, D. et al. (2016), “Blood pressure lowering for prevention of cardiovascular disease and death: a systematic review and meta-analysis”, *The Lancet*, Vol. 387/10022, pp. 957-967, [https://doi.org/10.1016/s0140-6736\(15\)01225-8](https://doi.org/10.1016/s0140-6736(15)01225-8). [36]
- European Commission (2022), *Union Register of medicinal products for human use. [Updated 2022]*, <https://ec.europa.eu/health/documents/community-register/html/h930.htm>. [217]
- European Stroke Organisation (ESO) (2025), *Stroke Service Tracker*, <https://actionplan.eso-stroke.org/stroke-service-tracker-2> (accessed on 3 June 2025). [83]
- Federal Joint Committee (2018), “Nutzenbewertungsverfahren zum Wirkstoff Evolocumab (Erneute Nutzenbewertung § 14: primäre Hypercholesterinämie, gemischte Dyslipidämie)”, <https://www.g-ba.de/bewertungsverfahren/nutzenbewertung/354/#beschluesse>. [205]
- Foo, C. et al. (2018), “Coronary intervention door-to-balloon time and outcomes in ST-elevation myocardial infarction: a meta-analysis”, *Heart*, Vol. 104/16, pp. 1362-1369, <https://doi.org/10.1136/heartjnl-2017-312517>. [74]
- for the ESCAPE-NET Investigators (2019), “First-response treatment after out-of-hospital cardiac arrest: a survey of current practices across 29 countries in Europe”, *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, Vol. 27/1, <https://doi.org/10.1186/s13049-019-0689-0>. [58]
- Ford, E. et al. (2007), “Explaining the Decrease in U.S. Deaths from Coronary Disease, 1980–2000”, *New England Journal of Medicine*, Vol. 356/23, pp. 2388-2398, <https://doi.org/10.1056/nejmsa053935>. [20]
- Ford, E. and S. Capewell (2011), “Proportion of the Decline in Cardiovascular Mortality Disease due to Prevention Versus Treatment: Public Health Versus Clinical Care”, *Annual Review of Public Health*, Vol. 32/1, pp. 5-22, <https://doi.org/10.1146/annurev-publhealth-031210-101211>. [22]
- Fredman, D., E. Berglund and P. Dardel (n.d.), *Citizen response to cardiac arrest*, European Emergency Number Association, Brussels. [57]

- García-Corcheró, J. and D. Jiménez-Rubio (2022), "Waiting times in healthcare: equal treatment for equal need?", *International Journal for Equity in Health*, Vol. 21/1, <https://doi.org/10.1186/s12939-022-01799-x>. [125]
- Gassner, L. and I. Reinsperger (2021), *National strategies and programmes for preventing and managing non-communicable diseases in selected countries*. [146]
- Grace, S. et al. (2016), "Ensuring Cardiac Rehabilitation Access for the Majority of Those in Need: A Call to Action for Canada", *Canadian Journal of Cardiology*, Vol. 32/10, pp. S358-S364, <https://doi.org/10.1016/j.cjca.2016.07.001>. [152]
- Graham, M. et al. (2006), "Treating the right patient at the right time: Access to cardiac catheterization, percutaneous coronary intervention and cardiac surgery", *Canadian Journal of Cardiology*, Vol. 22/8, pp. 679-683, [https://doi.org/10.1016/s0828-282x\(06\)70936-9](https://doi.org/10.1016/s0828-282x(06)70936-9). [128]
- Grimsmo, J. (2016), *EAPC Country of the month - Norway*. [158]
- Gudzune, K. and R. Kushner (2024), "Medications for Obesity", *JAMA*, Vol. 332/7, p. 571, <https://doi.org/10.1001/jama.2024.10816>. [227]
- Gulati, M. et al. (2021), "2021 AHA/ACC/ASE/CHEST/SAEM/SCCT/SCMR Guideline for the Evaluation and Diagnosis of Chest Pain: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines", *Circulation*, Vol. 144/22, <https://doi.org/10.1161/CIR.0000000000001029>. [81]
- Hacke, W. et al. (2008), "Thrombolysis with Alteplase 3 to 4.5 Hours after Acute Ischemic Stroke", *New England Journal of Medicine*, Vol. 359/13, pp. 1317-1329, <https://doi.org/10.1056/nejmoa0804656>. [76]
- Haidar, A. et al. (2025), "National Costs for Cardiovascular-Related Hospitalizations and Inpatient Procedures in the United States, 2016 to 2021", *The American Journal of Cardiology*, Vol. 234, pp. 63-70, <https://doi.org/10.1016/j.amjcard.2024.10.003>. [238]
- HAS (2018), , https://www.has-sante.fr/upload/docs/application/pdf/2019-01/repatha_summary_ct16427.pdf. [204]
- Haute Autorite de Sante (HAS) (2024), *Wegovy (semaglutide) - Obesite*. [220]
- Haydock, P. and A. Flett (2022), "Management of heart failure with reduced ejection fraction", *Heart*, Vol. 108/19, pp. 1571-1579, <https://doi.org/10.1136/HEARTJNL-2020-318811>. [45]
- Heart Protection Study Collaborative Group (2002), "MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20 536 high-risk individuals: a randomised placebocontrolled trial", *The Lancet*, Vol. 360/9326, pp. 7-22, [https://doi.org/10.1016/S0140-6736\(02\)09327-3](https://doi.org/10.1016/S0140-6736(02)09327-3). [29]
- Heerspink, H. et al. (2020), "Dapagliflozin in Patients with Chronic Kidney Disease", *New England Journal of Medicine*, Vol. 383/15, pp. 1436-1446, <https://doi.org/10.1056/nejmoa2024816>. [209]
- Heidenreich, P. et al. (2022), "2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines", *Circulation*, Vol. 145/18, pp. E895-E1032, https://doi.org/10.1161/CIR.0000000000001063/SUPPL_FILE/HF. [44]

- Holmberg, M. et al. (2017), “Bystander automated external defibrillator use and clinical outcomes after out-of-hospital cardiac arrest: A systematic review and meta-analysis”, *Resuscitation*, Vol. 120, pp. 77-87, <https://doi.org/10.1016/j.resuscitation.2017.09.003>. [63]
- Hotchkiss, J. et al. (2014), “Explaining trends in Scottish coronary heart disease mortality between 2000 and 2010 using IMPACTSEC model: retrospective analysis using routine data”, *BMJ*, Vol. 348/feb06 5, pp. g1088-g1088, <https://doi.org/10.1136/bmj.g1088>. [21]
- HSE (2024), *An Overview of Cardiac Rehabilitation Services in Ireland*, Prevention Sub-Group of the National Heart Programme Office of the National Clinical Advisor and Group Lead for Chronic Disease, <https://www.hse.ie/eng/services/publications/an-overview-of-cardiac-rehabilitation-services-in-ireland.pdf>. [154]
- Hsu, J. and T. Farrell (2023), “Updates in Bariatric Surgery”, *The American Surgeon™*, Vol. 90/5, pp. 925-933, <https://doi.org/10.1177/00031348231220576>. [230]
- IHAA (2024), *IHAA: Better Care for Irish Heart Attack Patients*, <https://www.noca.ie/audits/irish-heart-attack-audit/> (accessed on 9 May 2025). [52]
- Iliou, M. (2022), *EAPC Country of the Month - France*. [140]
- INESSS (2022), *State of Knowledge: pharmacotherapy in the treatment of obesity*, <https://www.inesss.qc.ca/publications/repertoire-des-publications/publication/la-pharmacotherapie-dans-le-traitement-de-lobesite.html>. [226]
- Institute for Clinical and Economic Review (ICER) (2022), *Medications for obesity management: effectiveness and value*, https://icer.org/wp-content/uploads/2022/03/ICER_Obesity_Final_Evidence_Report_and_Meeting_Summary_10_2022.pdf. [229]
- IQVIA (2023), “A Renaissance for Cardiometabolic Innovation”, <https://www.iqvia.com/-/media/iqvia/pdfs/library/white-papers/a-renaissance-for-cardiometabolic-innovation.pdf> (accessed on 5 June 2025). [234]
- IQVIA Institute (2024), *Global Trends in R&D 2024*, <https://www.iqvia.com/insights/the-iqvia-institute/reports-and-publications/reports/global-trends-in-r-and-d-2024-activity-productivity-and-enablers>. [233]
- Jaarsma, T. et al. (2021), “Self-care of heart failure patients: practical management recommendations from the Heart Failure Association of the European Society of Cardiology”, *European Journal of Heart Failure*, Vol. 23/1, pp. 157-174, <https://doi.org/10.1002/ejhf.2008>. [4]
- Jackson, R. and M. Bellamy (2015), “Antihypertensive drugs”, *BJA Education*, Vol. 15/6, pp. 280-285, <https://doi.org/10.1093/bjaceaccp/mku061>. [37]
- Janlöv, N. et al. (2023), “Sweden: health system review 2023”, *Health Systems in Transition*, <https://eurohealthobservatory.who.int/publications/i/sweden-health-system-review-2023>. [107]
- Jonsson, M. et al. (2021), “Inequalities in Income and Education Are Associated With Survival Differences After Out-of-Hospital Cardiac Arrest: Nationwide Observational Study”, *Circulation*, Vol. 144/24, pp. 1915-1925, <https://doi.org/10.1161/circulationaha.121.056012>. [95]

- Kalda, R. et al. (2023), *An analysis of human-centred prehospital emergency medical care [Inimkeskse Haiglaeelse Erakorralise Meditsiinilise Abi Analüüs]*, Sotsiaalministeerium, Tartus, <https://hdl.handle.net/10062/93478> (accessed on 19 May 2025). [240]
- Kalda, R. et al. (2023), *Inimkeskse Haiglaeelse Erakorralise Meditsiinilise Abi Analüüs*, Sotsiaalministeerium, Tartus. [16]
- KAMIR-NIH (2021), “Immediate Compared With Delayed Percutaneous Coronary Intervention for Patients With ST-Segment–Elevation Myocardial Infarction Presenting ≥ 12 Hours After Symptom Onset Is Not Associated With Improved Clinical Outcome”, *Circulation: Cardiovascular Interventions*, Vol. 14/5, <https://doi.org/10.1161/circinterventions.120.009863>. [245]
- Kasekamp, K. et al. (2023), “Estonia: Health system review”, *Health Systems in Transition: Estonia*, Vol. 25/5, pp. i-204, <http://www.healthobservatory.eu>. [14]
- Kayıkçıoğlu, M. and E. Aslanger (2020), *Country report Turkey*. [153]
- Kiguchi, T. et al. (2020), “Out-of-hospital cardiac arrest across the World: First report from the International Liaison Committee on Resuscitation (ILCOR)”, *Resuscitation*, Vol. 152, pp. 39-49, <https://doi.org/10.1016/J.RESUSCITATION.2020.02.044>. [252]
- Kim, R., J. Kim and J. Hwang (2022), “Epidemiology of myocardial infarction in Korea: hospitalization incidence, prevalence, and mortality”, *Epidemiology and Health*, Vol. 44, p. e2022057, <https://doi.org/10.4178/epih.e2022057>. [56]
- King’s College London for the Stroke Alliance for Europe (2017), *The Burden of Stroke in Europe*, https://www.safestroke.eu/wp-content/uploads/2017/12/SAFE_STROKE_ICELAND.pdf. [151]
- King’s College London (2024), *SSNAP Annual Report*, <https://www.strokeaudit.org/SupportFiles/Documents/Annual-report/2024/SSNAP-Annual-Report-2024-Infographic.aspx>. [175]
- Kishimori, T. et al. (2020), “Public-access automated external defibrillator pad application and favorable neurological outcome after out-of-hospital cardiac arrest in public locations: A prospective population-based propensity score-matched study”, *International Journal of Cardiology*, Vol. 299, pp. 140-146, <https://doi.org/10.1016/j.ijcard.2019.07.061>. [62]
- Kleinig, T. et al. (1910), “Hyper-Acute Stroke Systems of Care and Workflow”, *Current Neurology and Neuroscience Reports*, Vol. 24, pp. 495-505, <https://doi.org/10.1007/s11910-024-01367-6>. [250]
- Knoll, K. et al. (2023), “Combined telemonitoring and telecoaching for heart failure improves outcome”, *npj Digital Medicine*, Vol. 6/1, <https://doi.org/10.1038/s41746-023-00942-4>. [194]
- Køber, L. et al. (2016), “Defibrillator Implantation in Patients with Nonischemic Systolic Heart Failure”, *New England Journal of Medicine*, Vol. 375/13, pp. 1221-1230, <https://doi.org/10.1056/nejmoa1608029>. [114]
- Kroneman, M. et al. (2016), “Netherlands: Health system review”, *Health Systems in Transition*, Vol. 18/2. [17]

- Kulkarni, V. et al. (2013), "Regional Density of Cardiologists and Rates of Mortality for Acute Myocardial Infarction and Heart Failure", *Circulation: Cardiovascular Quality and Outcomes*, Vol. 6/3, pp. 352-359, <https://doi.org/10.1161/circoutcomes.113.000214>. [184]
- Kuluski, K. et al. (2022), "Expanding our understanding of factors impacting delayed hospital discharge: Insights from patients, caregivers, providers and organizational leaders in Ontario, Canada", *Health Policy*, Vol. 126/4, pp. 310-317, <https://doi.org/10.1016/j.healthpol.2022.02.001>. [168]
- Laatikainen, T. et al. (2005), "Explaining the Decline in Coronary Heart Disease Mortality in Finland between 1982 and 1997", *American Journal of Epidemiology*, Vol. 162/8, pp. 764-773, <https://doi.org/10.1093/aje/kwi274>. [23]
- Landeiro, F. et al. (2017), "Delayed Hospital Discharges of Older Patients: A Systematic Review on Prevalence and Costs", *The Gerontologist*, Vol. 59/2, pp. e86-e97, <https://doi.org/10.1093/geront/gnx028>. [166]
- Langhorne, P. and S. Ramachandra (2020), "Organised inpatient (stroke unit) care for stroke: network meta-analysis", *Cochrane Database of Systematic Reviews*, Vol. 2020/4, <https://doi.org/10.1002/14651858.CD000197.PUB4>. [105]
- Lapostolle, F. et al. (2021), "Effect of age, gender, and time of day on pain-to-call times in patients with acute ST-segment elevation myocardial infarction: the CLOC'AGE study", *Emergencias*, Vol. 33, pp. 181-186, <http://www.cardio-arsif.org> (accessed on 9 May 2025). [53]
- Lehto, S. et al. (2018), *Country report Finland*. [160]
- Lemor, A. et al. (2019), "Comparison of Outcomes of Transcatheter Versus Surgical Aortic Valve Replacement in Patients ≥80 Years of Age", *The American Journal of Cardiology*, Vol. 123/11, pp. 1853-1858, <https://doi.org/10.1016/j.amjcard.2019.03.006>. [116]
- Lincoff, A. et al. (2023), "Semaglutide and Cardiovascular Outcomes in Obesity without Diabetes", *New England Journal of Medicine*, Vol. 389/24, pp. 2221-2232, <https://doi.org/10.1056/nejmoa2307563>. [221]
- Lion, A. et al. (2021), "Association between a national public health campaign for physical activity for patients with chronic diseases and the participation in Phase III cardiac rehabilitation in Luxembourg", *IJC Heart & Vasculature*, Vol. 32, p. 100691, <https://doi.org/10.1016/j.ijcha.2020.100691>. [156]
- Lloyd, H. et al. (2018), "Validation of the person-centred coordinated care experience questionnaire (P3CEQ)", *International Journal for Quality in Health Care*, Vol. 31/7, pp. 506-512, <https://doi.org/10.1093/intqhc/mzy212>. [255]
- Löfqvist, T. et al. (2013), "Inequalities in avoidable hospitalisation by area income and the role of individual characteristics: a population-based register study in Stockholm County, Sweden", *BMJ Quality & Safety*, Vol. 23/3, pp. 206-214, <https://doi.org/10.1136/bmjqs-2012-001715>. [10]
- Luengo-Fernandez, R. et al. (2023), "Economic burden of cardiovascular diseases in the European Union: a population-based cost study", *European Heart Journal*, Vol. 44/45, pp. 4752-4767, <https://doi.org/10.1093/eurheartj/ehad583>. [235]

- Makrides, T. et al. (2022), *From stretcher bearer to practitioner: A brief narrative review of the history of the Anglo-American paramedic system*, Elsevier Australia, <https://doi.org/10.1016/j.auec.2022.05.001>. [67]
- Manolis, A. (2017), “Transcatheter aortic valve implantation economics: a grisly reality”, *Annals of Cardiothoracic Surgery*, Vol. 6/5, pp. 516-523, <https://doi.org/10.21037/acs.2017.07.02>. [119]
- Margey, R. et al. (2024), *Irish Heart Attack Audit National Report 2022 and 2023*, National Office of Clinical Audit, Dublin, <https://www.noca.ie/publications> (accessed on 1 April 2025). [247]
- Mathieu-Bolh (forthcoming), *Economic and policy implications of breakthrough obesity treatments*. [218]
- Mayor, S. (2016), “NICE recommends PCSK9 inhibitors for patients not responding to statins”, *BMJ*, p. i2609, <https://doi.org/10.1136/bmj.i2609>. [198]
- McClellan, M. et al. (2019), “Call to Action: Urgent Challenges in Cardiovascular Disease: A Presidential Advisory From the American Heart Association”, *Circulation*, Vol. 139/9, <https://doi.org/10.1161/cir.0000000000000652>. [1]
- McMurray, J. et al. (2019), “Dapagliflozin in Patients with Heart Failure and Reduced Ejection Fraction”, *New England Journal of Medicine*, Vol. 381/21, pp. 1995-2008, <https://doi.org/10.1056/nejmoa1911303>. [208]
- Meyer, M. et al. (2019), “Gender differences in patient and system delay for primary percutaneous coronary intervention: current trends in a Swiss ST-segment elevation myocardial infarction population”, *European Heart Journal: Acute Cardiovascular Care*, Vol. 8/3, pp. 283-290, <https://doi.org/10.1177/2048872618810410>. [54]
- Mikulik, R. et al. (2021), “Stroke 20 20: Implementation goals for intravenous thrombolysis”, *European Stroke Journal*, Vol. 6/2, pp. 151-159, <https://doi.org/10.1177/23969873211007684>. [88]
- Minguito-Carazo, C. et al. (2024), “Impact of initiation of SGLT2 inhibitor treatment on the development of arrhythmias in patients with implantable cardiac devices”, *Revista Española de Cardiología (English Edition)*, Vol. 77/6, pp. 481-489, <https://doi.org/10.1016/j.rec.2023.12.010>. [115]
- Ministry of Health and Care Services (2013), *NCD-strategi 2013-2017*, <https://extranet.who.int/mindbank/item/5374>. [142]
- Ministry of Health, Labour and Welfare (2024), *Reiwa4(2022)nenndo Kokumin iryouhi no gaikyou*, <https://www.mhlw.go.jp/toukei/saikin/hw/k-iryohi/22/dl/data.pdf>. [237]
- Miriam Blümel et al. (2020), “Germany: Health system review”, *Health Systems in Transition*, Vol. 22/6, <https://iris.who.int/bitstream/handle/10665/341674/HiT-22-6-2020-eng.pdf?sequence=1> (accessed on 20 January 2025). [18]
- Modi, V. et al. (2023), “Cardiac implantable electronic device implantation and device-related infection”, *Europace*, Vol. 25/9, <https://doi.org/10.1093/europace/euad208>. [122]
- MoH (2023), *The Israeli National Program for Quality Indicators for General and Geriatric Hospitals, Psychiatric Hospitals, Mother & Baby Health Centers and Emergency Medical Services (Ambulances)*, <https://www.gov.il/he/pages/quality-national-prog-2013-2022>. [135]

- MoH (n.d.), *The National Plan for Quality Indicators in General Hospitals - Quality Indicators for 2013-2025*, <https://www.gov.it/he/pages/quality-national-prog>. [136]
- Moriarty, P. et al. (2015), "Efficacy and safety of alirocumab vs ezetimibe in statin-intolerant patients, with a statin rechallenge arm: The ODYSSEY ALTERNATIVE randomized trial", *Journal of Clinical Lipidology*, Vol. 9/6, pp. 758-769, <https://doi.org/10.1016/j.jacl.2015.08.006>. [41]
- Moscelli, G., L. Siciliani and V. Tonei (2016), "Do waiting times affect health outcomes? Evidence from coronary bypass", *Social Science & Medicine*, Vol. 161, pp. 151-159, <https://doi.org/10.1016/j.socscimed.2016.05.043>. [126]
- National Institute for Health and Care Excellence (2024), *Overview | Acute coronary syndromes | Guidance | NICE*, NICE. [82]
- Navi, B. et al. (2022), "Mobile Stroke Units: Evidence, Gaps, and Next Steps", *Stroke*, Vol. 53/6, pp. 2103-2113, <https://doi.org/10.1161/STROKEAHA.121.037376>. [71]
- Nelson, B. et al. (2025), "Implementation of a Novel Prehospital Clinical Decision Tool and ECG Transmission for STEMI Significantly Reduces Door-to-Balloon Time and Sex-Based Disparities", *Prehospital Emergency Care*, Vol. 29/2, pp. 170-176, <https://doi.org/10.1080/10903127.2024.2357595>. [69]
- NHS (2024), <https://www.longtermplan.nhs.uk/online-version/>, <https://www.longtermplan.nhs.uk/online-version/chapter-3-further-progress-on-care-quality-and-outcomes/better-care-for-major-health-conditions/cardiovascular-disease/>. [143]
- NHS (2024), *National Audit of Cardiac Rehabilitation*, <https://www.cardiacrehabilitation.org.uk/site/docs/NACR%20Quality%20and%20Outcomes%20Report%202024%20Final.pdf>. [176]
- NHS England (2023), *13 July 2023 Statistical Note: Ambulance Quality Indicators (AQI)*. [84]
- NHS England (2023), *8 July 2023 Statistical Note: Ambulance Quality Indicators (AQI)*. [85]
- NICE (2024), *Tirzepatide for managing overweight and obesity, NICE technology appraisal guidance 1026*, <https://www.nice.org.uk/guidance/ta1026>. [225]
- NICE (2021), "Inclisiran for treating primary hypercholesterolaemia or mixed dyslipidaemia", <https://www.nice.org.uk/guidance/TA733/chapter/1-Recommendations>. [206]
- Niklasson, A., J. Herlitz and K. Jood (2019), "Socioeconomic disparities in prehospital stroke care", *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, Vol. 27/1, <https://doi.org/10.1186/s13049-019-0630-6>. [92]
- Norrving, B. et al. (2018), "Action Plan for Stroke in Europe 2018–2030", *European Stroke Journal*, Vol. 3/4, pp. 309-336, <https://doi.org/10.1177/2396987318808719>. [89]
- Nuffield Trust (2024), *Ambulance response times*, <https://www.nuffieldtrust.org.uk/resource/ambulance-response-times> (accessed on 18 February 2025). [73]
- OECD (2025), *Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS)*, OECD Publishing, Paris, <https://doi.org/10.1787/c8af05a5-en>. [3]
- OECD (2025), *OECD Data Explorer*, <https://data-explorer.oecd.org/> (accessed on 3 June 2025). [124]

- OECD (2024), *Pilot data collection on emergency medical services and indicators related to climate change*. [65]
- OECD (2023), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, OECD Publishing, Paris, <https://doi.org/10.1787/9acc1b1d-en>. [5]
- OECD (2020), *Realising the Potential of Primary Health Care*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/a92adee4-en>. [6]
- OECD (2020), *Waiting Times for Health Services: Next in Line*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/242e3c8c-en>. [123]
- OECD (2019), *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/e3b23f8e-en>. [196]
- OECD (2015), *Cardiovascular Disease and Diabetes: Policies for Better Health and Quality of Care*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/9789264233010-en>. [129]
- OECD (forthcoming), *Benchmarking Medicine Utilisation to Improve Health Outcomes*. [43]
- OECD (forthcoming), "Between Crisis and Care: The Evolving Landscape of Emergency Medical Systems across the OECD". [66]
- OECD/European Commission (2025), *EU Country Cancer Profile: Germany 2025*, EU Country Cancer Profiles, OECD Publishing, Paris, <https://doi.org/10.1787/f3a3cfcf-en>. [150]
- OECD/European Commission (2024), *Health at a Glance: Europe 2024: State of Health in the EU Cycle*, OECD Publishing, Paris, <https://doi.org/10.1787/b3704e14-en>. [178]
- OECD/European Observatory on Health Systems and Policies (2023), *Bulgaria: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/8d90f882-en>. [100]
- OECD/European Observatory on Health Systems and Policies (2023), *Germany: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/21dd4679-en>. [7]
- OECD/European Observatory on Health Systems and Policies (2023), *Latvia: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/bf2b15d6-en>. [102]
- OECD/European Observatory on Health Systems and Policies (2023), *Lithuania: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/5ed683c8-en>. [101]
- OECD/European Observatory on Health Systems and Policies (2023), *Slovakia: Country Health Profile 2023*, State of Health in the EU, OECD Publishing, Paris, <https://doi.org/10.1787/98f25a9b-en>. [9]
- OECD/The Health Foundation (2025), *How Do Health System Features Influence Health System Performance?*, OECD Publishing, Paris, <https://doi.org/10.1787/7b877762-en>. [13]

- OECD/The King's Fund (2020), *Is Cardiovascular Disease Slowing Improvements in Life Expectancy?: OECD and The King's Fund Workshop Proceedings*, OECD Publishing, Paris, <https://doi.org/10.1787/47a04a11-en>. [130]
- Osnabrugge, R. et al. (2015), "Cost-effectiveness of percutaneous coronary intervention versus bypass surgery from a Dutch perspective", *Heart*, Vol. 101/24, pp. 1980-1988, <https://doi.org/10.1136/heartjnl-2015-307578>. [103]
- Otieno, P. et al. (2023), "Effectiveness of integrated chronic care models for cardiometabolic multimorbidity in sub-Saharan Africa: a systematic review and meta-analysis", *BMJ Open*, Vol. 13/6, p. e073652, <https://doi.org/10.1136/bmjopen-2023-073652>. [164]
- Pellico-López, A. et al. (2022), "Cost of stay and characteristics of patients with stroke and delayed discharge for non-clinical reasons", *Scientific Reports*, Vol. 12/1, <https://doi.org/10.1038/s41598-022-14502-5>. [167]
- Perkins, G. et al. (2015), "European Resuscitation Council Guidelines for Resuscitation 2015", *Resuscitation*, Vol. 95, pp. 81-99, <https://doi.org/10.1016/j.resuscitation.2015.07.015>. [64]
- Piot, O. et al. (2022), "Healthcare costs in implantable cardioverter-defibrillator recipients: A real-life cohort study on 19,408 patients from the French national healthcare database", *International Journal of Cardiology*, Vol. 348, pp. 39-44, <https://doi.org/10.1016/j.ijcard.2021.11.056>. [112]
- Platz, E., T. Bey and F. Walter (2003), "International report: current state and development of health insurance and emergency medicine in Germany. the influence of health insurance laws on the practice of emergency medicine in a European country", *The Journal of Emergency Medicine*, Vol. 25/2, pp. 203-210, [https://doi.org/10.1016/S0736-4679\(03\)00173-2](https://doi.org/10.1016/S0736-4679(03)00173-2). [15]
- Pongiglione, B., A. Torbica and M. Gusmano (2020), "Inequalities in avoidable hospitalisation in large urban areas: retrospective observational study in the metropolitan area of Milan", *BMJ Open*, Vol. 10/12, p. e042424, <https://doi.org/10.1136/bmjopen-2020-042424>. [11]
- Powers, W. and et al (2019), "Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association", *Stroke*, Vol. 50/12, <https://doi.org/10.1161/str.0000000000000211>. [86]
- Preiss, D. et al. (2020), "Lipid-Modifying Agents, From Statins to PCSK9 Inhibitors", *Journal of the American College of Cardiology*, Vol. 75/16, pp. 1945-1955, <https://doi.org/10.1016/j.jacc.2019.11.072>. [42]
- Price, A. (2012), *Specialist nurses improve outcomes in heart failure - PubMed*, <https://pubmed.ncbi.nlm.nih.gov/23248904/> (accessed on 8 July 2025). [185]
- Productivity Commission (2025), *11 Ambulance services - Report on Government Services 2025*, Australian Government, <https://www.pc.gov.au/ongoing/report-on-government-services/2025/health/ambulance-services> (accessed on 18 February 2025). [72]

- Rahimi, K. et al. (2021), “Pharmacological blood pressure lowering for primary and secondary prevention of cardiovascular disease across different levels of blood pressure: an individual participant-level data meta-analysis”, *The Lancet*, Vol. 397/10285, pp. 1625-1636, [https://doi.org/10.1016/s0140-6736\(21\)00590-0](https://doi.org/10.1016/s0140-6736(21)00590-0). [34]
- Rao, M., R. Lopes and C. Granger (2013), *ARISTOTLE Trial and the Recent FDA Approval of Apixaban - American College of Cardiology*, <https://www.acc.org/Latest-in-Cardiology/Articles/2014/07/18/15/15/ARISTOTLE-Trial-and-the-Recent-FDA-Approval-of-Apixaban> (accessed on 6 June 2025). [48]
- Rathod, K. et al. (2021), “Early Hospital Discharge Following PCI for Patients With STEMI”, *Journal of the American College of Cardiology*, Vol. 78/25, pp. 2550-2560, <https://doi.org/10.1016/j.jacc.2021.09.1379>. [172]
- Reddy, H. (ed.) (2015), “Medication Underuse in Aging Outpatients with Cardiovascular Disease: Prevalence, Determinants, and Outcomes in a Prospective Cohort Study”, *PLOS ONE*, Vol. 10/8, p. e0136339, <https://doi.org/10.1371/journal.pone.0136339>. [47]
- Regierungskommission (2022), *Zweite Stellungnahme und Empfehlung der Regierungskommission für eine moderne und bedarfsgerechte Krankenhausversorgung [Second opinion and recommendation of the Government Commission for modern and needs-based hospital care]*. [8]
- Ruff, C. et al. (2014), “Comparison of the efficacy and safety of new oral anticoagulants with warfarin in patients with atrial fibrillation: a meta-analysis of randomised trials”, *The Lancet*, Vol. 383/9921, pp. 955-962, [https://doi.org/10.1016/s0140-6736\(13\)62343-0](https://doi.org/10.1016/s0140-6736(13)62343-0). [50]
- Sabatine, M. et al. (2017), “Evolocumab and Clinical Outcomes in Patients with Cardiovascular Disease”, *New England Journal of Medicine*, Vol. 376/18, pp. 1713-1722, <https://doi.org/10.1056/nejmoa1615664>. [200]
- Sachverständigenrat zur Begutachtung der Entwicklung im Gesundheitswesen (2018), *Bedarfsgerechte Steuerung der Gesundheitsversorgung*. [68]
- Sardari Nia, P. et al. (2021), “Effect of a dedicated mitral heart team compared to a general heart team on survival: a retrospective, comparative, non-randomized interventional cohort study based on prospectively registered data”, *European Journal of Cardio-Thoracic Surgery*, Vol. 60/2, pp. 263-273, <https://doi.org/10.1093/ejcts/ezab065>. [189]
- Scandinavian Simvastatin Survival Study Group (1994), “Randomised trial of cholesterol lowering in 4444 patients with coronary heart disease: the Scandinavian Simvastatin Survival Study (4S)”, *The Lancet*, Vol. 344/8934, pp. 1383-1389, [https://doi.org/10.1016/S0140-6736\(94\)90566-5](https://doi.org/10.1016/S0140-6736(94)90566-5). [26]
- Schmidt, A. et al. (2020), “PCSK9 monoclonal antibodies for the primary and secondary prevention of cardiovascular disease”, *Cochrane Database of Systematic Reviews*, Vol. 2020/12, <https://doi.org/10.1002/14651858.cd011748.pub3>. [202]
- Schwartz, G. et al. (2018), “Alirocumab and Cardiovascular Outcomes after Acute Coronary Syndrome”, *New England Journal of Medicine*, Vol. 379/22, pp. 2097-2107, <https://doi.org/10.1056/nejmoa1801174>. [201]

- Scottish Government (2021), "Heart disease: action plan", *Closing the poverty-related attainment gap: progress report 2016 to 2021*, pp. 1-253, <https://www.gov.scot/publications/heart-disease-action-plan/> (accessed on 8 July 2025). [190]
- Sederholm Lawesson, S. et al. (2018), "Gender disparities in first medical contact and delay in ST-elevation myocardial infarction: a prospective multicentre Swedish survey study", *BMJ Open*, Vol. 8/5, p. e020211, <https://doi.org/10.1136/bmjopen-2017-020211>. [55]
- Shakoor, A. et al. (2024), "Socio-economic inequalities and heart failure morbidity and mortality: A systematic review and data synthesis", *ESC Heart Failure*, Vol. 12/2, pp. 927-941, <https://doi.org/10.1002/ehf2.14986>. [96]
- Siddique, M. et al. (2021), "Carbon disclosure, carbon performance and financial performance: International evidence", *International Review of Financial Analysis*, Vol. 75, p. 101734, <https://doi.org/10.1016/j.irfa.2021.101734>. [161]
- Slawomirski, L. et al. (2025), "The economics of diagnostic safety", *OECD Health Working Papers*, No. 176, OECD Publishing, Paris, <https://doi.org/10.1787/fc61057a-en>. [197]
- Socha-Dietrich, K. (2021), "Empowering the health workforce to make the most of the digital revolution", *OECD Health Working Papers*, No. 129, OECD Publishing, Paris, <https://doi.org/10.1787/37ff0eaa-en>. [192]
- Sowden, S. et al. (2020), "Interventions to reduce inequalities in avoidable hospital admissions: explanatory framework and systematic review protocol", *BMJ Open*, Vol. 10/7, p. e035429, <https://doi.org/10.1136/bmjopen-2019-035429>. [12]
- Stehli, J. et al. (2021), "Sex Differences in Prehospital Delays in Patients With ST-Segment–Elevation Myocardial Infarction Undergoing Percutaneous Coronary Intervention", *Journal of the American Heart Association*, Vol. 10/13, <https://doi.org/10.1161/JAHA.120.019938>. [248]
- Stephen, C. et al. (2022), "Nurse-led interventions to manage hypertension in general practice: A systematic review and meta-analysis", *Journal of Advanced Nursing*, Vol. 78/5, pp. 1281-1293, <https://doi.org/10.1111/jan.15159>. [186]
- Svanström, H. et al. (2024), "SGLT-2 inhibitors and mortality among patients with heart failure with reduced ejection fraction: linked database study", *BMJ*, p. e080925, <https://doi.org/10.1136/bmj-2024-080925>. [213]
- Talha, K., S. Anker and J. Butler (2023), "SGLT-2 Inhibitors in Heart Failure: A Review of Current Evidence", *International Journal of Heart Failure*, Vol. 5/2, p. 82, <https://doi.org/10.36628/ijhf.2022.0030>. [207]
- Tamargo, J. et al. (2024), "New pharmacological agents and novel cardiovascular pharmacotherapy strategies in 2023", *European Heart Journal - Cardiovascular Pharmacotherapy*, Vol. 10/3, pp. 219-244, <https://doi.org/10.1093/ehjcvp/pvae013>. [199]
- The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group (1995), "Tissue Plasminogen Activator for Acute Ischemic Stroke", *New England Journal of Medicine*, Vol. 333/24, pp. 1581-1588, <https://doi.org/10.1056/NEJM199512143332401>. [75]
- Thompson, A. (2011), "Antihypertensive Treatment and Secondary Prevention of Cardiovascular Disease Events Among Persons Without Hypertension", *JAMA*, Vol. 305/9, p. 913, <https://doi.org/10.1001/jama.2011.250>. [35]

- Tomek, A. et al. (2024), “Stroke Action Plan for Europe”, *touchREVIEWS in Neurology*, Vol. 20/2, pp. 6-8, <https://touchneurology.com/stroke/journal-articles/stroke-action-plan-for-europe/>. [98]
- Tu, Q. et al. (2024), “The effects of multidisciplinary collaborative care on cardiovascular risk factors among patients with diabetes in primary care settings: A systematic review and meta-analysis”, *Primary Care Diabetes*, Vol. 18/4, pp. 381-392, <https://doi.org/10.1016/j.pcd.2024.05.003>. [165]
- Turc, G. et al. (2019), “European Stroke Organisation (ESO) – European Society for Minimally Invasive Neurological Therapy (ESMINT) Guidelines on Mechanical Thrombectomy in Acute Ischaemic Stroke Endorsed by Stroke Alliance for Europe (SAFE)”, *European Stroke Journal*, Vol. 4/1, pp. 6-12, <https://doi.org/10.1177/2396987319832140>. [87]
- Turk-Adawi, K. et al. (2019), “Cardiac Rehabilitation Availability and Density around the Globe”, *EClinicalMedicine*, Vol. 13, pp. 31-45, <https://doi.org/10.1016/j.eclinm.2019.06.007>. [139]
- Turner, A. et al. (2022), “Socioeconomic inequality in access to timely and appropriate care in emergency departments”, *Journal of Health Economics*, Vol. 85, p. 102668, <https://doi.org/10.1016/j.jhealeco.2022.102668>. [94]
- Tymińska, A. et al. (2022), “Fifteen-Year Differences in Indications for Cardiac Resynchronization Therapy in International Guidelines—Insights from the Heart Failure Registries of the European Society of Cardiology”, *Journal of Clinical Medicine*, Vol. 11/11, p. 3236, <https://doi.org/10.3390/jcm11113236>. [110]
- UK Government (2025), *Handbook to the NHS Constitution for England - GOV.UK*, Department of Health and Social Care, <https://www.gov.uk/government/publications/supplements-to-the-nhs-constitution-for-england/the-handbook-to-the-nhs-constitution-for-england> (accessed on 14 March 2025). [244]
- Usman, M. et al. (2024), “Effect of SGLT2 inhibitors on heart failure outcomes and cardiovascular death across the cardiometabolic disease spectrum: a systematic review and meta-analysis”, *The Lancet Diabetes & Endocrinology*, Vol. 12/7, pp. 447-461, [https://doi.org/10.1016/s2213-8587\(24\)00102-5](https://doi.org/10.1016/s2213-8587(24)00102-5). [214]
- Vafaie, M. et al. (2020), “Guideline-adherence regarding critical time intervals in the German Chest Pain Unit registry”, *European Heart Journal: Acute Cardiovascular Care*, Vol. 9/1, pp. 52-61, <https://doi.org/10.1177/2048872618762639>. [132]
- Valliant, S. et al. (2022), “Pharmacists as accessible health care providers: quantifying the opportunity”, *Journal of Managed Care & Specialty Pharmacy*, Vol. 28/1, pp. 85-90, <https://doi.org/10.18553/jmcp.2022.28.1.85>. [188]
- Valzania, C. et al. (2016), “Implant rates of cardiac implantable electrical devices in Europe: A systematic literature review”, *Health Policy*, Vol. 120/1, pp. 1-15, <https://doi.org/10.1016/j.healthpol.2015.11.001>. [120]
- van den Ende, E. et al. (2023), “Leaving the hospital on time: hospital bed utilization and reasons for discharge delay in the Netherlands”, *International Journal for Quality in Health Care*, Vol. 35/2, <https://doi.org/10.1093/intqhc/mzad022>. [170]

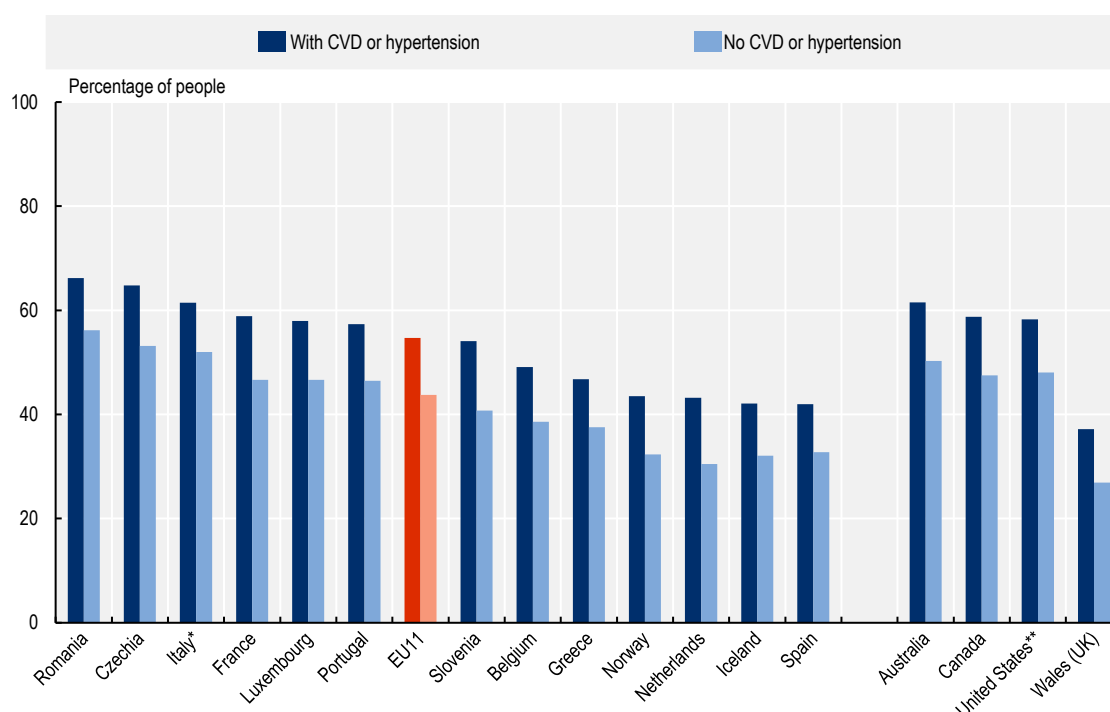
- van Schoonhoven, A. et al. (2023), “The health and budget impact of sodium-glucose co-transporter-2 inhibitors (SGLT2is) in The Netherlands”, *Journal of Medical Economics*, Vol. 26/1, pp. 547-553, <https://doi.org/10.1080/13696998.2023.2194802>. [215]
- Van Vark, L. et al. (2012), “Angiotensin-converting enzyme inhibitors reduce mortality in hypertension: a meta-analysis of randomized clinical trials of renin–angiotensin–aldosterone system inhibitors involving 158 998 patients”, *European Heart Journal*, Vol. 33/16, pp. 2088-2097, <https://doi.org/10.1093/EURHEARTJ/EHS075>. [27]
- Viigimaa, M. (2014), *Country report Estonia*. [148]
- Violán, C. et al. (2016), “The burden of cardiovascular morbidity in a European Mediterranean population with multimorbidity: a cross-sectional study”, *BMC Family Practice*, Vol. 17/1, <https://doi.org/10.1186/s12875-016-0546-4>. [2]
- Voors, A. et al. (2022), “The SGLT2 inhibitor empagliflozin in patients hospitalized for acute heart failure: a multinational randomized trial”, *Nature Medicine*, Vol. 28/3, pp. 568-574, <https://doi.org/10.1038/s41591-021-01659-1>. [211]
- Weisfeldt, M. et al. (2010), “Survival After Application of Automatic External Defibrillators Before Arrival of the Emergency Medical System”, *Journal of the American College of Cardiology*, Vol. 55/16, pp. 1713-1720, <https://doi.org/10.1016/j.jacc.2009.11.077>. [61]
- Wengemuth, E. et al. (2025), “Challenges in the transition between medical and vocational rehabilitation: a qualitative focus group study with service providers in Germany”, *BMC Health Services Research*, Vol. 25/1, <https://doi.org/10.1186/s12913-024-12055-z>. [159]
- Wen, J. et al. (2024), “An exploratory analysis of glucagon-like peptide-1 (GLP-1) agonists and biosimilars: A literature review”, *Diabetes, Obesity and Metabolism*, Vol. 27/3, pp. 1113-1122, <https://doi.org/10.1111/dom.16110>. [232]
- Wen, Z. et al. (2025), “Comparison of the effectiveness and safety of GLP-1 receptor agonists for type 2 diabetes mellitus patients with overweight/obesity: A systematic review and network meta-analysis”, *Diabetes Research and Clinical Practice*, Vol. 222, p. 111999, <https://doi.org/10.1016/j.diabres.2025.111999>. [223]
- WHO (2016), “Global strategy on human resources for health: Workforce 2030”. [181]
- WHO Regional Office for Europe (2022), “Health and care workforce in Europe: time to act”, pp. 1-205, <https://www.who.int/europe/publications/i/item/9789289058339> (accessed on 8 July 2025). [177]
- Winnige, P. et al. (2021), “Validity and Reliability of the Cardiac Rehabilitation Barriers Scale in the Czech Republic (CRBS-CZE): Determination of Key Barriers in East-Central Europe”, *International Journal of Environmental Research and Public Health*, Vol. 18/24, p. 13113, <https://doi.org/10.3390/ijerph182413113>. [147]
- World Health Observatory (2021), *Country Profile: Netherlands*, <https://world-heart-federation.org/world-heart-observatory/countries/netherlands>. [145]
- Xie, Y., T. Choi and Z. Al-Aly (2025), “Author Correction: Mapping the effectiveness and risks of GLP-1 receptor agonists”, *Nature Medicine*, Vol. 31/3, pp. 1038-1038, <https://doi.org/10.1038/s41591-025-03542-9>. [222]

- Yafasova, A. et al. (2021), "Time to Thrombolysis and Long-Term Outcomes in Patients With Acute Ischemic Stroke", *Stroke*, Vol. 52/5, pp. 1724-1732, <https://doi.org/10.1161/strokeaha.120.032837>. [77]
- Yang, Y. et al. (2022), "Multicomponent integrated care for patients with chronic heart failure: systematic review and meta-analysis", *ESC Heart Failure*, Vol. 10/2, pp. 791-807, <https://doi.org/10.1002/ehf2.14207>. [162]
- Yan, S. et al. (2020), "The global survival rate among adult out-of-hospital cardiac arrest patients who received cardiopulmonary resuscitation: a systematic review and meta-analysis", *Critical Care*, Vol. 24/1, p. 61, <https://doi.org/10.1186/s13054-020-2773-2>. [251]
- Yao, H. et al. (2024), "Comparative effectiveness of GLP-1 receptor agonists on glycaemic control, body weight, and lipid profile for type 2 diabetes: systematic review and network meta-analysis", *BMJ*, p. e076410, <https://doi.org/10.1136/bmj-2023-076410>. [224]
- Yao, H. et al. (2024), "Comparative effectiveness of GLP-1 receptor agonists on glycaemic control, body weight, and lipid profile for type 2 diabetes: systematic review and network meta-analysis", *BMJ*, p. e076410, <https://doi.org/10.1136/bmj-2023-076410>. [228]
- Zakariassen, E., R. Burman and S. Hunskaar (2010), "The epidemiology of medical emergency contacts outside hospitals in Norway - a prospective population based study", *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, Vol. 18/1, p. 9, <https://doi.org/10.1186/1757-7241-18-9>. [243]
- Zannad, F. et al. (2020), "SGLT2 inhibitors in patients with heart failure with reduced ejection fraction: a meta-analysis of the EMPEROR-Reduced and DAPA-HF trials", *The Lancet*, Vol. 396/10254, pp. 819-829, [https://doi.org/10.1016/s0140-6736\(20\)31824-9](https://doi.org/10.1016/s0140-6736(20)31824-9). [210]
- Zapata, T. et al. (2023), "From great attrition to great attraction: Countering the great resignation of health and care workers", Vol. 29/1, <https://iris.who.int/server/api/core/bitstreams/488b01ab-a066-4558-a345-476570fe2802/content> (accessed on 11 July 2025). [179]
- Zhao, H. et al. (2018), "Ambulance clinical triage for acute stroke treatment paramedic triage algorithm for large vessel occlusion", *Stroke*, Vol. 49/4, pp. 945-951, <https://doi.org/10.1161/STROKEAHA.117.019307>. [70]
- Zhelev, Z. et al. (2021), "Prehospital stroke scales as screening tools for early identification of stroke and transient ischemic attack", *Emergencias*, Vol. 33/4, pp. 312-314, <https://doi.org/10.1002/14651858.CD011427.pub2>. [249]
- Zillich, A. et al. (2014), "A Randomized, Controlled Pragmatic Trial of Telephonic Medication Therapy Management to Reduce Hospitalization in Home Health Patients", *Health Services Research*, Vol. 49/5, pp. 1537-1554, <https://doi.org/10.1111/1475-6773.12176>. [187]

Annex 4.A. Risk factor counselling and care plans in primary care for people living with CVD

Annex Figure 4.A.1. Only around half of the people with CVD or hypertension report receiving advice on physical activity, 10 p.p. higher than other primary care users aged 45 and older

Percentage of primary care users aged 45 and older that report receiving advice on physical activity by a healthcare professional

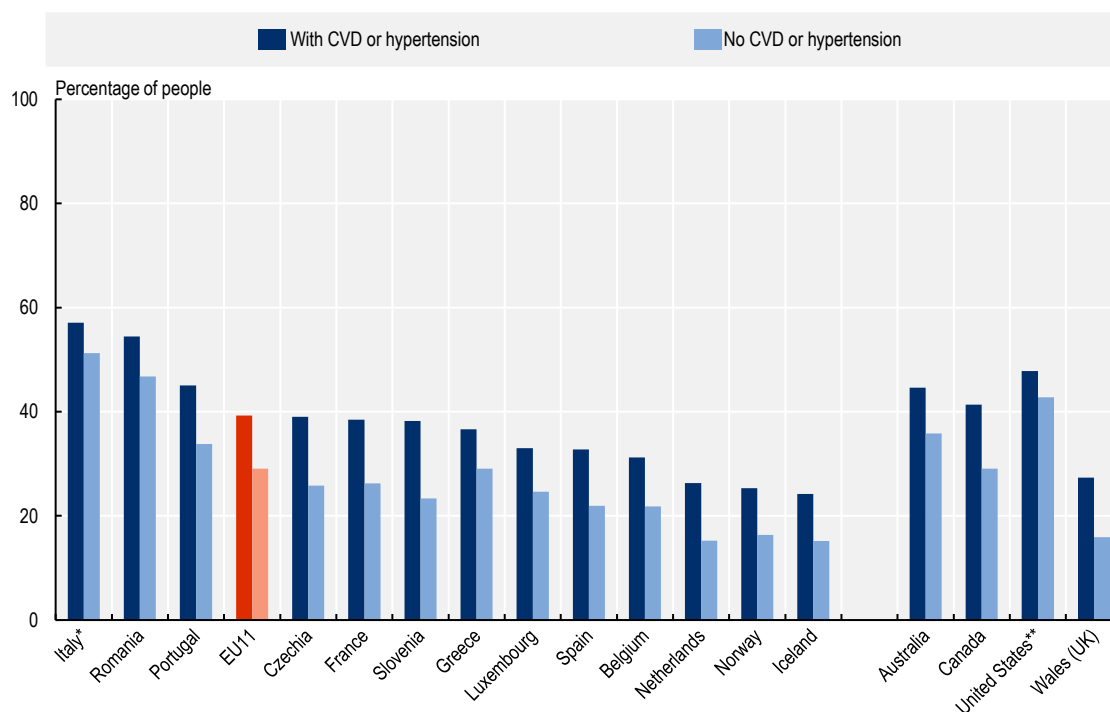


Note: Having received advice on physical activity refers to those that responded “yes” to the question: “In the past 12 months has any Healthcare professional talked with you about your physical activity”. All within country differences are statistically significant except for Greece, Italy, and the United States. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS 2024 Database.

Annex Figure 4.A.2. Less than 40% of people with CVD or hypertension report receiving advice on healthy eating, 10 p.p. higher than other primary care users aged 45 and older

Percentage of primary care users aged 45 and older that reported receiving advice on healthy eating by a healthcare professional

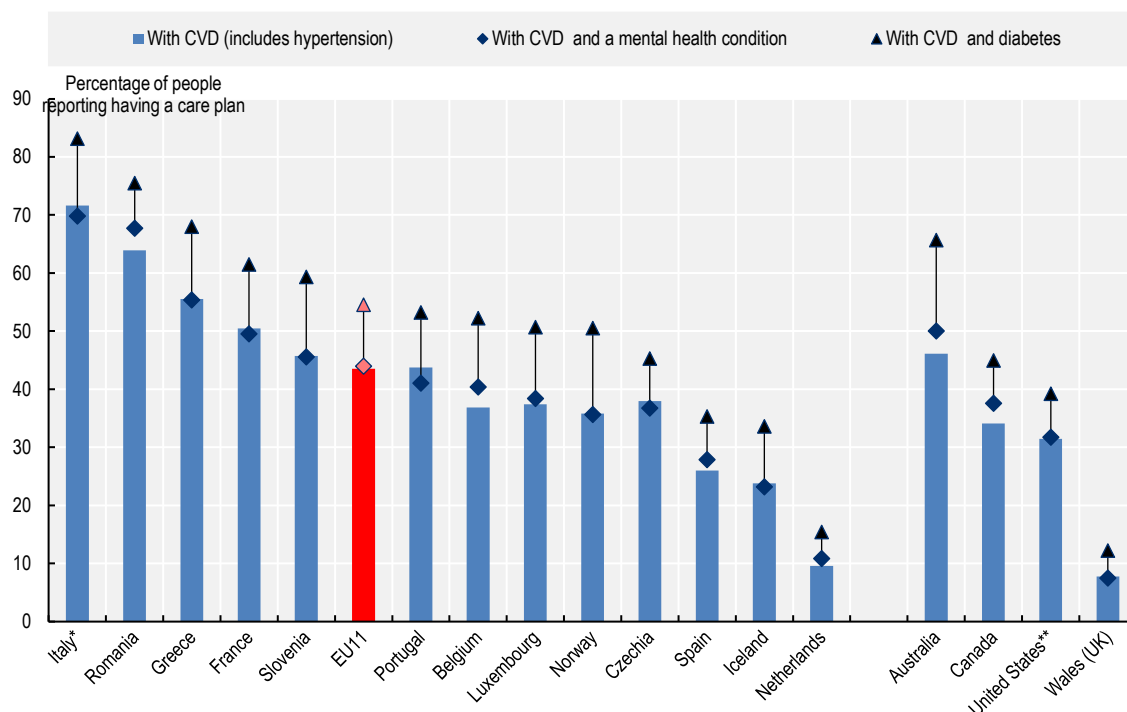


Note: Having received advice on healthy eating refers to those that responded “yes” to the question: “In the past 12 months has any Healthcare professional talked with you about healthy eating”. All within country differences are statistically significant except for Greece, Italy, Romania, Australia and the United States. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS 2024 Database.

Annex Figure 4.A.3. People with CVD or hypertension and diabetes tend to report having a care plan more often than those with mental health conditions

Percentage of primary care users aged 45 and older reporting having a care plan



Note: In this analysis CVD includes people reporting hypertension. Response to the question: "Do you have a care plan that takes into account all your health and well-being needs?" (Yes). Differences between people with CVD (including hypertension) and those with CVD and diabetes are statistically significant in Belgium, Italy, Norway, and Australia. * Data for Italy refer to patients enrolled in outpatient settings for specialist visits in selected regions. ** the United States sample only includes people aged 65 years or older.

Source: OECD PaRIS 2024 Database.

Annex 4.B. Estimates of cost saving by reducing CVD hospital admissions: Methodology and findings

The OECD estimated the cost that could have had been saved through reducing hospital admissions for CVD based on data available in Luengo-Fernandez et al. (2023), Australian Institute of Health and Welfare (2024), Ministry of Health, Labour and Welfare in Japan (2024), Haidar et al. (2025), Cheema et al. (2022), OECD Health Statistics and EUROSTAT (Annex Table 4.B.1). Luengo-Fernandez et al. (2023) provided the unit cost of inpatient care for CVD in 2021 collected from national experts in each EU country. Australian Institute of Health and Welfare (2024), Ministry of Health, Labour and Welfare in Japan (2024), Haidar et al. (2025) and Cheema et al. (2022) provided total cost for CVD inpatient care for Australia, Japan, the United Kingdom and the United States for years between 2020 and 2022, and the unit cost was derived for these countries by dividing the total hospital cost for CVD care with the number of hospital admissions for CVD available in OECD Health Statistics or in the literature. Since 2023 data on hospital admissions are available for most countries, the unit cost for 2023 was extrapolated by using consumer price index which is widely available, although the price change in healthcare is different from that for the entire economy.

Using OECD's hospital admission rates, supplemented by EUROSTAT data, Haidar et al. (2025) and Cheema et al. (2022), the difference between hospital admissions for CVD per population and the lowest CVD hospital admission rate in 2023 (or nearest year) was calculated for each country. If hospital admission data is available only for a year earlier than 2023 for any country, this data was used as a proxy. In 2023, hospital admission rates in Chile (712 per 100 000 population), Colombia (325 per 100 000 population), Costa Rica (367 per 100 000 population) and Mexico (201 per 100 000 population) were lower than that of Canada (944 per 100 000 population) but data for Canada was used as a benchmark. This is because low rates in Latin American countries are likely related to relatively low accessibility to hospital care, compared to other OECD countries, and data comparability issues due to non-inclusion of admissions to private hospitals.

To estimate the total cost saving, the difference in CVD hospital admissions per 100 000 population for 2023 was converted to the number of hospital admissions for CVD by multiplying population data available at the OECD, and the number of hospital admissions for CVD was multiplied by the estimated 2023 unit cost for each country. To assess economic impact on healthcare system, cost saving in hospital care for CVD was divided by total health spending for each country (Annex Table 4.B.2).

Annex Table 4.B.1. Unit cost and hospital admissions due to CVD

Country	Unit cost of CVD care in hospital (EUR), 2021	Estimated unit cost of CVD care in hospital (EUR), 2023	Currency conversion (national currency unit (NCU/EUR), 2023)	Admissions per 100 000 population, 2023	Admission rates, year (if not 2023)	Population (thousands), 2023	Health expenditure (millions, NCU)
Austria	10 091	11 627		2 781.6	2022	9 132	49 500.2
Belgium	10 032	11 536		1 719.5		11 780	57 123.9
Bulgaria	1 112	1 388	1.9558	4 094.0	2022	6 447	11 978.5
Croatia	1 536	1 830		2 011.9		3 856	4 716.0
Cyprus	10 058	11 109		1 278.3		958	2 279.0
Czechia	5 930	7 142	24.004	2 120.0	2022	10 864	577 424.9
Denmark	9 552	10 414	7.4509	1 528.2	2016	5 947	273 588.7
Estonia	2 670	3 404		2 038.4		1 370	2 351.6
Finland	6 118	6 825		1 755.0		5 584	24 651.8
France	9 973	10 984		1 825.0		68 372	307 216.0
Germany	7 968	8 977		3 368.3		83 287	467 794.0
Greece	4 543	5 007		1 944.8	2017	10 407	16 670.4
Hungary	3 649	4 701	381.85	2 401.9		9 592	4 075 498.4
Ireland	15 257	17 517		1 124.6		5 312	28 934.6
Italy	13 747	15 234		1 627.4		58 984	171 015.0
Latvia	2 195	2 658		3 231.8		1 877	3 038.1
Lithuania	3 193	4 117		3 143.5		2 872	4 382.5
Luxembourg	14 899	16 537		1 621.1	2016	666	4 096.1
Malta	5 634	6 258		1 367.3	2019	553	1 588.9
Netherlands	13 332	15 221		1 172.7	2022	17 877	B 99 274.0
Poland	4 389	5 482	4.5420	2 542.6		36 687	169 418.4
Portugal	5 866	6 526		948.7		10 578	B 24 291.3
Romania	2 038	2 536	4.9467	2 484.9		19 061	76 931.8
Slovak Republic	3 627	4 437		2 296.3		5 427	7 776.1
Slovenia	9 266	10 822		1 734.9		2 120	4 956.3
Spain	7 285	8 110		1 215.3		48 353	127 799.9
Sweden	10 328	11 737	11.4788	1 523.1		10 537	613 713.0
	Unit cost of CVD care in hospital (NCU), 2020-2022	Unit cost, year	Estimated unit cost of CVD care in hospital (NCU), 2023	Admissions per 100 000 population, 2023	Admission rates, year (if not 2023)	Population, 2023	Health expenditure (millions, NCU)
Australia	20 173	2020/21	23 132	1 711.1	2022	26 653	264 159.4
Japan	1 945 538	2022	1 995 788	1 568.1		124 352	63 570 189.0
United Kingdom	5 705	2021/22	6 508	1 771.0	2021/22	68 265	297 994.2
United States	23 041	2021	25 260	1 411.7	2021	334 915	4 627 736.5

Note For Cyprus and Malta, hospital admission data come from EUROSTAT. Hospital admission rates for the United Kingdom and the United States are derived from Haidar et al.(2025) and Cheema et al.(2022).

Source: (Luengo-Fernandez et al., 2023^[235]; Australian Institute of Health and Welfare, 2024^[236]; Ministry of Health, Labour and Welfare, 2024^[237]; Haidar et al., 2025^[238]; Cheema et al., 2022^[239]), OECD Health Statistics and EUROSTAT.

Annex Table 4.B.2. Estimated cost saving through reduction of CVD hospital admissions as a share of health spending, 2023

Country	% of health spending in 2023
Austria	3.7%
Belgium	1.6%
Bulgaria	3.8%
Croatia	1.4%
Cyprus	1.4%
Czechia	3.4%
Denmark	1.0%
Estonia	1.8%
Finland	1.1%
France	2.0%
Germany	3.7%
Greece	2.8%
Hungary	5.2%
Ireland	0.5%
Italy	3.4%
Latvia	4.0%
Lithuania	4.9%
Luxembourg	1.6%
Malta	0.9%
Netherlands	0.6%
Poland	5.9%
Portugal	0.0%
Romania	4.0%
Slovak Republic	3.6%
Slovenia	3.1%
Spain	0.8%
Sweden	1.2%
Austria	1.8%
Japan	2.4%
United Kingdom	1.2%
United States	0.9%

Annex 4.C. Target ambulance response times

Annex Table 4.C.1. Target ambulance response times vary depending on national priorities, resources and geography

	Target (min)	Note
Czechia	20	Maximum response time
Germany	10-15	Different depending on state (Länder)
Spain	8	
Estonia	15	70th centile target
	7	Mean urban response time for top triage tier
	14	Mean rural response time for top triage tier
Hungary	15	
Ireland	8	Mean response time target for Cardiac arrest and also for AML, stroke and severe conditions
Latvia	8-10	Latvia also has a 75th Centile 15 min urban, 25 min rural target
Lithuania	15	
Netherlands	15	95% of all A1 emergency deployments is within 15 min on-scene
Norway	12	90th centile Urban
	25	90th centile Rural
Slovenia	15	Mean response time
Türkiye	10	
England	8	Mean response time target for cardiac arrest or near cardiac arrest
	18	Mean response time target for AML, stroke, severe conditions

Source: CZE, EST, – (Kalda et al., 2023^[240]); DEU, ESP, HUN, IRL, LVA, LTU, NLD, NOR – (Bos et al., 2015^[241]); LVA – (Behmane et al., 2019^[242]); NOR – (Zakariassen, Burman and Hunskaar, 2010^[243]), GBR (England) – (UK Government, 2025^[244]).

Annex 4.D. Care pathways for AMI, stroke, and cardiac arrest

Emergency care, including bystander response, prehospital or ambulance care, hospital ED care and the unplanned delivery of urgent interventional care, is essential to management of acute CVD. AMI and stroke are both amenable to urgent treatments which reduce long-term morbidity and mortality, but these treatments have treatment windows measured in minutes to hours. Cardiac arrest requires near immediate treatment to begin in the community and continue through to hospital in order to get the best outcomes. Many acute CVD manifestations all have potential to deteriorate rapidly leading to death or significantly worsened health if not managed promptly.

Population access to, and effective delivery of, these therapies depend on integrated systems of care (ESC Guidelines, 2023^[78]). Timely diagnosis depends upon a populace who are educated to recognise high risk symptoms and who are confident to call EMS and provide first aid when these occur, and on trained EMS (ambulance) providers, working in a system that is resourced for timely responsiveness, and that is well integrated with hospital EDs, and with cardiac and neurology interventional units and imaging departments within hospitals. Some other manifestations of CVD such as CHF and atrial fibrillation (AF) can present to the emergency care system because of the suddenness of onset of symptoms, the degree of distress they cause, or the difficulty patients have in accessing care for them outside the ED.

Acute coronary syndromes, including acute myocardial infarction, are treated along clearly defined pathways with timeframes measured in minutes to hours

Determining the classification of an AMI as a STEMI or non-STEMI, and subsequent treatment options, requires testing for anomalies in the heart function using ECG readings (see Annex Box 4.D.1). Well-functioning EMS services are able to perform and interpret (or transmit for interpretation) lead ECG in the field. This investigation, along with time of onset of symptoms, provides the critical information for diagnosis and initial treatment. Early administration of aspirin, and prompt revascularisation (opening of a blocked artery, whether by thrombolytic agent or by PCI) both carry significant mortality reduction benefits. Other important therapies include further antithrombotics, lipid lowering agents and blood pressure control agents. Admission to a coronary care unit allows for cardiac monitoring and rapid defibrillation in the event of a dangerous disturbance to cardiac rhythm in the acute phase of the illness. This is followed by a period of cardiac rehabilitation aimed at restoring premorbid level of function and addressing lifestyle factors that can modify cardiac risk factors.

Annex Box 4.D.1. Background on AMI and typical emergency response options

Acute myocardial infarction (AMI) is part of the spectrum of disease known as acute coronary syndrome (ACS). ACS occurs when there is a sudden limitation to flow of blood through one of the coronary arteries that feed the heart muscle with blood. Partial blockages reduce flow, causing pain, breathlessness and other acute symptom without causing the death of cardiac muscle. AMI occurs when the blockage is so severe that cardiac muscle cells start to die. The first step in risk stratification of patients with symptoms consistent with ACS is the Electrocardiogram (ECG). An ECG abnormality called ST segment elevation indicates the presence of the more severe category of AMI called a STEMI, or ST elevation myocardial infarction. STEMI result from complete blockage of a coronary artery (the blood vessels that feed the heart muscle) with fresh clot that has formed on the surface of an atherosclerotic plaque. Mortality and morbidity are significantly reduced by urgent reopening of that artery, referred to as urgent revascularisation. This is ideally performed by primary percutaneous coronary intervention (PPCI), a minimally invasive procedure in which a wire is introduced via a needle at the wrist, into the obstructed coronary artery, and a balloon inflated over that wire to force the artery open. A stent (a metal device to keep that artery open) is then placed. The best results are achieved when the artery is opened within an hour of symptom onset, but there are significant benefits with up to 6 hours of symptoms and some persistent benefits out to 12 hours (KAMIR-NIH, 2021^[245]). When PPCI cannot be performed promptly (within 90-120 minutes, for example when the AMI is diagnosed at a non-PPCI capable hospital), a thrombolytic drug may be administered to break down the clot causing the occlusion, and a PCI performed in a semi-planned fashion (after transfer, ideally within 24 hours.).

Patients suffering ACS symptoms without elevation of the ST segment on the ECG undergo further risk stratification process blood tests, serial ECG measurements and consideration of the constellation of symptoms and signs. They are admitted to specialised coronary care units, started on medical therapies directed both at the acute process and at secondary prevention, and then investigated further with a semi-planned PCI, the goal being to prevent further symptoms and possible STEMI.

Effective care pathways require systems to manage patients who self-present to a non-PCI centre, or who are taken there because transport time to a PPCI centre would be prohibitive. Clear protocols are needed to guide timely use of IVT therapy and transfer protocols should ensure that time is not lost in trying to identify a PCI centre willing to accept the transfer. Experts recommend that the time from “door-in”, i.e. entering first hospital door, to “door-out”, i.e. patient being in an ambulance on the way to a PCI centre, is less than 30 minutes to expedite reperfusion therapy in a PCI centre (ESC Guidelines, 2023^[246]). Systems should aim to ensure that secondary PCI can be completed within 24 hours.

The ambulance system plays a critical role in the early management of patients with suspected STEMI, including prioritisation of ambulance dispatch to possible cases, immediately establishing the initial diagnosis, initiation of treatment with aspirin (and in some systems, where transport times are long, IVT) and delivery of the patient to a hospital that is ready to perform immediate PPCI. For that very reason, parallel circuits for referrals and transport of patients with suspected STEMI that bypass the emergency ambulance service should be avoided (ESC Guidelines, 2023^[78]). Some systems do not allow ambulance staff (paramedic or nursing) to make diagnoses or prescribe treatments. These systems must then make medical consultation possible usually by telemedicine.

Public awareness campaigns increase the likelihood that patients will recognise the seriousness of the key symptoms, and call EMS rather than seeking care at a GP or other service. Gender differences in time-to-call after onset of STEMI symptoms have been identified in registry data from France (Lapostolle et al., 2021^[53]), Ireland (Margey et al., 2024^[247]), and outside of Europe (Stehli et al., 2021^[248]) with women consistently calling later.

Stroke care also has clearly defined pathways with defined treatment windows

Stroke is a condition in which brain tissue is injured due to a vascular event. Stroke can be broadly classified as ischaemic (damage due to blockage of an artery that supplies blood to part of the brain, usually due at least partially to the presence of clot in that artery) or haemorrhagic (damage due to bleeding within the brain). The differentiation between the two needs to be accomplished as soon as possible as ischaemic stroke can often be treated with thrombolytic agents (drugs to break down clot) or mechanical thrombectomy (removal of clot using an instrument inserted into the vasculature via a puncture of an artery in the groin).

With the advent of time sensitive therapies for ischaemic stroke (intravenous thrombolytics and mechanical thrombectomy) systems have had to be developed to deliver them within the time windows in which they are effective. Significant public engagement is required to encourage people to call EMS immediately. Ambulance staff then need to be able to recognise potential acute stroke. This is aided by the use of simple stroke screening tools such as “FAST” (facial asymmetry, arm weakness, speech difficulty, time of onset) (Zhelev et al., 2021^[249]). As for AMI, the EMS must then decide on a destination hospital capable of providing the therapies and deliver and hand over the patient to that hospital in time for these therapies to be delivered.

Mechanical thrombectomy (MT) is reserved for a subset of people experiencing strokes caused by blockage in a larger artery (LVO – large vessel occlusion). Some systems will aim to get all patients to a mechanical thrombectomy capable centre (often called a comprehensive stroke centre – CSS) and utilise other hospitals (Primary Stroke Centres – PSC) only when transport times to a comprehensive centre are too long. Other systems will select patients in field for CSS using screening tools, and take others to PSC. (Kleinig et al., 1910^[250]) When applying such an approach it is essential that the PSC is capable of obtaining urgent CT imaging, providing a neurological assessment in person or by telemedicine, and administering thrombolytic agents.

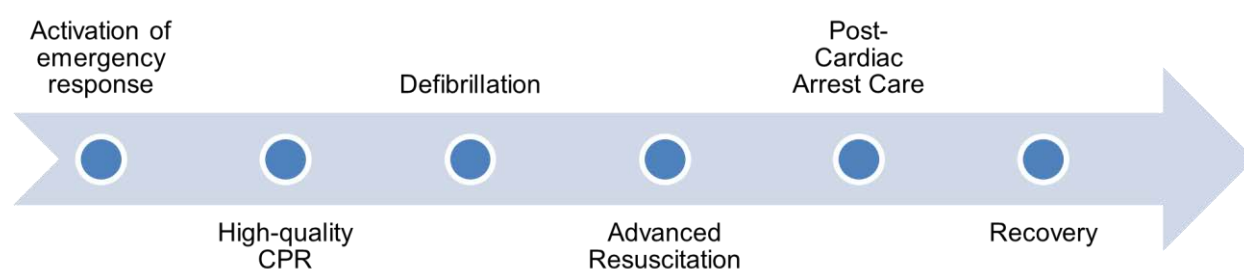
A system for prenotification of the receiving hospital by EMS is essential for guaranteeing prompt access to diagnostics, to free up specialist teams, and to ensure seamless handover of care without loss of time. Standardised handover facilitates high stakes communication and overcomes difficulties created by poor quality radio connections, and communication from moving vehicles. By limiting communication to a clear statement that the case is a potential stroke, estimated time of onset, estimated time of arrival, and current physiological state there is less likelihood of misunderstanding. Countries with well established pre-alert systems as part of national guidelines include Ireland, Czechia, United Kingdom and others. Yet the ESO-SAFE experts reported four EU countries did not have prenotification of stroke admission in place in 2022, including Belgium, Cyprus, Estonia and Italy (data were not available for Slovenia and Luxembourg) (ESO-SAFE, 2025^[91]).

Cardiac arrest requires immediate response

A special case of CVD is cardiac arrest, the cessation of effective heartbeat. A significant proportion of cardiac arrests are reversible if resuscitation begins within minutes, and if the underlying disease process is itself treatable. Cardiac arrest management depends upon the “chain of survival” meaning immediate cardio-pulmonary resuscitation (CPR), early access to advanced life support, particularly early defibrillation (treatment with a measured electric shock) and expert post-resuscitation care (Annex Figure 4.D.1.). Survival rates are significantly higher when the collapse is witnessed, when bystanders begin CPR, and when defibrillation (application of a controlled electric shock to the heart) is applied early in appropriate cases, and when post-resuscitation care is well organised and includes management of underlying ACS and management of organ injury resulting from the period of cessation of blood flow (Yan et al., 2020^[251]).

A 2020 systematic review and meta-analysis of the previous 40 years of research established that people suffering an out of hospital cardiac arrest in Europe had their heart restarted in 36.7% of cases, survived to hospital admission in 25.7%, to hospital discharge in 11.7% and were alive a year later in 9.2% (Yan et al., 2020^[251]). The survival rates for all out of hospital cardiac arrests in Europe are significantly better than those in Asia or North America but significantly behind Oceania (1 year survival is 9.2% in Europe, 5.3% in Asia, 4.0% in North America and 11.5% in Oceania) suggesting there may be room to improve European outcomes (Yan et al., 2020^[251]). Within Europe there are also significant differences between countries. The Danish and Norwegian national cardiac arrest registries respectively report 47.4% and 43.6% 30 day survival or survival to discharge from hospital for shockable, bystander witnessed out of hospital cardiac arrests while the Pavia Cardiac Arrest Registry (Italy), the Swiss Registry of Cardiac Arrest and the Sudden Death Expertise Center Registry (Paris) respectively report only 29.8%, 24.4% and 20.9% for the same metric in the same cohort, respectively (Kiguchi et al., 2020^[252]).

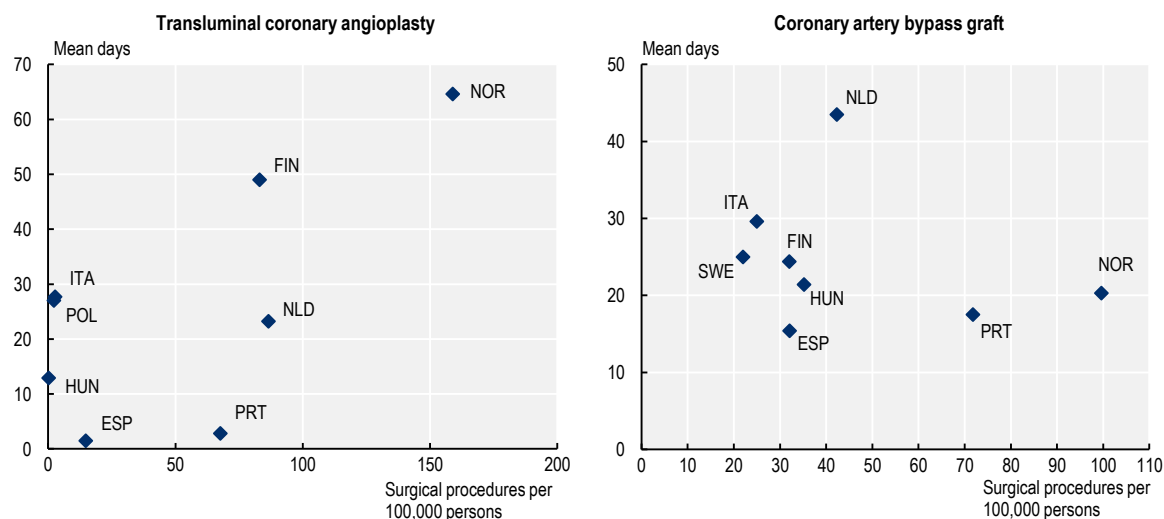
Annex Figure 4.D.1. Components of the Cardiac Arrest Chain of Survival



Source: American Heart Association and International Liaison Committee on Resuscitation.

Annex 4.E. Relationship between waiting time and surgical procedure type in 2023

Annex Figure 4.E.1. Scatterplot of the relationship between waiting time and surgical procedure type in 2023



Note: **Left Panel:** For waiting time, data for Finland and Italy refer to 2022 instead of 2023. Data for Spain refer to 2020 instead of 2023. Data for the United Kingdom refer to 2019 instead of 2023. For Norway, waiting times are over-estimated because they start from the date when a doctor refers a patient for specialist assessment up to the treatment (whereas in other countries they start only when a specialist has assessed the patient and decided to add the person on the waiting list for treatment). For Italy there has been a change in definition for transluminal coronary angioplasty. For Spain, value is estimated. For surgical procedures, data for Finland, Hungary, Italy, the Netherlands, Poland and Spain refer to 2022 instead of 2023. For the Netherlands, data refers to 2021 instead of 2023. For Hungary and Portugal, provisional values are provided.

Right Panel: For waiting time, data for Australia, Finland and Italy refer to 2022 instead of 2023. For Norway, waiting times are over-estimated because they start from the date when a doctor refers a patient for specialist assessment up to the treatment (whereas in other countries they start only when a specialist has assessed the patient and decided to add the person on the waiting list for treatment). For surgical procedures, data for Finland, Hungary, Italy, Norway, Portugal, Spain, Sweden refer to 2022 instead of 2023. For the Netherlands, data refer to 2021 instead of 2023. Provisional values were used for Portugal and Hungary.

Source: OECD Health Statistics.

Annex 4.F. New medicines in cardiovascular medications therapy

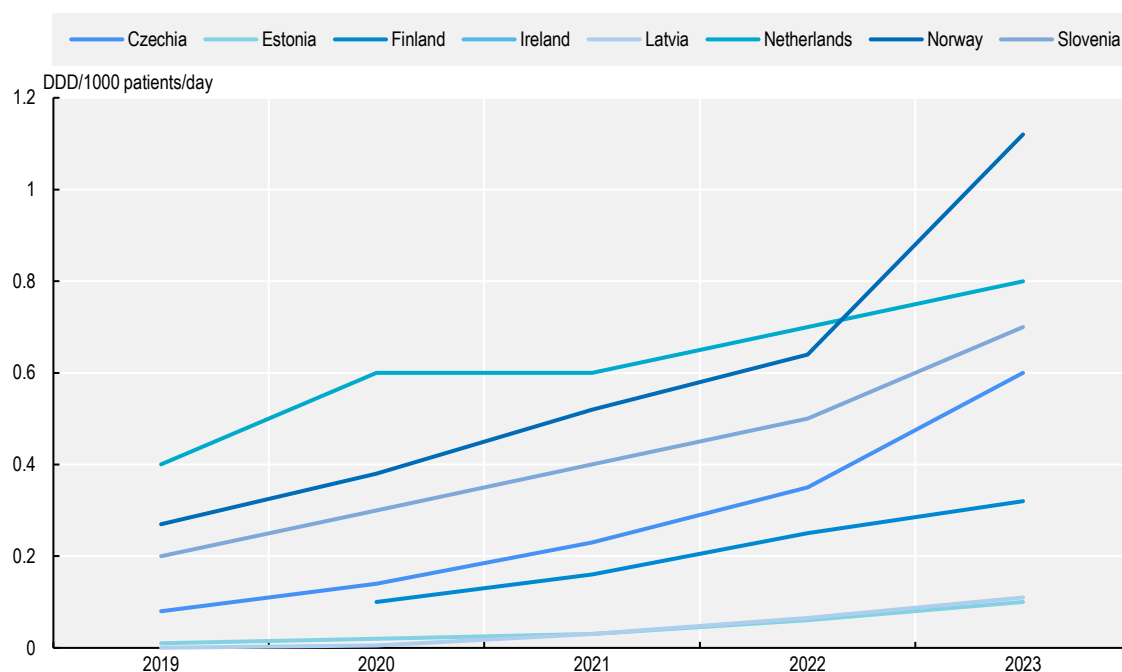
Annex Table 4.F.1. New medicines in cardiovascular medications therapy

Drug Class	Example Drugs	Primary Indication/ Target population	CVD Benefits	Other Clinical Benefits	Side effects
DOACs	dabigatran rivaroxaban apixaban edoxaban	Prevent stroke and systemic embolism in adults with non-valvular AF (atrial fibrillation) and at least one stroke risk factor (e.g. hypertension, diabetes, prior stroke/ transient ischemic attack (TIA)). Treatment and Secondary Prevention of Deep vein thrombosis (DVT), Pulmonary embolism (PE) Primary Prevention of venous thromboembolism (VTE) after Major Orthopedic Surgery	Modest reduction in CVD mortality in select populations: 10% relative reduction in cardiovascular death compared to warfarin; Reduced the risk of intracranial bleeding by approximately 50-70% compared to warfarin.		Bleeding, which can range from minor bruising to serious gastrointestinal or intracranial hemorrhage. Other side effects include nausea, abdominal pain, anemia, headache or dizziness, and, less commonly, elevated liver enzymes or allergic reactions.
PCSK9 inhibitors	alirocumab, evolocumab inclisiran	Patients with primary hypercholesterolemia (incl. familial hypercholesterolemia) or mixed dyslipidemia; statin-intolerant or uncontrolled hyperlipidemia despite maximum statins	Modest reduction in CV events (e.g. myocardial infarction (MI) and stroke) when added to statins; Reduces LDL-C levels by up to 60%.		Injection site reactions (such as redness, swelling, or pain), flu-like symptoms and upper respiratory tract infections. Less common side effects relate to memory issues or confusion.
SGLT2 inhibitors	empagliflozin, dapagliflozin	Initially type 2 diabetes mellitus (T2DM); now recommended for heart failure with reduced ejection (HFrEF) and chronic kidney disease (CKD)	Reduce heart failure (HF) hospitalisation; emerging evidence of mortality reduction (esp. HFrEF)	Reduce progression of renal disease	Increased urination, genital and urinary tract infections (especially fungal infections), and dehydration or dizziness due to fluid loss. They may also cause a small drop in blood pressure. Less commonly, they have been associated with diabetic ketoacidosis and, in rare cases, acute kidney injury or bone fractures (notably with canagliflozin).
GLP-1 receptor agonists (A1oBJ)	semaglutide, liraglutide	T2DM with high CV risk; being considered for obesity and primary prevention in high-risk groups	Reduce MACE in high-risk diabetics; Potential stroke and MI prevention	Reduce body weight Improves glycemic control	Nausea, vomiting, diarrhea, constipation, and abdominal pain. Other possible side effects include decreased appetite, headache, and fatigue. Less commonly, they may be associated with pancreatitis, gallbladder issues, or, in rare cases, thyroid C-cell tumours (seen in animal studies).

Source: Authors' compilation based on ESC Guidelines (2023^[253]), "2023 ESC Guidelines for the management of cardiovascular disease in patients with diabetes", <https://doi.org/10.1093/eurheartj/ehad192>; Developed with the special contribution of: European Association for Cardiovascular Prevention & Rehabilitation et al. (2011^[254]), "ESC/EAS Guidelines for the management of dyslipidaemias: The Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)", <https://doi.org/10.1093/eurheartj/ehf158>; ESC Guidelines (2024^[32]), "2024 ESC Guidelines for the management of elevated blood pressure and hypertension", <https://doi.org/10.1093/eurheartj/ehae178>.

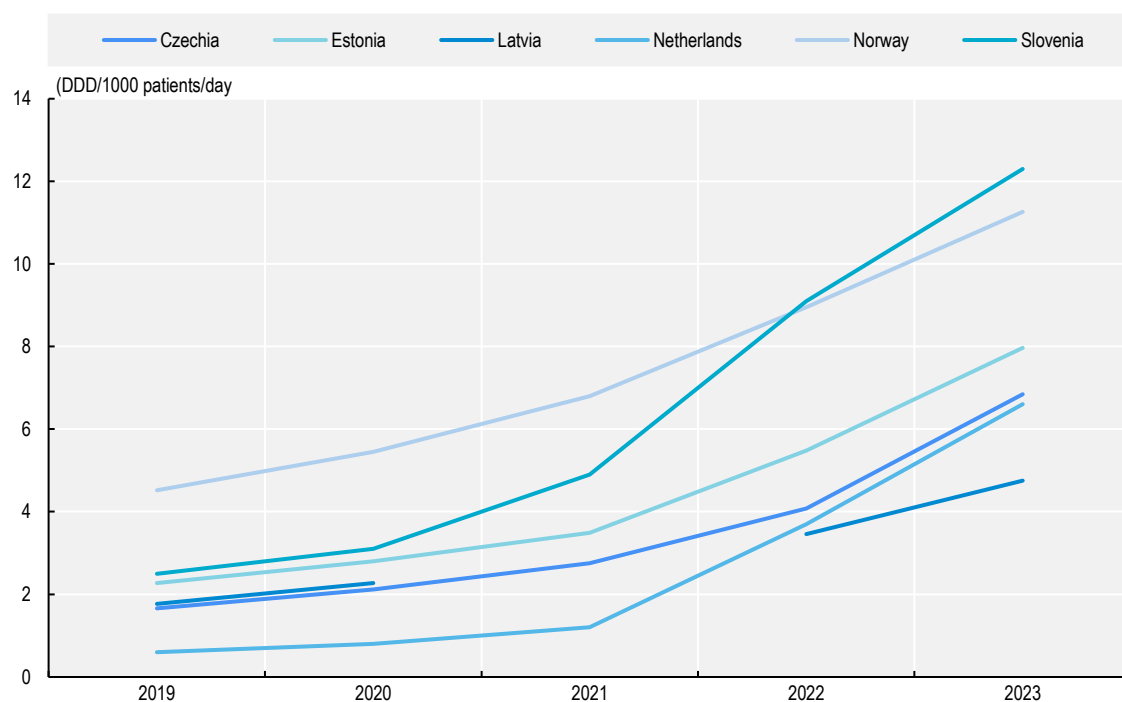
Annex 4.G. Countries are seeing increased utilisation of PCSK9 and SGLT2 inhibitors

Annex Figure 4.G.1. PCSK9 inhibitors are increasingly used in most countries



Note: PCSK9 inhibitors capture the sum of C10AX13, C10AX14, C10AX16. Data represented from selected countries pending validation.
Source: 2025 OECD Cardiovascular Policy and Data Survey.

Annex Figure 4.G.2. Increased use of SGLT2 inhibitors across European countries



Note: SGLT2 inhibitors A10BK. Data represented from selected countries pending validation.

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Notes

¹ The P3CEQ care co-ordination scale, used in the PaRIS survey, assesses if the care a patient receives: includes a single professional responsible to co-ordinate care across services the patient uses; is organised in a way that works for the patients, uses care plans, and provides information and support to self-manage (Lloyd et al., 2018^[255]). PaRIS data show that out of these five components, insufficient care planning is the main contributor to lowering patient's overall experience with care co-ordination (OECD, 2025^[3]).

² **RAAS:** Renin-angiotensin-aldosterone system, **ACE-I:** Angiotensin-converting enzyme inhibitors, **ARB:** Angiotensin receptor blockers, **ARNI:** Angiotensin Receptor-Neprilysin Inhibitors, **MRA:** Mineralocorticoid Receptor Antagonists, **SGLT2 inhibitors:** Sodium/glucose cotransporter-2 inhibitors.

³ ST-elevation myocardial infarction.

⁴ Not all patients who are eligible on time grounds will be suitable for IVT due to the presence in some of contraindications (e.g. recent major trauma or major surgery that would increase the major bleeding risk, or severe comorbidities that would limit the prospects of a functional recovery).

⁵ 2025 OCED Cardiovascular Policy and Data Survey.

5 Leveraging digital technology and health data for cardiovascular health

Digital health technologies are reshaping cardiovascular disease (CVD) prevention, diagnosis, and management. Tools such as electronic health records (EHRs), clinical decision support systems, telemedicine, mobile health apps, and wearable devices support risk identification, real-time monitoring, and tailored interventions. These innovations promise improved care co-ordination and reduced avoidable morbidity, yet evidence of sustained impact on long-term outcomes remains limited. EHRs and decision support systems can close treatment gaps, but interoperability and governance challenges persist. Telemedicine has expanded access, particularly for stroke and chronic CVD care, and remote monitoring and consumer wearables offer opportunities for self-management – though uptake is uneven and integration into health systems remains limited. Artificial intelligence and big data analytics can further enhance diagnosis and risk prediction but also present concerns related to bias, transparency, and privacy. Realising the full potential of digital health requires robust infrastructure, inclusive design, and harmonised data governance.

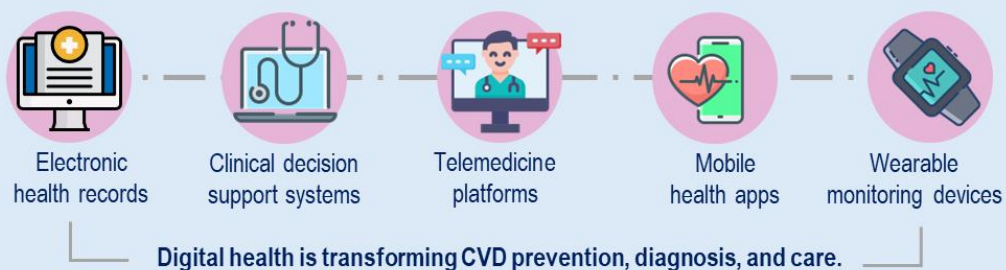
In Brief

- **Digital health technologies are transforming the way cardiovascular disease (CVD) is prevented, diagnosed, and managed.** Tools such as electronic health records (EHRs), clinical decision support systems (CDSS), telemedicine platforms, mobile health apps, and wearable monitoring devices are enabling more proactive, co-ordinated, and patient-centred care. These technologies can help identify individuals at high risk, monitor chronic conditions in real time, and deliver tailored interventions – potentially reducing avoidable morbidity and mortality. However, while process improvements are well documented, evidence of sustained improvements in long-term cardiovascular outcomes remains limited and context dependent.
- EHR systems now underpin much of the information infrastructure in high-income countries, allowing for better care co-ordination, patient tracking, and data-driven insights. When linked with CDSS, they can prompt evidence-based decisions, close treatment gaps, and reduce variation in care. Yet, challenges around usability, interoperability across local and organisational EHR platforms, and trust in data governance continue to limit their full potential. Results from the 2025 OECD Cardiovascular Policy and Data Survey suggest that **countries may not be positioned to leverage EHR data for prevention, early detection and management of CVD.**
- **Telemedicine has emerged as a core component of cardiovascular care**, especially since the COVID-19 pandemic. Remote consultations, virtual rehabilitation, and telemonitoring have been associated with better access to services and improved outcomes in some conditions, provided they are accompanied by clinical follow-up and intervention. In terms of acute intervention, six of 18 countries report having in place telemedicine facilities that connect stroke patients in remote regions with specialist teams, while seven countries report regulatory frameworks for teleconsultations are either “fully implemented” or “in development”. Ten countries report that ambulances have telemedicine capabilities that connect paramedics with physicians and/or specialist teams.
- Remote monitoring devices and implantable sensors enable earlier detection of deterioration, and studies show they can reduce hospitalisations and enhance treatment adherence when combined with structured care programmes. **Consumer-facing technologies, including smartwatches, fitness trackers, and mobile health apps, offer new opportunities for self-management and early detection.** These tools can help patients track activity, monitor heart rhythms, and receive coaching or medication reminders. However, their use remains skewed towards younger, more affluent populations, with limited integration into mainstream health services. Questions remain over their reliability as well as regulating their integration into mainstream services. Currently, **few countries have policies or infrastructure in place to leverage wearable and mobile technologies for national-level CVD monitoring or prevention.** Bridging these gaps – through inclusive design, policy development, and better data systems – will be essential to realising the full promise of digital innovation in cardiovascular health.
- Machine learning, artificial intelligence (AI), foundational models and big data analytics play a key role in powering new monitoring tools. They are reshaping CVD management by enhancing diagnostics, risk prediction, and treatment personalisation. AI is showing promise in interpreting medical imaging ECGs, detecting conditions such as asymptomatic left ventricular dysfunction from routine ECGs or coronary artery calcium from unrelated computed tomography (CT) scans.

With more robust trials and evaluation, these tools may enhance the ability to uncover hidden cardiovascular risks and guide early intervention. AI is also being embedded into wearables and mobile health apps, allowing continuous, real-time analysis of large data volumes from devices. Machine learning models are already helping clinicians predict patient outcomes, optimise treatment plans, and support clinical decision making. With over 1 000 FDA-approved tools in 2024 – many in cardiology – these **AI-based technologies are increasingly used in practice**. Meanwhile, big data integration across EHRs, registries, wearables, and genetic databases is powering large-scale research and CVD surveillance. The EU has introduced an Act to help regulate this burgeoning industry – the first jurisdiction in the world to do so.

- Despite the promise, implementation of **AI and big data faces challenges including data bias, algorithm transparency, data privacy, and automation bias**. Ensuring equitable access and building clinician trust are essential for responsible adoption. Trust can only be built through high data quality, adequate training and supervision, robust clinical evidence and transparency. While these technologies can enable a more proactive and personalised approach to cardiovascular care, their implementation requires careful consideration of evidence, ethics, and inclusivity.
- **Leveraging routinely collected health data is key** to maximising the potential of digital technologies and advancing next-generation biomedical innovations in CVD. EHRs, with their longitudinal patient histories, support both clinical care and research (although most OECD countries are yet to fully leverage their potential). Disease-specific registries enable benchmarking, real-world evaluation of care, and inclusion of underrepresented patient groups. Administrative datasets offer system-level insights into care delivery and costs, while mortality databases enable tracking trends and outcomes. These individual sources are powerful, but their **true potential is realised when data infrastructure can be linked and made interoperable** to provide a continuous, granular view of the patient journey, support better prevention strategies, and allow benchmarking across systems and borders.
- Interoperability allows for richer analytics – such as calculating survival rates or identifying high-risk patients before adverse events occur. **Cross-border data integration in Europe is also key, as it enables pooled analyses, enhances statistical power, and facilitates benchmarking**. Initiatives like the European Society of Cardiology's (ESC) EuroHeart aim to standardise cardiovascular data across countries to improve policy and practice. However, data silos, incompatible standards, lack of unique patient identifiers, and varying privacy regulations remain substantial barriers. Overcoming these challenges is critical to realising the full value of electronic data for CVD prevention and control.
- Achieving health data interoperability requires co-ordinated action on several fronts. Technical barriers include differing data formats and the absence of a shared patient ID across Europe. Legal and ethical hurdles stem from varying interpretations of General Data Protection Regulation (GDPR), inconsistent consent rules, and public trust concerns. **Technical and governance structures like the European Health Data Space (EHDS) offer promise by creating national competent authorities facilitating data access to health data (Health Data Access Bodies), bodies, common standards, and by bringing legal clarity**. Strong governance involves patient representation, transparent policies, and robust measures for data quality and security. In addition, investment in infrastructure and workforce development is essential. Skilled professionals, from informaticians to clinicians trained in data literacy, are essential to fully exploit digital health tools. Incentives, mandates can ensure comprehensive and high-quality data collection. A fully interoperable system can serve as the backbone of learning health systems across Europe.

Infographic 5.1. Leveraging digital technology and health data for cardiovascular health



Adoption of digital health technologies remains limited.



Only **7 of 19 countries** leverage potential of **EHR** for CVD burden and outcomes.



Only **3 out of 19 countries** promote adoption of wearables.

Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, Netherlands, Norway, Slovenia, Sweden, Türkiye, United Kingdom).

AI for Cardiovascular Care: Assessing the Benefits (⚡) and Risks (⚡)



Interoperability Problems Limit EU's Full Potential on CVD Health



5.1. Digital health technologies show growing potential in CVD care

Many cases of CVD are linked to modifiable risk factors and could be prevented through better early intervention, prompting health systems and policymakers to leverage digital innovations to strengthen prevention and management efforts. Recent advances in information and communication technologies (ICT) offer novel ways to prevent disease, detect problems sooner, and manage chronic cardiac conditions more effectively. Digital health technologies – encompassing electronic records, connected devices, and patient-facing applications – are increasingly used to prevent, detect and manage CVD. These technologies range from tools used primarily by healthcare professionals (such as electronic health records (EHRs), clinical decision support systems, and telemedicine platforms) to consumer-facing devices and apps like wearable fitness trackers, home monitoring devices, Holter monitors, connected wearables and mobile health (mHealth). Each category of technology can play a distinct role in CVD management, and evidence is rapidly emerging on their uptake, benefits, and limitations.

Prevention is key, and digital technology can facilitate moving care upstream to fundamentally modify cardiovascular risk factors such as diet, obesity, inactivity and chronic stress. In Europe, 11.4 million deaths from CVD were deemed avoidable between 1995 and 2020 – resulting in a potentially avoidable loss of 213.1 life years (Avi Cherla, 2024^[1]). As much as 80% of the current stroke burden is linked to 10 modifiable risk factors including high blood pressure (BP), smoking, cholesterol, and salt, alcohol and sugar intake, as well as environmental factors such as air pollution, see more on risk factors for CVD in Chapter 3 (Feigin et al., 2025^[2]). Similar prevention initiatives exist across EU Member States, supported by the European Society of Cardiology (ESC) and national digital health programmes – for example, the ESC’s EuroHeart registry, which as of 2024 covers 14 countries and more than 60 000 patients.

Primary preventative interventions include encouraging and supporting lifestyle interventions, building health literacy, and promoting screening and management of associated health conditions. Secondary prevention is also critical with 25% of stroke victims likely to have another stroke within five years (Mohan et al., 2011^[3]). Most interventions that have been evaluated in the academic literature have focussed on dietary habits; adherence; medication use; waist circumference and quality of life (Qi et al., 2025^[4]). Evidence of the long-term impact of these interventions on key cardiovascular outcomes is still relatively undeveloped. Plus, given that 20% to 40% of heart attacks occur in patients previously undiagnosed with CVD, monitoring could prevent much morbidity and mortality (McClellan et al., 2019^[5]). Digital technology can be useful to monitor people routinely and generate alerts when action is needed, as, for example, proposed under the *EU CVD Health Check* (Section 5.1.5).

5.1.1. Clinical Decision Support Systems (CDSS) improve clinical processes but evidence for improved outcomes remains elusive

Clinical decision support systems are computerised tools that assist clinicians by integrating patient data with evidence-based guidelines or algorithms to inform decision making at the point of care. CDSSs targeting CVD prevention include: assessing a patient’s risk for developing CVD based on their history, risk factors, and clinical test results; recommending health behaviour changes, such as quitting smoking, increasing physical activity, and reducing excessive salt intake; tailored reminders to screen for risk factors and preventive care, clinical tests, and treatments; alerts when indicators for CVD risk factors are suboptimal; and evidence-based treatments to prevent CVD, including intensification of existing management (Njie et al., 2015^[6]). CDSS include both rule-based tools that apply predefined guidelines and emerging AI-enabled systems that learn from clinical data to provide predictive or personalised recommendations.

In cardiovascular care, CDSS often take the form of risk calculators, alert systems, or care pathway prompts embedded in electronic health record interfaces (Qi et al., 2025^[4]). For example, a CDSS might alert a primary care provider that a patient’s blood pressure is uncontrolled and suggest

guideline-recommended therapy adjustments, or it might calculate a patient's ten-year risk of heart attack based on their profile and prompt a statin prescription if appropriate. By providing tailored recommendations based on individual data, CDSS aim to enhance clinician oversight and reduce “clinical inertia” in managing CVD risk factors (Njie et al., 2015^[6]). The ESC's Chatbot *ESC Chat* platform offers instant and personalised answers to clinical queries. Answers are exclusively based on current ESC Clinical Practice Guidelines (ESC, 2025^[7]). Decision support tools for acute ischaemic stroke are also proliferating, although the quality of the evidence is variable and challenges to clinical translation are reported (Ela Marie Z. Akay, 2023^[8]).

Virtual, computational representations of individual patients built from real-world clinical, physiological, and genetic data also hold potential for improving CVD prevention and care. Such virtual human digital twins integrate information from imaging, EHRs, wearable data profiles to simulate the dynamic behaviour of the cardiovascular system under different conditions or interventions. This enables personalised risk prediction, early detection of disease trajectories, and the capacity to test therapeutic strategies *in silico* before applying them in clinical practice (Viceconti, 2016^[9]). In CVD care, digital twins could continuously update as new data are collected, allowing clinicians to model how a patient's heart might respond to medication changes, revascularisation, or lifestyle modification, thereby supporting truly adaptive and preventive medicine. Beyond individual care, population-level digital twins could help identify vulnerable groups, optimise resource allocation, and accelerate the evaluation of new treatments. Digital twin frameworks exemplify the convergence of AI, systems biology, and precision medicine. Despite challenges and limitations (data quality, model complexity), they offer a pathway toward continuously learning, data-driven cardiovascular care (Corral-Acero et al., 2020^[10]).

Over the past decade, CDSS capabilities have been increasingly incorporated into care – often as part of broader health IT systems – especially in hospitals and large practices. Many OECD health systems now use CDSS for preventive care reminders (e.g. prompting cholesterol or diabetes screening) or for acute care decision support (e.g. alerts for possible drug interactions in cardiac medications). The adoption of CDSS parallels the adoption of EHRs, with which they are frequently integrated, which expanded dramatically after 2010 due to policy incentives (in the United States, for instance, CDSS use rose with near-90% EHR adoption in hospitals (Qi et al., 2025^[4]). Precise utilisation rates vary by setting and country, but CDSS are commonly available in modern cardiology practice environments – from specialised algorithms in catheterisation labs to primary care tools for cardiovascular risk assessment (Njie et al., 2015^[6]). Machine-learning models are increasingly explored to support cardiovascular decision making, with early studies suggesting potential efficiency gains; however, systematic evidence on clinical outcomes remains limited. With over 1 000 FDA-approved AI-based tools by 2024 – many in cardiology – these technologies are increasingly used in practice, promising faster workflows and more targeted care (Grant et al., 2024^[11]; Singh et al., 2025^[12]).¹

Evidence suggests CDSS can modestly improve the quality of CVD care processes. A systematic review by the U.S. Community Preventive Services Task Force found that CDSS implementations led to significant increases in clinicians' performance of recommended CVD preventive services, risk factor screenings, and treatments (median improvements on the order of 2-4 percentage points in adherence to recommended care) (Njie et al., 2015^[6]). For example, the presence of a CDSS might increase the likelihood that a patient due for a cholesterol test actually gets one, or improve rates of appropriate antihypertensive prescribing by a few percentage points. Across large populations, such incremental gains can be meaningful. However, the impact on patient outcomes (like actual reductions in blood pressure, cholesterol levels, or CVD events) was inconsistent with some studies finding evidence of improvement and others failing to. Overall, reviewers concluded that CDSSs can improve process measures of care, but more evidence is needed to demonstrate clear reductions in CVD morbidity and mortality attributable to these decision support tools (Njie et al., 2015^[6]).

Individual studies suggest promise in specific contexts: for instance, a CDSS in community clinics significantly improved control of cardiovascular risk factors in socio-economically vulnerable patients (Gold et al., 2022^[13]). In the management of heart failure (HF), for example, integrating CDSS into care has been associated with better adherence to guideline-directed therapies and even improved clinical outcomes in certain cases. A review noted that while broad EHR adoption alone did not automatically HF outcomes, targeted EHR-based decision tools (a form of CDSS) did help increase guideline-concordant care and were linked to better patient self-management and clinical results (Kao, 2022^[14]).

Based on the available evidence, CDSSs can help to standardise care and reduce gaps between evidence and practice. They can remind busy clinicians of best practice, potentially preventing errors of oversight. By processing large amounts of clinical data, advanced decision support (increasingly augmented by AI – see below) can also identify non-obvious patterns – for example, flagging a combination of subtle ECG changes and lab results that suggest HF risk.

Nevertheless, limitations exist. Early-generation CDSS often produced alert fatigue (too many pop-up alerts leading providers to override or ignore them). Integration challenges and poor usability have sometimes hindered uptake, with resistance to tools that disrupt workflow. Moreover, if underlying clinical guidelines are outdated or not applicable to a particular patient – say an elderly multimorbid patient not fitting trial populations – CDSS advice can be less useful or even misleading. AI-ready guidelines are thus urgently needed to ensure correct evidence-to-CDSS mapping. This requires digital libraries containing phenotype definition to ensure harmonisations of definitions and alignment across guidelines. Furthermore, guidelines adapted to local circumstances (e.g. resources, language, culture) are needed before wide-scale implementation.

Gaps also exist in evidence on long-term outcomes. Many studies suggest improved care processes but evidence on meaningful improvements in patient outcomes (e.g. fewer heart attacks or strokes) remain elusive (Kao, 2022^[14]). Good implementation and continuous evaluation and updating of CDSSs are pivotal. When implemented well, a CDSS can effectively prompt better CVD preventive care, but they work best as part of a comprehensive strategy including provider education and patient engagement (Kao, 2022^[14]).

5.1.2. EHRs and related data systems enable prevention, early detection and management

EHRs are primarily clinical information systems used to document and exchange patient data. On this foundation, additional functionalities – such as dashboards, decision-support modules, and analytics – can support prevention and management of CVD (Slawomirski et al., 2023^[15]; Kao, 2022^[14]). The past decade has seen near-universal EHR adoption in some high-income countries. Countries including Denmark and Estonia have implemented comprehensive, national EHR systems enabling seamless data flow across care settings. The widespread use of EHRs means that most patients with CVD have their histories, medications, and investigations recorded electronically, which can theoretically support co-ordinated prevention and management of CVD.

EHR platforms also enable large-scale data aggregation – facilitating national CVD registries and research networks. For instance, the European Heart Rhythm Association's Atrial Fibrillation (AF) Ablation Pilot Study leveraged a multi-country registry to collect real-world data on 1 410 patients undergoing AF ablation across 72 centres, yielding insights into outcomes and practice variation (European Heart Rhythm Association, 2014^[16]). Of course, such initiatives that access and link data for direct and indirect purposes are predicated on good EHR infrastructure (OECD, 2019^[17]).

The impact of EHRs on cardiovascular care can take several forms. Firstly, access to EHR by relevant providers improves information continuity – all members of a patient's care team (cardiologists, primary care physicians, emergency department staff) can view a patient's history, medications, allergies, and test

results. This is expected to reduce errors such as duplicate medications or overlooked contraindications and supports safer care transitions for CVD patients. For example, when a HF patient is discharged from hospital, their outpatient provider can see the discharge summary without delay and adjust treatment accordingly.

EHRs also enable population management: using EHR data, clinics can identify patients overdue for cholesterol checks or vaccinations, supporting preventive care outreach. Some evidence suggests that specific EHR-based interventions can improve care quality. A review noted that employing EHR tools – like automated reminders for physicians about therapy optimisations or patient portals for self-monitoring weight and symptoms – was associated with better adherence to HF guidelines and even improved patient outcomes in some instances (Kao, 2022^[14]). Similarly, EHR data analytics have been used to flag care gaps, such as finding coronary artery disease patients not on statins, and prompting targeted improvements (Kao, 2022^[14]).

The rich data in EHRs are increasingly being mined to develop predictive models – for example, algorithms that predict which hypertensive patients are at highest risk of a cardiovascular event within five years, so that clinicians can intervene proactively (Grant et al., 2024^[11]). Research leveraging EHR databases has led to discoveries in CVD trends, treatment effectiveness, and identification of at-risk cohorts (Dhingra et al., 2023^[18]). The FIND-AF algorithm, developed using machine learning models, which scans primary care medical records for red flags that a patient might develop atrial fibrillation, which, when undiagnosed can lead to stroke, is being piloted (Nadarajah et al., 2023^[19]). Such initiatives depend on robust governance frameworks addressing privacy, public engagement and cybersecurity.

Despite the obvious potential, broad studies on EHR adoption have revealed modest direct impact in outcomes. Early analyses comparing hospitals with and without EHRs found mixed results in CVD care quality. One study noted that EHR adoption was not by itself associated with major improvements in HF outcomes or 30-day readmission rates (Kao, 2022^[14]). A 2023 survey of OECD countries found persistent fragmentation of EHRs, with only 15 of the 27 responding countries reporting a single, unified EHR covering the entire healthcare system (Slawomirski et al., 2023^[15]).

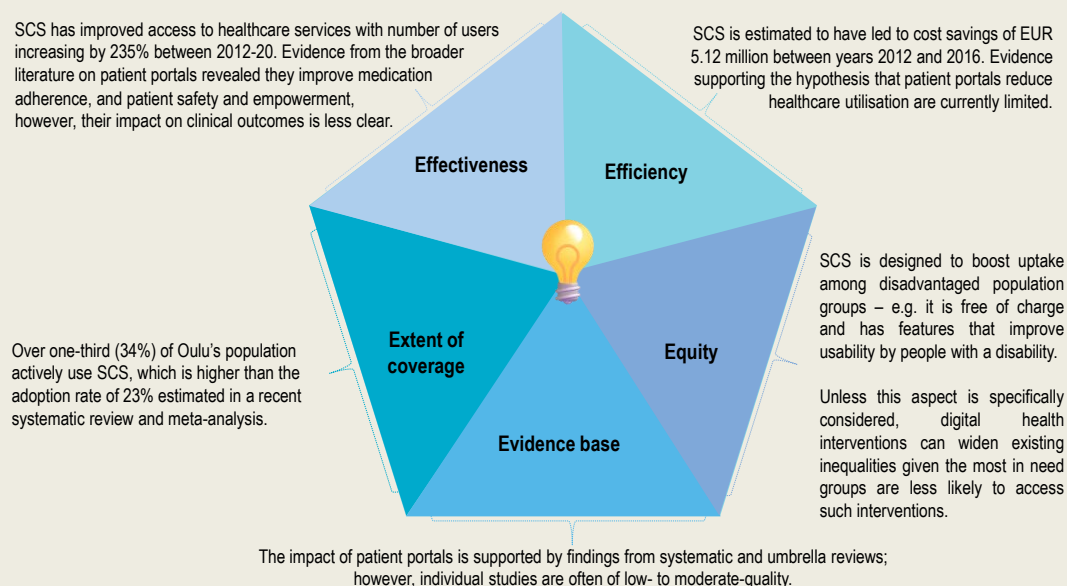
Better information does not translate to improved outcomes organically or automatically. Much depends on how effectively the EHR is used. Clinician users often report that current EHR interfaces are cumbersome, consuming time that could be spent with patients. Usability issues and alert fatigue can hinder the effective use of EHR features. Interoperability is another challenge: if data cannot easily flow between different healthcare institutions, the continuity benefits are undercut. Concerns about data privacy and security remain salient. The OECD survey of 2023 found ongoing challenges in the governance of harnessing EHR data for analytics and research. Many of these challenges have been reported since 2012. They include legal barriers, lack of resourcing, and ongoing resistance from providers. A lack of social consensus, license and trust is a key barrier to using EHR data for these purposes (Slawomirski et al., 2023^[15]). This is also explored further in Section 0.

The potential of EHRs in preventing and managing CVD is nevertheless considerable. When optimised, they standardise best practices (partly through embedded CDSS alerts discussed above), track outcomes, and enable large-scale quality improvement initiatives. For example, integrated EHR data allowed the American Heart Association's *Get With The Guidelines* program to monitor and improve adherence to acute myocardial infarction treatment metrics nationwide (Njie et al., 2015^[6]). As such, EHRs can form the backbone of digital cardiology if universally adopted and used for direct patient care as well as research, and a consensus exists that they are a necessary foundation for improving CVD management. To truly realise benefits, ongoing efforts to enhance their usability, interoperability, and incorporation into clinical workflow are needed. When coupled with other digital tools - and applied in a patient-centred way - EHR systems can meaningfully contribute to better prevention and management.

Box 5.1. Best practices for advancing cardiovascular health: Oulu's Self Care Service

Description: In 2011, the City of Oulu, Finland, scaled-up its digital patient-provider portal – the Self Care Service (SCS) – to all residents. SCS offers patients a range of online primary care services such as online appointment booking, messaging with professionals and ePrescriptions. SCS is tethered to each individual's electronic health record (EHR) to ensure health professionals have ready access to patient data. For health professionals, SCS provides guidelines and care pathways based on individual patient data. SCS is voluntary and free-of-charge.

Best practice assessment:



Enhancement options: To *enhance effectiveness*, policy makers can continue efforts to boost population health literacy to ensure patients understand the information they receive and therefore appreciate the usefulness of SCS. To enhance equity, plans to expand the number of languages available on SCS can be prioritised given languages such as Dari and Somali are spoken by refugees who typically have worse health outcomes. To enhance the evidence-base, researchers can capitalise on the high-quality data stored within Finland's national EHR system by evaluating the impact of SCS on outcomes and healthcare utilisation. Several options to enhance the extent of coverage are available such as encouraging health professionals to promote SCS to patients.

Transferability: SCS has been transferred from Oulu to other Finnish municipalities. It has not been transferred to other countries, however, many OECD and EU countries allow patients to access their EHR via a patient portal (or have plans to). Results from the transferability assessment using publicly available data revealed SCS is most suited to other Nordic countries, which have digitally advanced healthcare systems.

Conclusion: SCS is a patient-provider portal offering residents of Oulu access to a wide-range of primary care services online. SCS is a global leader in this area, however, further enhancements are possible, as outlined in this case study. A high-level transferability assessment revealed Nordic countries are most suited to SCS, nevertheless, there is political interest among a number of countries to improve patient access to their data.

Source: OECD (2023^[20]), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, <https://doi.org/10.1787/9acc1b1d-en>.

5.1.3. Telemedicine and telehealth in cardiovascular care has been shown to improve access and outcomes

Telemedicine refers to the remote provision of clinical care through digital communication technologies, while telehealth encompasses a broader range of remote health-related services including rehabilitation, follow-up and patient education. Telemedicine has moved from a niche offering to a mainstream component of cardiovascular care in recent years. Modalities include video or phone consultations, remote cardiac monitoring, and virtual clinics and virtual wards for chronic disease management. The COVID-19 pandemic in 2020 dramatically accelerated telemedicine adoption across OECD health systems, as regulatory barriers were lowered and both patients and providers became more familiar with remote consultations (OECD, 2023^[21]; Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]). In many countries, cardiology services rapidly shifted to telehealth for routine check-ups, follow-ups, and rehab sessions when in-person visits were limited. Even post-pandemic, telemedicine remains a key part of care delivery for CVD, valued for its convenience and ability to reach patients who otherwise face access barriers.

Pre-2020, telemedicine use in CVD care was “not used at scale” in most OECD Member countries (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]), though pockets of innovation existed such as telestroke networks in some regions, or remote HF monitoring programmes. The pandemic forced countries to adapt, leading to the volume of teleconsultations surging by several-fold within months. In 2020, in-person cardiology visits dropped significantly in many countries, replaced by telephone or video visits. OECD analysis found in-person consults per capita fell by up to 30%, reflecting substitution by remote care (OECD, 2023^[21]). By 2021, telehealth stabilised but remained far above pre-pandemic levels; in the United States, for instance, telehealth accounted for around 4-5% of all outpatient claim submissions in late 2021 (up from virtually 0% before) (Edmiston and AlZuBi, 2022^[23]), and it is now common for cardiology practices to offer a mix of in-person and telemedicine appointments.

Remote consultations are especially used for follow-up (e.g. reviewing blood pressure or cholesterol lab results), cardiac rehabilitation sessions, and managing stable HF patients who require frequent check-ins. Telemedicine's uptake is likely a function of high patient satisfaction and acceptance. Surveys show most patients find virtual cardiac care acceptable and would use it again (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]). An example from Ireland is the Virtual Atrial Fibrillation Care at Home Pathway, where – following an assessment in the Emergency Department – eligible patients are provided with a home blood pressure monitor and access to *Fibrichck* (a certified smartphone App that monitors heart rate and rhythm) and are then managed at home (HSE, 2025^[24]).

A growing evidence base suggests that telemedicine can enhance outcomes in addition to traditional face-to-face care in cardiology. A 2024 systematic review found that it was associated with significant improvement in patient access, satisfaction and patient outcomes in chronic disease management, especially diabetes (Ezeamii et al., 2024^[25]), while an umbrella review of 98 systematic reviews concluded that 83% of reviews found telemedicine “at least as effective as” in-person care for clinical outcomes across various conditions (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]). In the CVD context, studies and trials have demonstrated telehealth's effectiveness. For example, multiple randomised trials of telemedicine-based cardiac rehabilitation (where patients do rehab exercises and counselling at home with remote supervision) have shown equivalent or better improvements in exercise capacity and risk factor control compared to conventional face-to-face rehabilitation (Gallegos-Rejas et al., 2024^[26]). This has considerable import, since tele-rehabilitation expands access for patients who face geographic or mobility barriers.

Another area is chronic HF management: remote monitoring of patients' weight, blood pressure, and symptoms combined with scheduled teleconsultations has led to reduced hospitalisations. A 2022 meta-analysis found that in HF patients, a telemedicine intervention consisting of combined remote monitoring plus consultation was associated with a 29% reduction in cardiovascular-related hospitalisations and a significant reduction in cardiovascular mortality (risk ratio ~0.83) compared to usual

care (Kuan et al., 2022^[27]). Notably, the benefits were observed when telemedicine was comprehensive (monitoring + active management). Remote consultations alone without data monitoring did not significantly change outcomes (Kuan et al., 2022^[27]). Telehealth has also shown to be effective in hypertension management – patients receiving remote coaching and telemonitoring achieved slightly better blood pressure control than those with usual office care – and in secondary prevention. One study reported small but significant improvements in systolic blood pressure through telemedicine with patients recovering from myocardial infarction (Kuan et al., 2022^[27]).

Overall, evidence suggests that telemedicine can be a useful addition to face-to-face management of cardiovascular conditions, while often improving patient convenience and adherence. In fact, the OECD review concluded telemedicine interventions have demonstrated concrete benefits such as reducing chronic HF mortality and improving patients' physical activity levels (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]).

The key advantages of telemedicine in cardiology include improved access (patients in remote or underserved areas can consult specialists without travel), timeliness (early follow-ups can be done quickly via video), and potentially cost savings for both patient and system, if hospital admissions are avoided (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]). Telehealth can also promote multidisciplinary care. For example, a virtual heart team conference can bring together cardiologists, dietitians, and nurses to counsel a patient with coronary disease.

However, there are limitations. Not all evaluations or treatments can be done remotely. Certain visits, like initial diagnostic workups or procedures (stress tests, echocardiograms), still require in-person attendance. Another challenge is technology access and literacy. Older CVD patients may struggle with video platforms or may not have high-speed internet, which can exacerbate disparities. Digital divide concerns have arisen. A study found older and lower-income cardiac patients were less likely to engage in telehealth, requiring strategies to improve usability and access (Dhingra et al., 2023^[28]). Reimbursement and regulatory frameworks are still catching up – not all countries reimburse telecardiology at parity with in-person care, and cross-jurisdiction care (important for rural areas near borders) can face licensing hurdles.

Despite these issues, the use of telemedicine is growing in cardiovascular care delivery. The general consensus from outcomes studies is encouraging: telehealth is effective and safe for managing many CVD patients, with particular success in chronic disease management (e.g. HF) and preventive coaching, as long as it is used in appropriate contexts (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]; Kuan et al., 2022^[27]). The focus now is on refining hybrid care models that optimally mix telemedicine with hands-on care, and ensuring no patient populations are left behind as care increasingly goes digital.

The survey results from the *2025 OECD Cardiovascular Policy and Data Survey* paint a different picture, however. Only six countries (**Croatia, Estonia, Germany, Ireland, Norway and Slovenia**) reported having in place telemedicine facilities that connect stroke patients in remote regions with specialist stroke teams. Eight (**Estonia, France, Germany, Ireland, Latvia, Norway, Slovenia and the United Kingdom**) reported that regulatory frameworks for teleconsultations were either “fully implemented” or “in development”. Meanwhile nine countries (**Canada, Czechia, Estonia, Finland, Germany, Iceland, Ireland, Norway and the United Kingdom**) reported that ambulances have telemedicine capabilities that connect paramedics with physicians and/or specialist stroke teams.

5.1.4. Remote monitoring and home-based cardiac devices can enhance care quality, but managing the volume of data is essential

Remote patient monitoring (RPM) refers to the use of connected medical or consumer devices to collect and transmit cardiovascular parameters – such as blood pressure, weight, or heart rhythm – from patients' homes to healthcare providers. This approach enables continuous monitoring outside traditional clinical settings, supporting early detection of deterioration and proactive management of chronic conditions. In

high-income countries, RPM programmes have expanded for hypertension, heart failure, and arrhythmia detection, using technologies that range from regulated medical-grade devices (e.g. Bluetooth-enabled blood pressure monitors, ECG sensors) to consumer-grade wearables that provide complementary data but may vary in accuracy. By integrating both types of devices, health systems can enhance patient engagement and improve care co-ordination.

Hypertension is an example where home monitoring has made an impact. Patients measure their blood pressure at home using digital sphygmomanometers, and readings can be automatically sent via smartphone apps or telehealth platforms to their clinic. This not only provides a more accurate picture (since home readings avoid “white coat” effects) but also allows providers to adjust medications between office visits and has been shown to overcome therapeutic inertia and yield meaningful improvements in BP levels. A meta-analysis of 46 trials (covering over 13 000 patients) found that home blood pressure telemonitoring (HBPT) significantly improved blood pressure control compared to usual care, lowering systolic BP by about 4 mmHg on average (Duan et al., 2017^[29]). Moreover, patients doing HBPT were more likely to achieve blood pressure targets than those with office measurements alone. The effect was even greater when home monitoring was combined with proactive support such as counselling, education, or medication management from care teams (Duan et al., 2017^[29]). While simply giving patients a BP cuff helps, giving them a BP cuff plus active telehealth follow-up helps more.

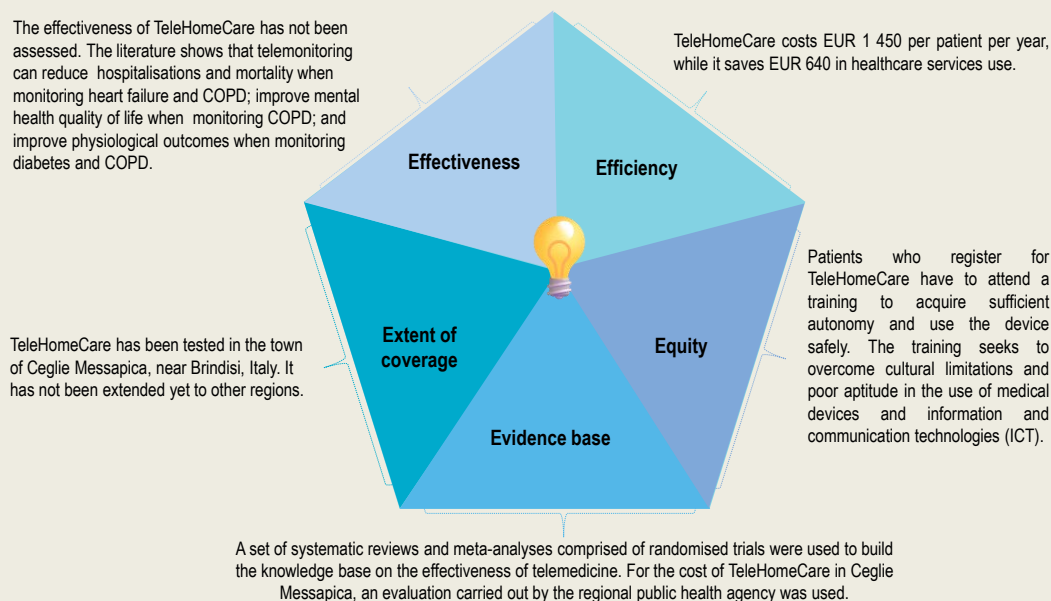
Similar home monitoring approaches exist for other risk factors: diabetics use glucometers feeding data to digital logs; patients trying to lose weight use Wi-Fi scales; those with hyperlipidaemia might use digital pill bottles or apps to ensure medication adherence. While these devices by themselves are not treatments, they facilitate behaviour change and early intervention. If a hypertensive patient’s readings creep up, for example, a nurse or pharmacist can intervene via a phone call rather than waiting for the next clinic visit potentially avoiding months of uncontrolled pressure. The overall evidence supports that home monitoring, when coupled with clinical response, leads to better risk factor management and could reduce cardiovascular events (Duan et al., 2017^[29]).

Patients with HF benefit from at-home monitoring of weight, blood pressure, heart rate, and symptoms. Sudden weight gain can indicate fluid retention and impending decompensation; detecting this early via a connected scale allows for diuretic adjustments and averts hospitalisation. Trials like TIM-HF and others demonstrated that remote monitoring of HF patients (with daily weight and symptom reporting, plus nurse follow-up) reduced HF hospitalisations and improved survival in some studies (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]). As mentioned above, a programme of remote monitoring plus teleconsultation was associated with a 29% reduction in HF hospitalisations, based on a meta-analysis (Kuan et al., 2022^[27]). Other successful examples include the STOP-HF screening programme in Ireland (HeartBeat Trust, 2025^[30]).

Box 5.2. Best practices for advancing cardiovascular health: TeleHomeCare

Description: TeleHomeCare is a digital intervention designed to support home care through telemonitoring and teleconsultation for patients who suffer from one or more of the following chronic diseases: HF, chronic obstructive pulmonary diseases (COPD) and diabetes. TeleHomeCare was initially developed in Ceglie Messapica (a small town near Brindisi, Italy). The intervention involves the patient, caregivers of patients, General Practitioners (GPs), specialists, and nurses working in the area. The device installed at the patient's home – called Hospital-at-Home (H@H) – allows the patient to monitor physiological parameters, share measurements with control room operators and care providers. All clinical parameters of the patients based at home are centralised in the hospital, which respect all privacy laws. The device allows doctors to have remote consultations with patients via video.

Best practice assessment:



Enhancement options: Monitoring and evaluating clinical outcomes of TeleHomeCare are needed to enhance the effectiveness. While the intervention was evaluated to cost more than it saves, future evaluation of TeleHomeCare can envisage taking a broader perspective, valuing improved quality of life of patients, reduced waiting and travelling times, reduced workload of healthcare workers, and higher work productivity of patients. Efforts can focus on enhancing the internet network to enable access to TeleHomeCare technology and improve access to population groups who are at risk of digital exclusion, in particular older people, disabled people, people in remote locations and those on low incomes.

Transferability: TeleHomeCare is likely to be transferable, since telemonitoring is experimented with in many countries, either at the national, regional or local level. In addition, there is political support given most countries have a national eHealth and telehealth policy or strategy. However, health- and digital literacy are important considerations.

Conclusion: By favouring continuity of care from hospital to the home setting, TeleHomeCare has the potential to reduce costs due to long hospital stays and emergency services use. Further evaluations on what aspects of the intervention work well and do not work well are needed to improve effectiveness.

Source: OECD (2023^[20]), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, <https://doi.org/10.1787/9acc1b1d-en>.

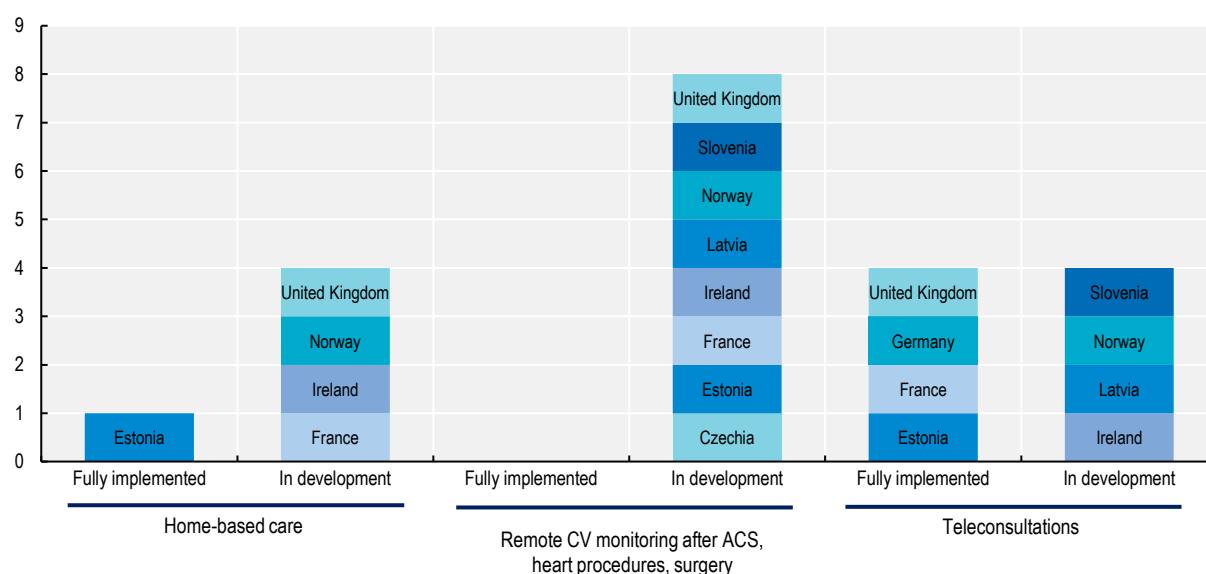
Some HF programmes also use patch-based sensors that track respiratory rate or thoracic impedance (as a proxy for lung fluid) to detect decompensation. One of the more cutting-edge technologies is the CardioMEMS device – an implanted pulmonary artery pressure sensor. This tiny sensor is placed in a patient’s pulmonary artery via catheter and transmits daily pressure readings wirelessly to their doctor. The CHAMPION trial showed that managing HF based on this continuous pressure data led to nearly a 30% reduction in HF hospitalisations over 15 months (Eze, Mateus and Cravo Oliveira Hashiguchi, 2020^[22]), an example of an invasive but efficacious digital monitoring tool. While not a “wearable” per se, it exemplifies how digital tech can directly improve management by providing actionable, real-time data from outside the clinic.

Detecting cardiac arrhythmias, such as atrial fibrillation (AF) or sporadic tachycardias, traditionally relied on Holter monitors – portable devices with electrodes that record ECG for 24 to 48 hours. Holter monitors are a well-established tool, and essentially an early form of wearable tech prescribed by healthcare professionals. They have helped diagnose countless cases of intermittent arrhythmia. However, their limited recording duration can miss infrequent events. Today’s digital health toolkit has expanded to include extended continuous ECG monitors, such as adhesive patch monitors, event recorders, and even implantable loop recorders for long-term monitoring.

Studies comparing newer wearable ECG patches to traditional Holters show striking differences in detection yield. In one head-to-head study, a 14-day continuous ECG patch detected arrhythmias in 66% of patients, whereas a standard 24-hour Holter caught arrhythmias in only 9% of the same patients (Chua et al., 2020^[31]). The patch, worn for 2 weeks, can reveal episodes of atrial fibrillation, flutter, or tachycardia that a one-day recording missed. Specifically, the patch detected atrial fibrillation in 22% of patients (capturing 202 AF episodes), while the Holter detected AF in just 3% (only 1 episode) in that study. Improved sensitivity is important because finding atrial fibrillation, even asymptomatic, can prompt anticoagulation to prevent stroke. Indeed, prolonged monitoring is now recommended in guidelines for patients with cryptogenic strokes to screen for occult AF. Wearable ECG patches and implantable loop recorders (which can monitor for a year or more) have improved detection elusive arrhythmias, leading to earlier and more definitive treatment. While a higher diagnostic yield means fewer missed clinically significant arrhythmias, detecting short term episodes may add little therapeutic value while creating additional work for providers.

Regulatory frameworks to enable safe, high-quality home-based monitoring and care for CVD and other high-impact diseases can be further promoted and harmonised across the EU. Eight countries responding to the OECD CVD survey reported developing regulatory frameworks for remote monitoring after acute coronary syndrome and cardiovascular procedures. Only **Estonia** reported having implemented home-based care regulation, while four reported having one in development. In terms of telehealth, **Estonia, France, Germany** and the **United Kingdom** reported fully implemented regulation (while **Ireland, Norway, Latvia** and **Slovenia** reported these to be in development) (Figure 5.1).

Figure 5.1. Status of regulatory frameworks for new models of CV care



Note: N=18 EU+2 and OECD G20 countries (Austria, Canada, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

The downside of longer monitoring is the volume of data produced – hundreds of hours of ECG that must be analysed. The limitation mainly involves ensuring the data are acted upon (having care team infrastructure to respond to alerts) and dealing with potential false alarms or patient anxiety from constant monitoring. Still, remote monitoring stands out as one of the most tangible successes in digital cardiology, directly linking patients' daily health metrics to timely clinical interventions. Algorithmic analysis (often AI-powered) is being applied to filter and identify episodes of concern, helping clinicians manage the data deluge.

5.1.5. Wearable devices and smartwatches show promise but uptake skews towards healthier and wealthier users

Wearable eHealth devices – especially smartwatches and fitness trackers – have seen explosive growth among consumers, and they are increasingly relevant to cardiovascular health. These gadgets blur the line between medical device and lifestyle accessory. Modern wearables come equipped with sensors that measure heart rate, physical activity, and even perform single-lead ECGs or blood oxygen saturation readings. In the context of CVD prevention and detection, wearables offer a unique opportunity: they allow continuous or frequent monitoring in everyday life, potentially catching early signs of disease or motivating healthier behaviours.

Wearables have seen rapid adoption across high-income countries. Recent market data show that as of 2023, roughly one in three adults in the United States uses some form of wearable health tracker (smartwatch or fitness band) (Dhingra et al., 2023^[28]). Global estimates indicate over 400 million people worldwide use smartwatches, with the user base expected to approach half a billion in 2025, with Poland, Germany and France among the top ten adopters (Kumar, 2025^[32]). This popularity stems from the appeal of these devices as consumer electronics for fitness and communication, as well as increasing health awareness. Cardiologists see patients already armed with data from their wearable device and health systems have begun pilots to integrate patient-generated wearable data into electronic records for

monitoring of conditions like atrial fibrillation or post-operative recovery. As consumer wearables become ubiquitous, their influence on CVD care is rising.

However, disparity in their usage has been observed and, paradoxically, those who might benefit most (older, less healthy individuals) are less likely to be using wearables, whereas younger, health-conscious individuals lead adoption. Although this trend may benefit the latter group as they age, it is important to ensure that current non-adopters are not overlooked. In the United States, fewer than one in four individuals with, or at high risk of, CVD use a wearable device. Those with established CVD who do own a wearable, only about 38% use it regularly, compared to almost half of healthy adults (Dhingra et al., 2023^[28]). Ensuring accessibility for older adults, low-income users and people with limited digital literacy is critical to prevent widening cardiovascular health inequalities.

Wearables can also contribute to better cardiovascular health by encouraging physical activity and healthier lifestyles. Fitness trackers count steps, measure exercise duration, and often allow goal-setting with feedback, which can motivate users to move more. There is evidence that these devices succeed in boosting activity levels. A 2022 meta-review encompassing 163 000 participants found that wearable activity trackers (including pedometers and smartwatches) significantly increased physical activity, adding approximately 1 800 extra steps per day and about 40 minutes more walking per day on average compared to controls. Users also saw improvements in weight and body composition – about a 1 kg more weight loss on average and reductions in BMI and waist circumference – when using wearables to support lifestyle change (Ferguson et al., 2022^[33]). These modest effects can be clinically meaningful: even a ~2 mmHg blood pressure reduction or a kilogram of weight loss can contribute to lower CVD risk. The review concluded that activity trackers are effective at increasing physical activity across age groups and populations, with benefits sustained over time, and recommended their use as a public health intervention [ibid.].

[My sports monitor] provides me with recommendations regarding physical activities, heart rate, exercise level, [and] sleep/sleep assessment. In addition, I use a health watch to find out about my hypertension, ECG, blood numbers on cholesterol and others.

Ulrich, 65, retired military officer, heart attack and transient ischaemic attack survivor, living with high cholesterol, arrhythmia and heart failure.

Other studies reflect these findings, showing improvements in exercise capacity (e.g. better six-minute walk test distances) among cardiac rehab patients given wearable monitors and app-based coaching (Zhu, Zhao and Wu, 2024^[34]). Wearables can also incorporate features like reminding users to stand if they've been sedentary too long, monitoring sleep (poor sleep is a risk factor for hypertension), and tracking stress or heart rate variability – all data that can potentially nudge users toward healthier behaviour or alert them to trends. There is growing interest in leveraging these devices in preventive cardiology programmes; for example, some insurers provide fitness trackers to members as part of wellness incentive programmes, banking on the evidence that increased activity translates into healthier outcomes.

One of the more attention-grabbing impacts of smartwatches has been in the detection of atrial fibrillation and other arrhythmias. Several smartwatch models now have EU-cleared features that can passively monitor pulse irregularity via photoplethysmography (PPG) and actively record a single-lead ECG. These capabilities turn the watch into a basic heart rhythm monitor.

The *Apple Heart Study* illustrated the potential smartwatch potential. This study enrolled over 419 000 participants to assess the Apple Watch's ability to identify undiagnosed AF. Over about four months of monitoring, ~0.5% of participants received an alert of an irregular pulse, and of those who followed up with an ECG patch, 34% were confirmed to have atrial fibrillation. The positive predictive value was 84% for the watch's irregular rhythm notification – i.e. most notified cases were true AF upon further evaluation (Perez et al., 2019^[35]). While the yield of screening was relatively low (only a half-percent got flagged), the system was reasonably accurate and could safely identify new AF cases that might have gone otherwise undetected. No serious adverse events were reported in the study, and about 57% of those notified sought medical attention as advised (Perez et al., 2019^[35]). Similar studies, including Fitbit's Heart Study and various smaller trials have also suggested that wearables can pick up asymptomatic AF with a decent reliability. However, the role and benefit of opportunistic passive smartwatch AF screening in initiating anticoagulation therapy remains to be seen.

The benefits of wearables include empowering individuals to take charge of their health metrics daily. For clinicians, patient-generated data from wearables can provide insights that one-off clinic measurements cannot, capturing sporadic events or lifestyle patterns. For instance, knowing a patient's step count trend can contextualise their weight and blood pressure trends.

However, there are important limitations. False positives and over-diagnosis are a concern; an irregular pulse alert may lead to anxiety and a cascade of tests in some cases where no significant pathology exists. The specificity of algorithms can be high but is far from perfect, and remain to be validated, while benign variants like premature beats can trigger alerts. This requires the healthcare system to be ready to process these outputs – triaging which alerts need follow-up. Interpreting consumer ECGs also adds to clinicians' workloads, and responsibilities and costs associated with possible technical failures may discourage adoption in the medical and pharmaceutical industries. Additionally, there is no guarantee of sustained use. People may abandon their wearable devices after the novelty wears off. Long-term adherence to using the device (and acting on its data) is variable. Privacy and data security of wearable data is another consideration, as these devices often sync to phone apps and cloud services. As mentioned, wearables currently skew toward younger, wealthier users. Older patients with CVD use wearables at lower rates due to cost, access, or technology comfort (Dhingra et al., 2023^[28]). This could widen health disparities and thwart the goal of participatory, equitable and effective surveillance of CVD (and other diseases).

While I appreciate the advancements in wearable devices and health apps, I believe there is still a gap in their accessibility and usability for older or less tech-savvy patients. Personalization and user-friendly designs are crucial for these tools to be effective.

Caius, artist, researcher, patient advocate, and heart attack survivor.

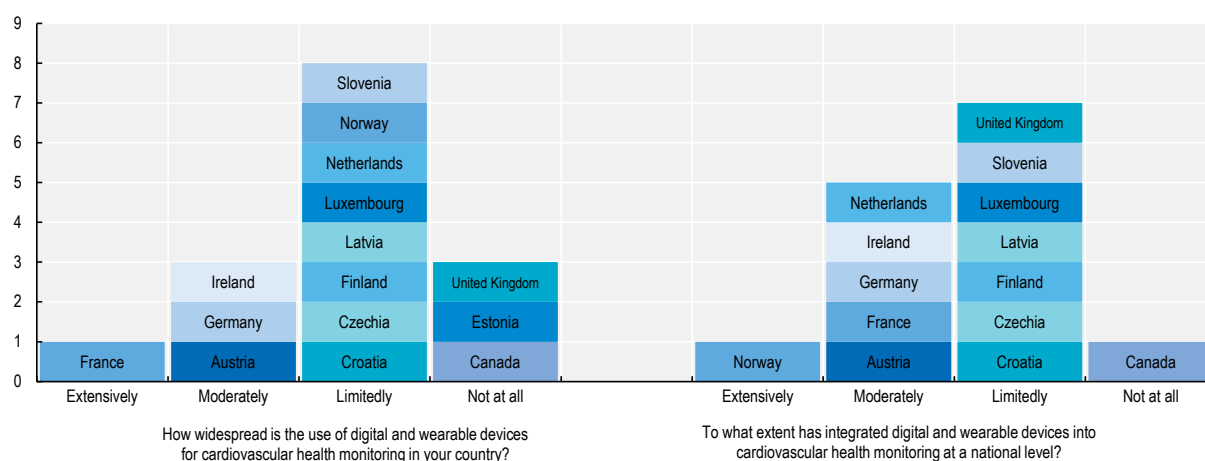
Despite these challenges, the trend is that wearables and smartwatches are becoming more sophisticated each year. Some regulators have embraced a pathway for clearing software as medical devices, which has allowed algorithms on consumer devices (such as Apple's AF detection or AliveCor's smartphone ECG) to be clinically validated and approved (Grant et al., 2024^[11]). As accuracy improves, wearables may contribute not just to detection of disease but to management – for example, guiding titration of exercise in rehab, or monitoring adherence to medications via physiological markers.

In the EU, wearable eHealth devices fall under the Medical Device Regulation (MDR) umbrella and are covered under the EU Regulation on Health Technology Assessment (HTA), under which electronic wearable products face additional scrutiny (EU, 2021^[36]). Differences in classification, assessment, and

oversight are due not only because of the intangible nature of software, but also because they, by definition, involve the collection of sensitive health data. The additional requirements therefore centre on data interoperability, cybersecurity, and their potential use in machine learning / AI (see Section 0). In addition, the EU Regulation on MDR, establishes a framework for the systematic clinical evaluation of high-risk medical devices such as implantable devices or active devices intended to administer or remove medications (*ibid.*).

Countries report limited use and integration of wearables into national CVD health monitoring (Figure 5.2). Only three EEA countries (**Czechia, France and Norway**) reported having policies in place to promote the adoption of medical devices such as wearable fitness trackers, home ECG-enabled arrhythmia detection devices for CVD prevention and monitoring. Only one of these (**France**) reports having comprehensive data infrastructure to support the transmission of data from wearables to a patient's EHR. Elsewhere, Singapore reports having policies to support the use of medical devices for CVD prevention and monitoring. The Health Sciences Authority (HSA) regulates these devices using a risk-based system, covering both CVD and telehealth tools to ensure safety.

Figure 5.2. Countries report limited use and integration of wearables into national CVD health monitoring



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OCED Cardiovascular Policy and Data Survey.

Nevertheless, wearables represent a potentially powerful public-facing technology for CVD health – they actively engage people in prevention (by promoting exercise and healthy habits) and provide an adjunct diagnostic tool for early detection of problems like arrhythmias. The empirical evidence shows tangible benefits, but realising their full potential will require addressing usage gaps and integrating these tools responsibly into care pathways. Additional areas that need to be carefully addressed include representativeness of the subjects and data used to evaluate these technologies, the interoperability of their data with health information systems, and – as always – the risk of entrenching inequalities. Attention is needed to governance, privacy and capacity of the health system to absorb additional data generated.

Digital health tools such as remote monitoring and online patient portals have been beneficial in managing my conditions, allowing me to track vital signs and communicate with providers more efficiently. However, there are usability challenges, and not all providers use these tools uniformly. Telemedicine has offered convenience but sometimes lacks the personal touch necessary for complex care discussions.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

5.1.6. Some smartphone apps and mHealth platforms can help but their effectiveness varies widely

Alongside hardware devices, software in the form of mobile health apps and digital platforms is transforming CVD management and prevention. Smartphone apps targeting CVD are incredibly diverse – ranging from simple activity trackers, medication reminder apps and blood pressure diaries to comprehensive cardiac rehabilitation programmes and interactive coaching platforms. These apps are accessible to the public via app stores – for better or worse as their quality and effectiveness can vary considerably. Additionally, SMS text message-based programmes (an early form of mHealth) have demonstrated some success in behaviour change for CVD prevention, especially in low-resource settings.

Numerous apps aim to improve lifestyle factors that contribute to CVD. For instance, there are apps for smoking cessation (providing tips and tracking quit progress), dietary improvement (logging food intake and providing heart-healthy recipe suggestions), and increasing physical activity (workout planners, virtual coaches). Many of these apps use techniques like goal setting, gamification (e.g. earning points for each healthy meal), and social support (connecting with peers). One example is the TEXT ME study from Australia, where patients with coronary disease received regular motivational and educational text messages; after six months, those patients had significantly lower LDL cholesterol, blood pressure, and body mass index compared to controls (Qi et al., 2025^[4]), illustrating that even a relatively low-tech intervention (text messages) can improve multiple cardiovascular risk factors and medication adherence.

A 2024 systematic review and meta-analysis of mobile health apps for coronary heart disease (CHD) patients found that, across 34 randomised trials with over 5 300 participants, use of cardiac mobile apps led to a 32% reduction in the incidence of major adverse cardiac events (MACE) (RR = 0.68) and a 44% reduction in hospital readmission rates (RR = 0.56) compared to usual care (Zhu, Zhao and Wu, 2024^[34]). These apps were also found to improve patients' exercise capacity (VO₂ max), ejection fraction, six-minute walk distances, and medication adherence rates. Psychosocial outcomes also improved with users reporting lowered anxiety and depression scores (Zhu, Zhao and Wu, 2024^[34]). Such findings suggest that well-designed digital interventions can keep patients out of the hospital by better managing their condition. Notably, the meta-analysis did not find a significant impact on blood pressure or LDL cholesterol in aggregate (Zhu, Zhao and Wu, 2024^[34]), suggesting some risk factors still require more intensive intervention beyond what apps achieved, or perhaps that usual care was already effective in those areas.

My smartwatch counts the steps I take, encouraging me to walk more. I exercise at home using an App. I control my blood pressure through my mobile phone.

Diana, 48, stroke survivor.

In HF, some trials where apps have been used to monitor symptoms and weight and have shown improvements in self-care behaviour and reductions in HF exacerbations (Choi et al., 2023^[37]). These tools are designed to help healthcare providers make evidence-based decisions. Increasingly, consumer apps are bridging to clinical management. Some allow patients to transmit data to clinics (e.g. an app paired with a blood pressure cuff sending readings to a hypertension clinic where clinicians review trends). Electronic cardiac diaries allow patients to log symptoms (chest pain episodes, palpitations) which can be reviewed in follow-up to tailor treatment. On the provider side, digital platforms used by clinicians include apps that calculate risk scores and apps that help guide acute treatment.

Smartphone apps have the advantage of being widely accessible – nearly everyone carries a mobile phone, and app-based interventions are relatively low-cost to scale. They can deliver rich multimedia content (videos on heart-healthy living, interactive quizzes to reinforce knowledge) and can be personalised (for example, adjusting goals based on a user's progress). They also facilitate frequent interaction: daily or weekly messages keep patients engaged in their care continuously, as opposed to the episodic reinforcement that happens only during clinic visits. This “always-on” support is a key reason why digital interventions often improve adherence – patients are repeatedly reminded and educated, which helps sustain behaviour change or medication routines (Zhu, Zhao and Wu, 2024^[34]).

However, not all health apps are effective, and their quality varies considerably. The market is flooded with thousands of “heart health” apps, but only a fraction has been formally evaluated in clinical studies. Many users download health apps but stop using them after a short period (retention is a challenge unless the app is very engaging or the user is highly motivated). Integration can be problematic, where people use apps in isolation and the data may not reach their healthcare providers. For maximum benefit, especially in disease management, apps can be incorporated into programmes where clinicians or coaches actively follow the data and give feedback. Some successful studies provided human support in conjunction with the app (e.g. nurse phone calls when certain thresholds are crossed), making it hard to disentangle the effect of the app alone versus the app plus the human touch.

As always, data privacy and ensuring regulatory compliance (for example, when apps provide medical advice, they need regulatory clearance) are additional considerations. Nevertheless, many organisations are moving towards prescribing vetted apps as adjunct therapy. For instance, the National Health Service (NHS) in the United Kingdom has an app library including ones for managing hypertension or depression, and some insurers in the United States cover programmes like Omada (a digital behaviour change programme for diabetes/CVD risk). As digital health matures, more standardisation and clinical validation of apps is expected, although more high-quality trials are needed to accommodate these tools into mainstream practice (Liu, 2024^[38]).

Evidence to date, especially the meta-analytic data showing reduced cardiac events (Zhu, Zhao and Wu, 2024^[34]), underscores that when used properly, mobile apps can measurably improve patient outcomes in CVD. Going forward, integration of apps with wearables (e.g. an app that not only provides coaching but also takes in data from a smartwatch to tailor recommendations) and with healthcare provider dashboards will likely enhance their impact even further.

Health technologies have played a valuable role in helping me manage my complex medical profile more efficiently. I regularly use a mobile app... which consolidates all my medical records, test results, and reports in one accessible platform. This centralized access has made it significantly easier to track my health history, prepare for appointments, and consult with multiple specialists—especially important given the number of chronic conditions I manage.

I have also seen the potential of wearable technology in improving patient comfort and compliance. For example, during one cardiac assessment, I used a smartwatch-based Holter monitor instead of the traditional wired version. This was by far the most comfortable and unobtrusive experience I've had when monitoring heart activity, and it allowed me to maintain a normal routine while still collecting accurate data. Such advancements in digital health and wearable diagnostics could greatly improve the quality of care and patient adherence, especially for those with long-term or complex conditions like mine.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

5.2. Emerging technologies like AI and big data analytics have potential for advancing cardiovascular health

AI algorithms have shown impressive performance in interpreting medical data relevant to cardiology (Figure 5.3). AI-enabled supports for stroke detection and care have been outlined previously. In medical imaging, for instance, deep learning models can analyse echocardiograms with accuracy approaching that of experienced sonographers. In one blinded study, an AI system automatically assessed left ventricular ejection fraction from echocardiographic images and its initial readings were found to be non-inferior to those of expert human sonographers (He et al., 2023^[39]). AI may soon assist (or even partially automate) the interpretation of routine cardiac ultrasounds, potentially speeding up workflows and improving reliability (Hirata and Kusunose, 2025^[40]). AI has also been applied to analyse 12-lead ECGs to detect subtle patterns; notably, researchers at the Mayo Clinic developed a neural network that can identify patients with asymptomatic left ventricular dysfunction (low ejection fraction) just from their surface ECG – essentially using AI to find a HF signal in what appears to be a normal ECG (Grant et al., 2024^[11]). Such an algorithm can flag patients who would benefit from further echocardiographic evaluation and early intervention.

Another example is the use of AI on chest CT scans performed for other reasons. Here, algorithms can quantify coronary artery calcium on a routine CT scan and thereby estimate CVD risk, even if the scan was done for respiratory problems, for example (Grant et al., 2024^[11]). AI-driven analysis of retinal photographs has even been shown to predict cardiovascular risk factors (blood pressure or smoking status) and risk of cardiac events, illustrating the breadth of AI's pattern-recognition power. Importantly, AI is also being

embedded in wearables and apps – for instance, algorithms that analyse PPG waveforms from a smartwatch to detect not just AF but potentially other arrhythmias or even atrial premature contractions burden. AI can also be deployed to parse the large volumes of data generated by wearables and apps, which would overwhelm any human analyst, thus helping to overcome a major limitation of consumer-facing technologies.

Beyond diagnostics, AI is being used to optimise treatment decisions. For example, machine learning models can predict which HF patients are at highest risk of hospitalisation in the next 30 days, helping clinicians prioritise interventions (this is already used in some hospital readmission reduction programmes). AI-based clinical decision support, as an evolution of the rule-based CDSS discussed earlier, can integrate far more data (genetics, labs, imaging, sensor data) to provide nuanced recommendations – essentially an advanced form of CDSS. Examples include algorithms that analyse coronary angiography images to assist in lesion assessment or help in cardiac MRI interpretation. With these tools, clinicians may gain decision support such as “This patient’s profile suggests a 90% likelihood of responding to catheter ablation for their arrhythmia” or “AI analysis of this echo suggests the patient’s aortic stenosis is severe,” which can supplement clinical judgment.

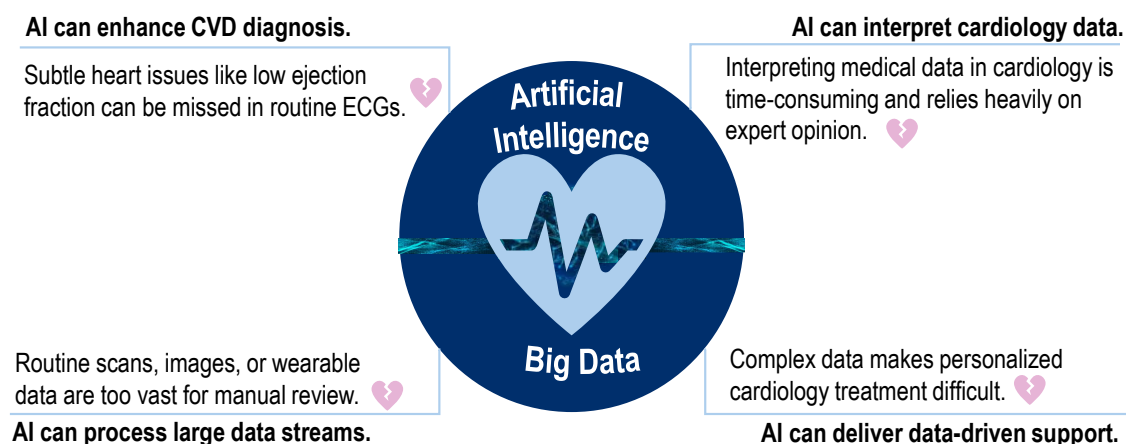
5.2.1. Large language models have the potential to improve the management of CVD

Another emerging application is **large language models (LLMs)** being tested to enhance patient communication and health coaching (Grant et al., 2024^[11]). Early experiments suggest LLMs can draft answers to patient questions, potentially helping to keep patients informed and engaged outside of brief doctor visits. However, this technology is still nascent and requires further rigorous investigation.

The amalgamation of large datasets from EHRs, registries, wearables, and genomics is allowing for predictive analytics at scale. In research contexts, projects like the UK Biobank and the All of Us project in the United States are correlating genetic profiles with lifetime cardiovascular outcomes to find new risk factors. Clinically, integrated data networks enable something like a national CVD surveillance system – using EHR data across hospitals to track trends in heart attacks, HF admissions, and outcomes in near real-time (Williams et al., 2022^[41]). This can guide public health interventions and resource allocation.

With improved interoperability, cardiologists will have more complete data on their patients (for example, knowing about that emergency visit in a different city, or being alerted if their patient’s wearable detects an issue). Algorithms could potentially help tailor prevention strategies to individual risk profiles far beyond traditional risk scores. It could also reduce diagnostic errors and free up clinicians from mundane tasks (like measurements on imaging) to focus on complex decision making and patient counselling. The ESC-EHRA EORP Atrial Fibrillation Ablation Long-Term Registry – a prospective observational study conducted across 27 European countries and 104 centres, enrolling consecutive patients undergoing catheter ablation for atrial fibrillation – serves as an example of harnessing data from multiple countries and centres to generate real-world evidence in a way a single centre never could.

Figure 5.3. Opportunities for the application of AI in CVD diagnosis and care



Source: Authors based on information from Poterucha, T. et al. (2025^[42]), "Detecting structural heart disease from electrocardiograms using AI", <https://doi.org/10.1038/s41586-025-09227-0>; Singh, M. et al. (2024^[43]), "Artificial intelligence for cardiovascular disease risk assessment in personalised framework: a scoping review", <https://doi.org/10.1016/j.eclinm.2024.102660>; Chowdhury, M. et al. (2025^[44]), "The Heart of Transformation: Exploring Artificial Intelligence in Cardiovascular Disease", <https://doi.org/10.3390/biomedicines13020427>.

However, these technologies bring challenges. Validation and accuracy are paramount – an AI algorithm is only as good as the data it's trained on, and there have been instances of bias (for example, an algorithm underperforming in minority populations if trained predominantly on white patients). Thus, rigorous testing and regulatory oversight are needed to ensure AI tools are safe and effective across diverse populations (Grant et al., 2024^[11]; Oliveira Hashiguchi, Slawomirski and Oderkirk, 2021^[45]). Clinician acceptance is another hurdle – some providers are wary of "black box" algorithms. Explainable AI (making AI outputs interpretable) is an area of active development aimed at addressing this concern, but it is not a substitute for trust and transparency. As the use of personal data increases, concerns about privacy are growing; policies need to ensure that patient data remains protected while enabling meaningful insights. There is also a risk of both over- and under-reliance – AI can serve as a valuable support tool, but it is not intended to replace human judgment. Lastly, there's an equity concern: if sophisticated AI tools only benefit those in high-tech health systems, disparities could widen (Oliveira Hashiguchi, Slawomirski and Oderkirk, 2021^[45]; OECD, 2019^[17]). Democratising access (for example, deploying AI ECG interpretation even in rural clinics via cloud services) is important. The key with these technologies is implementing them thoughtfully, with attention to evidence, ethics, and equity.

Regulation is also a critical aspect to help this emerging technology advance social and public policy objectives. The European Union Artificial Intelligence Act, which came into force in 2025, is the world's first comprehensive legal framework governing AI. It adopts a risk-based approach to regulate AI systems, aiming to ensure safety, transparency, and fundamental rights protection while fostering innovation. The Act categorises models based on the level of risk they pose. It also introduces specific provisions for General Purpose AI, including LLMs. Full compliance obligations take effect in August 2026, with non-compliance resulting in significant fines (EU, 2024^[46]). The European Commission has developed resources to assist developers navigate the Medical Device Regulation and the AI Act (European Commission, 2025^[47]). Like the General Data Protection Regulation (GDPR), the Act has extraterritorial reach because it applies to any system that affects individuals within the EU, regardless of where the provider is based. This positions the Act as a potential global standard for AI regulation.

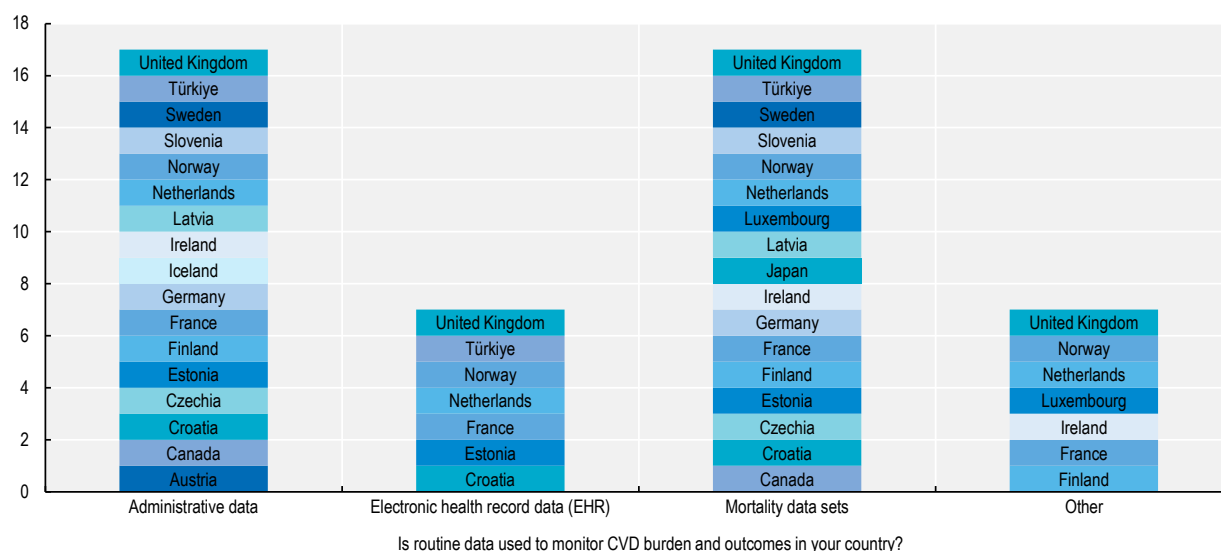
5.3. Leveraging health data is essential to fully realise the benefits of existing and emerging technologies

A range of routinely collected health data can be leveraged to improve CVD prevention and management both directly, and by underpinning the digital technologies outlined above. Each data source – including EHRs, registries, administrative datasets, mortality data and (increasingly) alternative sources like patient-generated information – provides unique value for guiding interventions and policy. However, it is by linking these data, and making them interoperable across jurisdictions and sectors, that their value can be amplified exponentially, and be harnessed to develop and refine potentially game-changing technologies to prevent and manage CVD.

EHR systems were discussed above mainly in terms of directly improving patient care and outcomes, such as identifying high-risk patients and improving care co-ordination. But because EHRs contain longitudinal patient data from routine clinical encounters, offering a comprehensive view of individual health histories, their data can be put to work in a number of productive ways. They provide a rich source of information for research on CVD prevention, treatments and outcomes that can enable large-scale analysis of real-world evidence – although caveats do apply (Davidson et al., 2020^[48]).

Seven of the 19 participating countries in the *2025 OECD Cardiovascular Policy and Data Survey* reported using EHRs to monitor CVD burden and outcomes (**Croatia, Estonia, France, the Netherlands, Norway, Türkiye** and the **United Kingdom**). For comparison, 17 countries report using administrative datasets and mortality data for this purpose (Figure 5.4). This suggests that countries may not be positioned to leverage EHR data for CVD management and research.

Figure 5.4. Only seven of the 19 participating countries in the 2025 OECD Cardiovascular Policy and Data Survey reported using EHRs to monitor CVD burden and outcomes



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

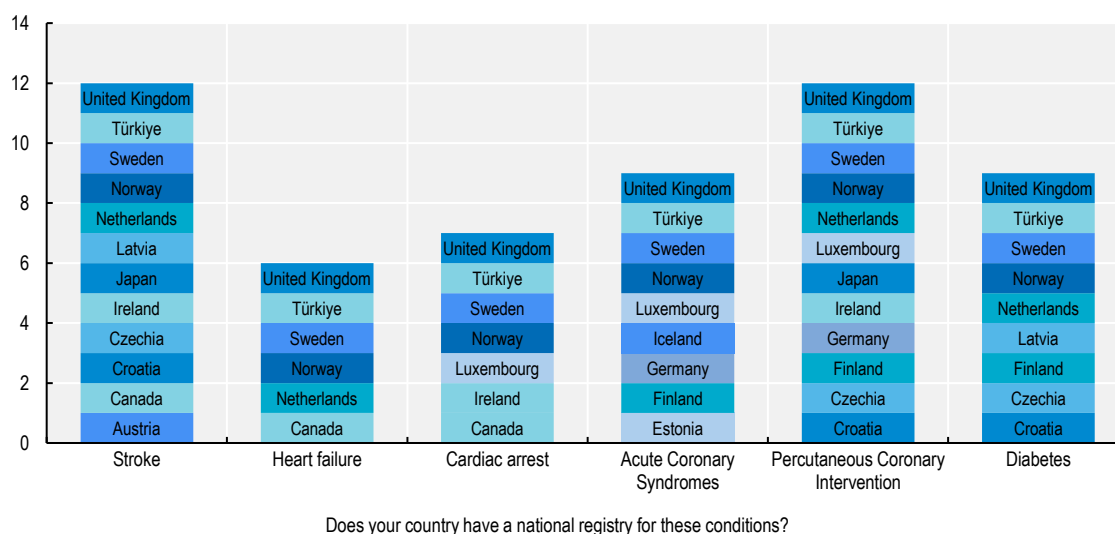
Source: 2025 OECD Cardiovascular Policy and Data Survey.

Disease-specific registries collect standardised clinical information on people who suffer from a specific condition. Registries record how patients are managed and their outcomes, monitor the quality of care, and provide a rich resource for research. They help track disease patterns, evaluate treatments and

adherence to guidelines, and assess the effectiveness of preventive measures in real-world practice. For example, the European Society of Cardiology (ESC) has developed over 20 registries (enrolling 140 000+ patients) through its EURObservational Research Programme to continuously improve patient care and outcomes (ESC_[49]). These support quality benchmarking across hospitals and countries, and they enable studies that include patient groups often excluded from clinical trials such as the elderly or those with complex co-morbidities (ESC_[49]). Among the countries responding to the 2025 OECD survey, 11 (about half) report having a national Stroke registry and PCI registry, while fewer report having registries for HF, cardiac arrest, acute coronary syndrome and diabetes (Figure 5.5). Only three components of stroke registries – morbidity, mortality and demographic information – feature in every registry reported (Figure 5.6).

Registries can also enable randomised clinical trials. For example, **Swedeheart** (the Swedish CVD registry) has pioneered the concept of registry-based randomised clinical trials, leveraging high-quality, population-level data infrastructure for efficient and pragmatic research (Doherty DA, 2023_[50]; Erlinge, 2021_[51]). By integrating trial randomisation and follow-up directly into the existing registry platform, Swedeheart allows investigators to enrol large numbers of patients, capture outcomes through routine clinical data, and minimise the need for costly parallel data collection systems. This approach has produced by the TASTE and VALIDATE-SWEDEHEART trials, which enrolled thousands of patients across Sweden and produced findings comparable to traditional RCTs at a fraction of the cost (Ole Fröbert, 2013_[52]; Erlinge D, 2017_[53]). This illustrates how registries can serve not only as surveillance and quality-improvement tools but also as powerful research infrastructure, bridging the gap between clinical research and real-world care delivery.

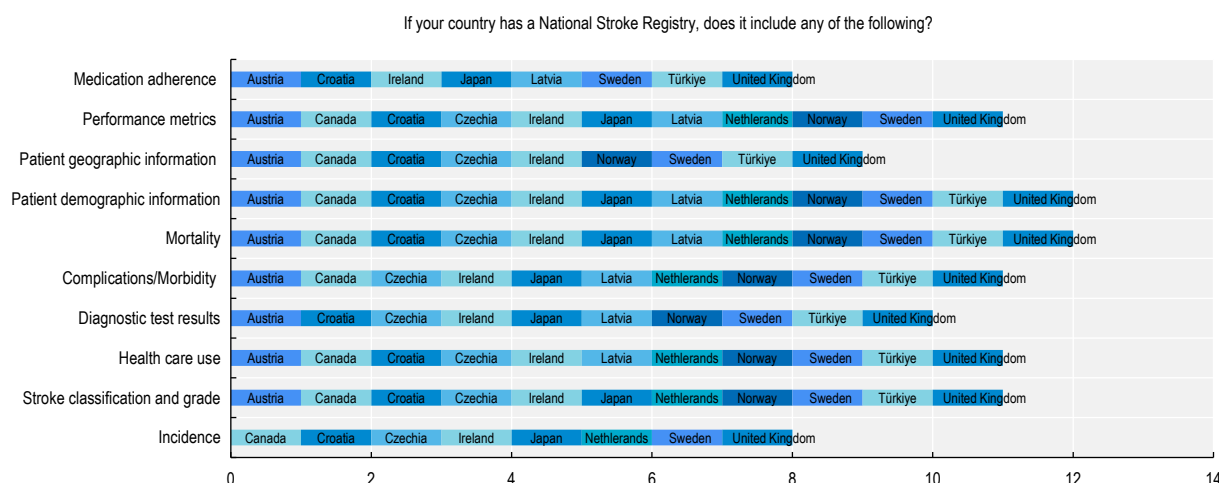
Figure 5.5. Most countries report having a national Stroke registry and PCI registry



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Figure 5.6. Only three components of stroke registries – morbidity, mortality and demographic information – feature in every registry reported



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Administrative health datasets – such as hospital discharge databases and insurance claims – capture information on healthcare utilisation, procedures, and costs. Although collected for non-clinical purposes, these data can be repurposed to monitor CVD care at the system level. Administrative data allow efficient acquisition of large volumes of patient data, providing a big-picture view of disease burden and treatment. Health services can use such data to calculate indicators like hospital readmission rates after heart attacks or procedure volumes and outcomes by hospital. In Europe, routine hospital admission and procedure data are already used for CVD indicators – for example, tracking rates of acute myocardial infarction admissions or cardiac surgeries across countries (ESC_[49]). Administrative data can lack clinical detail, but linking them with clinical registries or EHRs can yield powerful insights (Maciejewski et al., 2022_[54]). In many countries, administrative datasets are the only or main source available because registries are expensive and often absent. While registries provide a more complete picture and enable better monitoring, reliance on administrative data alone can pose challenges for accurately assessing CVD care and outcomes.

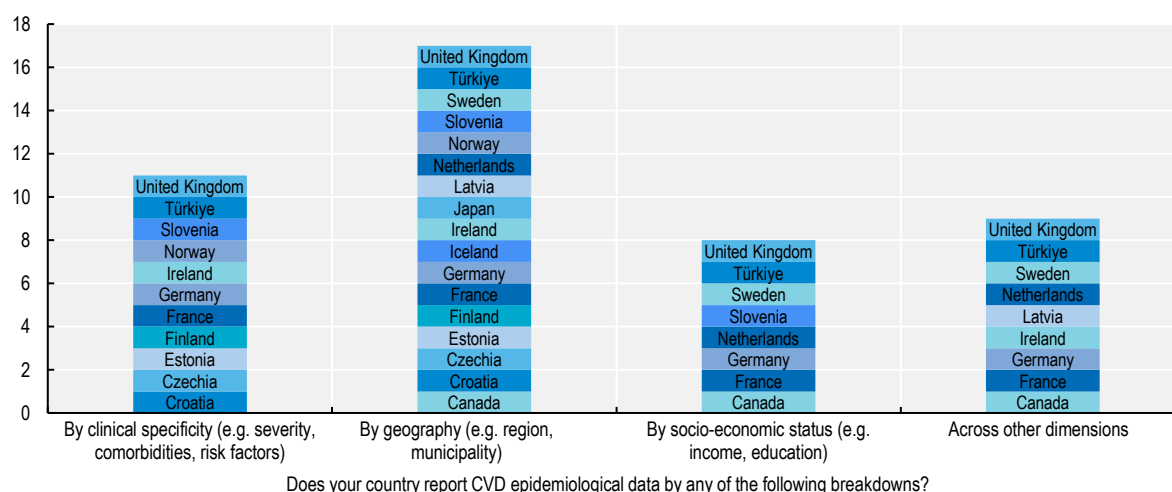
Civil registration and mortality databases record causes of death, providing an indispensable health outcome measure for CVD. Mortality statistics are a fundamental tool to assess long-term trends and the effectiveness of prevention efforts (Palmieri et al., 2018_[55]). The decline in cardiovascular mortality in many countries over recent decades reflects significant progress in prevention and treatment, although disparities remain. These data help identify where CVD continues to be a leading cause of premature death and inform policy priorities. Linking mortality records with patient registries or EHRs enables calculation of survival rates and case-fatality for conditions such as heart attack or heart failure, offering valuable insights into healthcare system performance. However, mortality data are not always fully accurate, as the underlying cause of death is often based on clinical judgment rather than thorough investigation, which can lead to misclassification.

Additional routinely collected data can further support CVD prevention and management. These include risk-factor surveillance systems that track population-level indicators such as blood pressure, smoking rates, and cholesterol levels, as well as prescription registries. Such data help identify emerging trends, such as rising obesity or diabetes prevalence, that influence cardiovascular risk, and they enable monitoring of preventive interventions – for instance, tracking uptake of hypertension treatment or use of

cholesterol-lowering medications. Israel also maintains national registries on CVD-related interventions, including cardiac surgery, transcatheter aortic valve implantation (TAVI), and atrial fibrillation (AF) ablation, which provide valuable insights for improving care and outcomes. As outlined above, patient-generated data from wearables or mobile apps are also becoming more common; when carefully integrated into health systems, these can complement traditional data sources by enabling real-time monitoring of health metrics.

Tracking CVD epidemiology is a cornerstone of effective prevention and management, yet responses to the 2025 OECD survey reveal significant gaps. Seventeen countries reported breaking down epidemiological data by geographic region, and 11 by clinical characteristics such as severity or risk factors. However, only eight countries include socio-economic indicators like income or educational attainment – critical factors for understanding health inequalities and targeting interventions (Figure 5.7).

Figure 5.7. All countries can break down CVD data by geography, but less than half on aspects of socio-economic status



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

5.3.1. Data linkage and interoperability across systems is essential but challenging

Linking data from different sources is essential for a comprehensive understanding of CVD and for co-ordinated care, as no single dataset provides the full picture. Each source captures only part of the story – without integration, critical risk factors, interventions, and outcomes may be overlooked. Data linkage refers to the technical process of connecting datasets, interoperability is the ability of systems to exchange and interpret these data reliably, and governance frameworks establish the legal and organisational conditions for such exchanges (Palmieri et al., 2018^[55]). For example, linking a myocardial infarction registry to administrative hospitalisation records and mortality data can derive incidence of heart attacks, 30-day and 1-year survival rates, and identify gaps in follow-up care. Data linkage also supports prevention. Combining primary care risk-factor data with hospital records can identify patients who are not yet in registries but are at high risk and need preventive interventions. As outlined above, can also enables research such as clinical trials using large populations in a more cost-effective way. In short, interoperability multiplies the value of individual datasets, enabling more effective CVD research, detection and management across the care continuum.

I use the remote monitoring tool to send the hospital data from my subcutaneous implantable cardioverter-defibrillator once a week. I also use a watch to keep control of my heart beats during exercise. I think they can be useful but always under the supervision of an expert.

Francesca, 34, female living with hypertrophic cardiomyopathy and an implantable cardioverter-defibrillator.

This remains challenging. The 2023 survey of 27 OECD countries found “ongoing challenges in the governance of harnessing EHR data for analytics and research. Many of these challenges have been reported since 2012. They include legal barriers, lack of resourcing, and ongoing resistance from providers. A lack of social consensus, license and trust is a key barrier to using EHR data for these purposes (Slawomirski et al., 2023^[15]). While critical issues remain, the last two years have seen encouraging initiatives and investment to improve and to enhance information infrastructure and to address the lack of social consensus and improvement of data use. For example, the recent European Court of Justice decision regarding the secondary use of health data (see Section 5.3.3).

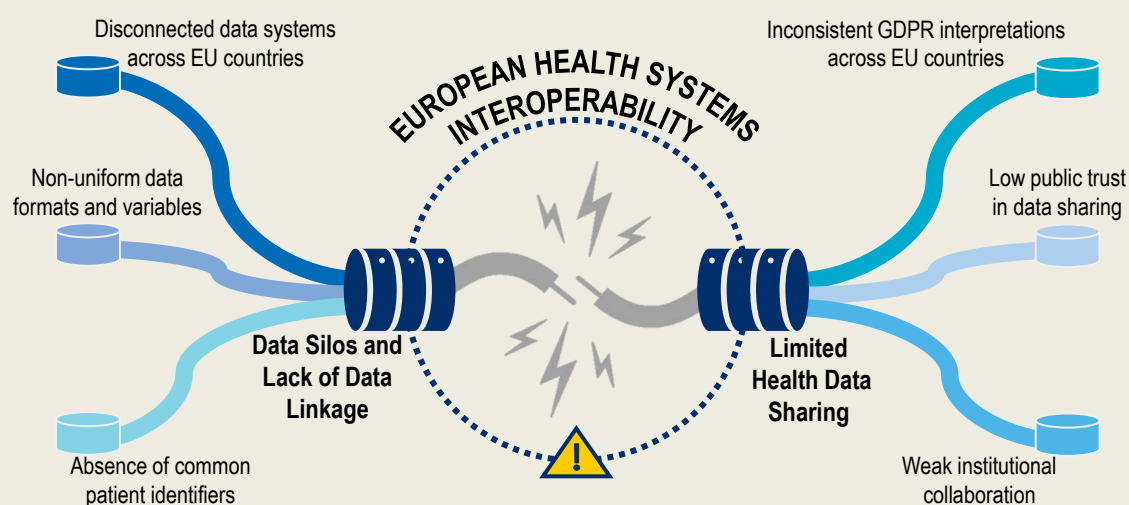
Beyond integration within a country, interoperability across countries has high importance. Cross-border data sharing permits pooling of information from different populations, which is especially valuable for comparing outcomes and best practices. Large differences in CVD mortality and incidence exist between European member states (OECD/European Commission, 2024^[56]). Yet it may be unclear how much of this variation stems from risk factors versus differences in healthcare quality or access – or indeed differences in clinical interpretation and coding. Harmonised data collection and exchange allow for benchmarking, which enables national health systems to learn from one other and inform adjustments to policy and practice. Moreover, researchers studying cardiovascular outcomes benefit from pan-European datasets that increase statistical power, which helps to study less common conditions or treatments. Collaborative registries like EuroHeart are encouraging. EuroHeart is an ESC project that connects national cardiovascular quality registries across Europe, providing the infrastructure for collecting large volumes of high-quality patient data, conducting research, and monitoring new drugs and devices. The explicit aim is to produce “*comparable real-world data in cardiovascular disease... at European level*,” by using common datasets across countries, which can help identify effective interventions and support continuous improvement across Europe (ESC^[49]).

Achieving such linkage and interoperability is not straightforward. Key challenges include technical and semantic incompatibility, a lack of unique identifiers, legal and privacy constraints, and organisational and cultural barriers (see Box 5.3). Despite these challenges, the imperative for interoperability is widely recognised. The cost of fragmented data is missed opportunities – missed chances to prevent strokes and heart attacks by intervening earlier, and missed insights into which treatments work best in routine care. Strengthening data linkage infrastructure is therefore a high-yield investment for CVD health outcomes. Overcoming these barriers requires clear incentives, leadership, and demonstrating the mutual benefits of data sharing.

Box 5.3. Key challenges of data linkage and interoperability

Health data are still too often siloed and incompatible. Different hospitals and countries collect data using varying definitions and standards, impeding direct comparison and linkage. The current arrangements mean that many national CVD registries cannot simply be combined because of non-uniform data formats and variables (OECD, 2022^[57]) (ESC/EHN^[58]). A more practical challenge is reliably matching patient data across databases. There is no common patient identifier across European health systems. Policy experts have noted the need for “the introduction of a unique European patient identification number” to facilitate cross-system data linkage (ESC/EHN^[58]). In the absence of such an ID, probabilistic matching or legal workarounds are used, but these are imperfect and resource-intensive.

Figure 5.8. Key challenges in data linkage and interoperability



Data protection rules and privacy concerns limit data sharing. To be clear, strong privacy safeguards are essential, variation in how EU member states implement these rules creates uncertainty. For example, interpretations of the EU General Data Protection Regulation (GDPR) differ by country, leading to a fragmented landscape that complicates cross-border health data exchange. Navigating multi-country data projects can be onerous due to differing consent requirements or approval processes in each jurisdiction (OECD, 2022^[57]; ESC/EHN, n.d.^[58]). Building trust with the public is also paramount; patients and providers need to be confident that data sharing will occur securely and ethically. This is a political challenge, not a technical one.

Health institutions may be reluctant to share data due to concerns about data ownership, potential misuse, or simply the lack of a collaborative culture (OECD, 2022^[57]). Across Europe, member states have historically been protective of health data systems (healthcare is largely managed nationally), which can hinder central or regional initiatives. Efforts to standardise data collection, such as the CARDS project establishing common cardiology data definitions, saw limited uptake without strong national buy-in (ESC/EHN^[58]).

5.3.2. Interoperable data systems through standards, governance and capacity

Moving toward interoperable, linked health data in Europe will require co-ordinated action on technical standards, governance frameworks, and workforce capacity. Clear strategies and policy measures can guide this implementation. Establishing and mandating common standards for health data is foundational. Common standards ensure that data collected in different hospitals or countries are comparable and can be aggregated for a European-level view of CVD outcomes, and are composed of semantic standards, technical protocols, and organisational frameworks. Past collaborative efforts like the ESC's Cardiology Audit and Registration Data Standards (CARDS) defined core datasets for key cardiac conditions and more recently the EuroHeart project is using common data elements across national registries (ESC/EHN^[59]). Policymakers can support the development and adoption of standards like standardised EHR data fields, coding terminologies like SNOMED CT or ICD, interoperability protocols like HL7 FHIR, as well as promoting consistent vocabulary in emerging research approaches like the GREG (Guidance and Tools for Real-World Evidence Generation and Use for Decision-Making in Europe) consortium. In practice, this might include EU-wide guidelines or requirements for vendors to ensure EHR systems are compatible with agreed standards.

Robust governance is essential to ensure that electronic health data are accessed and reused responsibly for secondary purposes. The European Health Data Space (EHDS) establishes a common EU framework for this secondary use. Each Member State will designate Health Data Access Bodies (HDAB) responsible for organising access to health data, evaluating data-access applications, granting permits for authorised purposes, maintaining a dataset catalogue, and ensuring that access to data takes place in Secure Processing Environments (SPEs) (EUR-Lex, 2025^[60]).

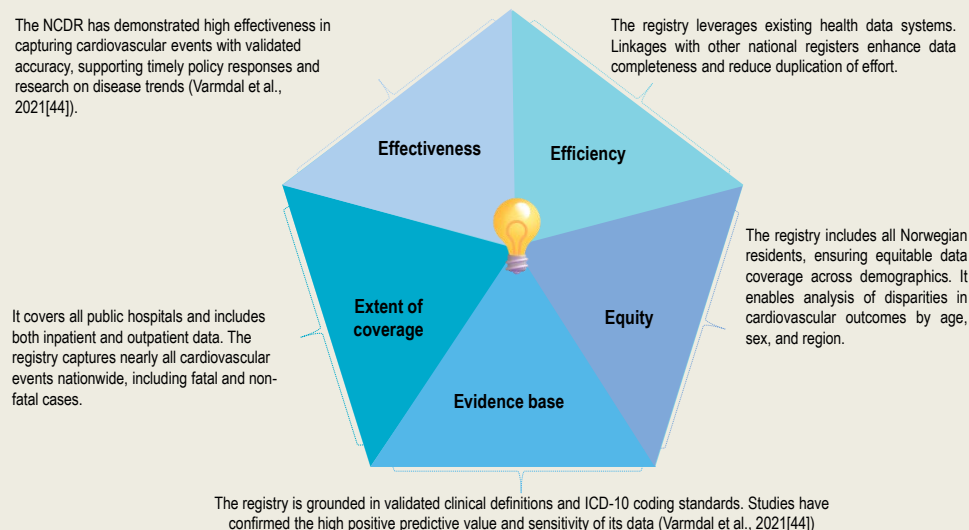
Through the HealthData@EU infrastructure, the national catalogues are federated to form a single European entry point for dataset discovery. Data holders will supply these catalogues with dataset descriptions prepared in line with the common European framework and technical specifications, allowing authorised users to locate relevant datasets (Raffaelli et al., 2025^[61]). Once an HDAB grants a permit, data are made available within an SPE following the common European technical specifications adopted under the EHDS. Several safeguard ensure that data remain protected: processing is limited to anonymised or pseudonymised data and permitted use, activities are logged, and outputs are checked before extraction. Together, the HDABs, the HealthData Infrastructure, and the SPE provide the operational backbone of the EHDS – enabling secure and efficient secondary use of health data for research, innovation, and public-health purposes while maintaining a high level of trust, security, and data-protection.

Compliance with GDPR and other privacy laws is non-negotiable, but greater harmonisation is needed so that researchers and healthcare providers face consistent rules across Europe. The current implementation of GDPR rules covering health research at member state level is fragmented, posing a barrier to multi-country studies policymakers can work toward aligned interpretations. For example, a pan-EU Code of Conduct for health research under GDPR has been recommended (ESC^[49]). Such a code could clarify permissible data uses (e.g. defining the public interest in using health data for research) and streamline approval processes. Additionally, investing in privacy-preserving technologies – such as data anonymisation/pseudonymisation techniques and federated analytics that allow analysis without raw data leaving its home country – can help reconcile data sharing with strict privacy requirements (OECD, 2022^[57]). The goal is a governance regime where data can be confidently shared for legitimate purposes, under uniform safeguards across the EU.

Box 5.4. Best practices in advancing cardiovascular health: The Norwegian Cardiovascular Disease Registry

Description: The Norwegian Cardiovascular Disease Registry (NCDR) is a national health registry established in 2012 to monitor and improve cardiovascular health outcomes in Norway. It collects data on all individuals treated for CVD in specialised healthcare services, as well as those who died from CVD. The registry consists of a core registry and eight condition-specific medical quality registries, some of which are managed by engaged clinicians across different regions. The core registry is maintained by the Norwegian Institute of Public Health and includes personal identifiers, administrative data, enabling linkage across datasets. The medical quality registries include detailed information about specific cardiovascular conditions and include patient-reported outcome measures (PROMs) submitted through standardised questionnaires.

Best practice assessment:



Enhancement options: To further enhance the NCDR, integration of real-time data feeds, better integration with electronic health record to inform on comorbidity and expansion to include primary care data could improve timeliness and comprehensiveness of the data. Additionally, incorporating patient-reported experience measures (PREMs) in the registries and social determinants of health would enrich the dataset.

Transferability: The Norwegian model is highly transferable to other countries with centralised health systems and national identification numbers. Key success factors include legal frameworks for data sharing, robust data infrastructure, and stakeholder collaboration. Transferability may be limited in settings with fragmented healthcare systems or weaker digital infrastructure. The registry's integration with PROMs and public reporting mechanisms requires cultural and institutional readiness to prioritise transparency and patient-centred care.

Conclusion: The Norwegian Cardiovascular Disease Registry exemplifies a best practice in monitoring the quality of cardiovascular care delivery through its comprehensive, validated, and actionable data. The registry supports epidemiological research, quality improvement, and health policy planning by providing high-quality and person-identifiable data, comprising a valuable tool to improve cardiovascular health in Norway.

Source: NIPH (2024^[62]), *About the Norwegian Cardiovascular Disease Registry* – NIPH, <https://www.fhi.no/en/nc/cardiovascular-disease-registry/about-the-norwegian-cardiovascular-disease-registry/> (accessed on 11 July 2025).

Interoperability is also about systems and people. Many health systems need upgrades to their IT infrastructure to collect and exchange data efficiently. The ESC has urged that “*Member States should be supported to increase the digital maturity of their systems,*” backed by EU funding for developing digital infrastructure (ESC_[49]). This might include modernising hospital EHR systems, implementing national data integration platforms, and ensuring connectivity for health facilities. Alongside technology, building workforce capacity is critical. Health services need skilled professionals such as medical informaticians, data analysts, and cybersecurity experts to manage and utilise these data systems. Clinicians and public health workers also require training in data literacy – understanding data standards, interpreting real-world data, and using data tools for decision making. Developing this workforce may involve updating medical and nursing curricula to include clinical informatics (the study of how information, data, and technology can be used to improve clinical care), as well as on-the-job training programmes.

The ESC is working with experts from national registries and clinical cardiology to develop a “suite of data standards for common cardiovascular diseases which are being used by national registries to capture information about patients with cardiovascular disease” (ESC_[63]). This *EuroHeart* initiative aims to support the improvement of cardiovascular care quality and new avenues for medical research. The standards will comprise internationally agreed standardised variables and corresponding definitions. In addition, these data standards aim to align ESC quality indicators with the ESC Clinical Practice Guidelines.

Policy levers and incentives can encourage or require participation in data reporting to ensure comprehensive data capture. For example, contributions to certain disease registries can be made mandatory for hospitals, or financial incentives for reporting quality indicators can be used (“pay for data”). An EU-wide CVD data system will require buy-in from all member states and their health institutions. Continuous data collection can be facilitated through compulsory data collection or incentives (ESC/EHN_[58]). Policymakers could, for example, consider tying funding or accreditation to data submission for CVD care, thus embedding data collection into routine practice.

Better data standards and infrastructure will lead to higher-quality data, which in turn enable more insightful analysis and feedback to clinicians and health managers, driving further improvements in care. Over time, an interoperable data system under strong governance can become a powerful engine for learning health systems – where policies and clinical practices continually adapt based on evidence from real-world data.

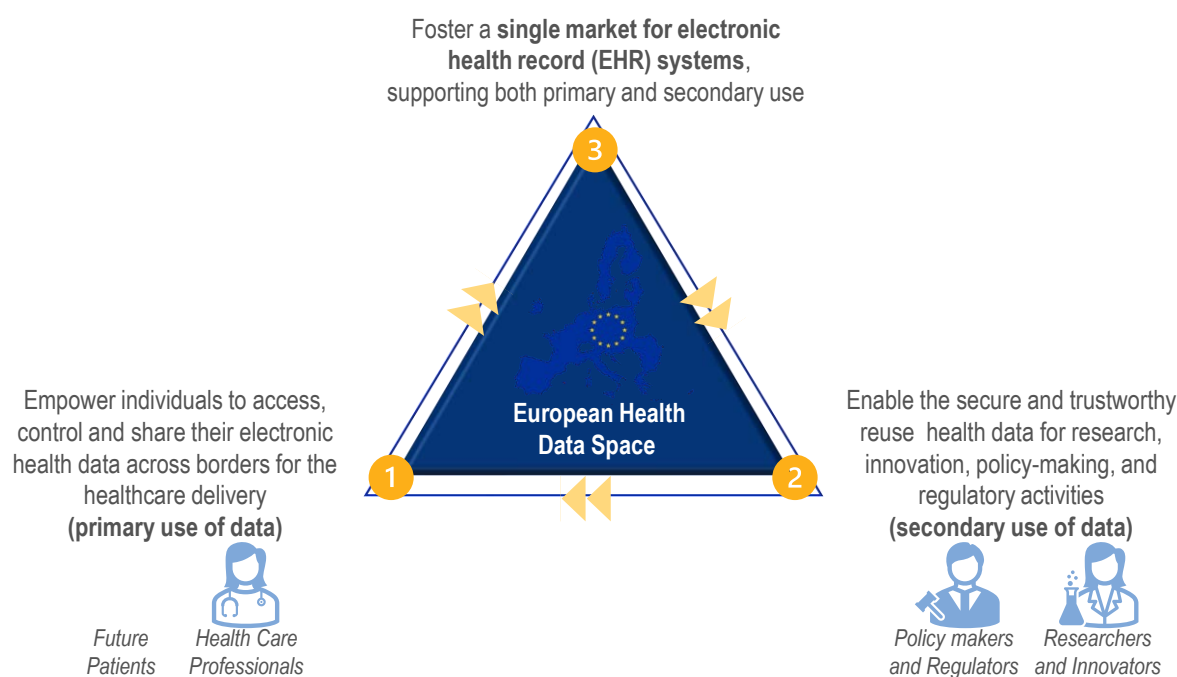
5.3.3. The necessary policy and regulatory frameworks are being instituted

Policymakers have recognised that data-driven healthcare requires supportive policy frameworks at both EU-wide and health-sector levels. Over the past decade, a combination of horizontal and sector-specific instruments has been developed to enable the secure and effective use of health data for cardiovascular and other conditions entered into force in 2025. The **European Health Data Space (EHDS) Regulation** establishes a common European framework for sharing and using electronic health data. It pursues two complementary objectives:

1. Empowering individuals to access and share their own health data for continuity of care across borders (primary use); and
2. Enabling secondary use of electronic health data under strict conditions for purposes such as research, innovation, statistics, and public-health policymaking.

For this second pillar, the EHDS creates a harmonised governance model: each Member State designates a Health Data Access Body (HDAB) to evaluate applications and issue permits for authorised purposes; data holders describe their datasets in national catalogues connected to the HealthData@EU infrastructure; and access is granted within Secure Processing Environments (SPEs) operating under common European technical specifications the EHDS introduces mandatory self-certification of Electronic Health Record (EHR) systems against common European specifications, ensuring interoperability, security and portability of health data throughout the EU (Figure 5.9).

Figure 5.9. Mechanisms and objectives of the European Health Data Space



Source: Authors, (EHDS_[64]), The European Health Data Space (EHDS), <https://www.european-health-data-space.com/>.

In practical terms, this means relevant healthcare professionals involved in the care of a patient in one country could, in the future, quickly obtain that patient's medical data from another country via a common protocol, while a researcher could request access to anonymised datasets on heart disease outcomes from multiple sources through a single application process. As the EHDS is implemented, it is expected to streamline data sharing and break down many of the interoperability barriers described earlier, provided that if member states and stakeholders invest in the necessary capacities and trust frameworks.

EHDS is a sectoral component of the broader *European Data Strategy*. The upcoming implementation of the Data Governance Act and Data Act will also interact with health data by setting rules for data sharing and ensuring fairness in use of data (though not specific to health, they provide general frameworks for data access and portability that complement health-specific laws). GDPR, implemented in 2018, sets uniform requirements for data privacy and security across all member states. This matters for maintaining public trust in health data use. Under GDPR, health data are classified as sensitive personal data, subject to strict protection. The regulation does, however, explicitly allow certain uses of health data for public health and research – for instance, processing is permitted if it is “*necessary for reasons of public interest in the area of public health, such as protecting against serious cross-border threats to health...or ensuring high standards of quality and safety of healthcare*” (GDPR Art. 9(2)(i)), or if it is for “*scientific research in the public interest*” under defined safeguards (Art. 9(2)(j)). These provisions mean that valuable activities like disease registries, surveillance, and research on CVD can be lawful, as long as appropriate protections such as ethics approvals, pseudonymisation of data, and data minimisation are in place. These frameworks are distinct but complementary, applying in parallel within their respective scopes: the GDPR governs personal-data protection; the EHDS regulates access and re-use of electronic health data for both primary and secondary purposes; and the DGA and DA provide cross-sectoral mechanisms on data sharing and fairness. None overrides the others. The EHDS relies on consistency with the GDPR but does not act as *lex specialis*.

GDPR has provided a common baseline that enables data use by clarifying consent and security requirements, and by mandating Data Protection Officers and impact assessments for large health databases, improve how data is handled. However, as noted above, a challenge has been divergence in how each country implements some of GDPR's clauses related to research – as well as further conditions, including limitations, with regard to the processing of genetic data, biometric data or data concerning health that may be present at the national level. National legislations and ethics committees interpret differently what is “in the public interest” or what other legal basis can be used for registry-based research. Policymakers are addressing this by seeking greater harmonisation: the European Data Protection Board has been working on guidance to unify the interpretation of GDPR for health research, and the European Commission has been urged to use both soft law (guidelines, codes of conduct) and even new regulations if necessary to reduce fragmentation (ESC_[49]; EC, 2025_[65]). The EHDS responds to these issues by providing a single, EU-level legal framework for secondary use, replacing the need for separate national interpretations when authorised purposes and safeguards are met.

A recent European Court of Justice ruling (C-413/23 P, 4 September 2025) has potentially helped to clarify some of the questions raised above. The ruling stated that pseudonymised information is classified “personal data” if the recipient of these data can realistically re-identify the individual. This implies that if this is not realistically possible, such pseudonymised data may fall outside the full scope of GDPR as long as the data controllers (who hold the encryption key to re-identification) have implemented all necessary safeguards stipulated under the GDPR (InfoCruia, 2025_[66]). While this ruling does is not a “free pass” for use of health data, it offers more clarity under what circumstances these data can be shared and analysed.

Several other EU policies support the creation of a coherent digital-health ecosystem. The Cross-Border Healthcare Directive laid early groundwork for patient data exchange, which the EHDS now consolidates and extends. The EU's Digital and Data Strategies promote common data spaces built on shared values, while health-specific programmes such as **EU4Health** and **Horizon Europe** fund projects that implement EHDS priorities – developing federated data networks, improving data quality, and strengthening the health-data workforce. Several European countries have their own national digital health strategies that align with these EU initiatives. For instance, some Nordic countries have long-established personal identity numbers and linked health registries that serve as models for how data can drive quality improvement in CVD care. The EU's role is to facilitate the sharing of such best practices and ensure that less digitally advanced health systems receive support to catch up.

5.4. Conclusion

Digital technologies are redefining how we prevent, detect, and manage CVD. Across OECD countries, what was once considered futuristic – remote monitoring of a HF patient from their home, a watch detecting an arrhythmia, or an AI helping interpret an echocardiogram – is increasingly part of everyday practice. This chapter reviewed major categories of digital technologies by type, providing evidence of their uptake and effectiveness. Clinical decision support systems and electronic records are improving adherence to best practices and enabling data-driven care (albeit with incremental gains and a need for further outcome improvements). Telemedicine has proven its worth by expanding access and showing outcomes on par with in-person care in many scenarios – even reducing mortality and hospitalisations in HF when used to its full potential. Remote monitoring devices and wearables empower continuous vigilance over health, catching problems early and nudging healthier behaviours; they have demonstrably improved surrogate outcomes like blood pressure control, arrhythmia detection rates, and physical activity levels. Mobile apps and digital interventions are engaging patients beyond clinic walls, leading to better adherence, fitness, and even fewer major cardiac events in studies. And on the horizon, AI and big data promise a new level of personalised, precision cardiology that could further enhance outcomes while potentially streamlining care delivery.

These innovations come with important challenges and limitations and need appropriate clinical evidence for their efficacy and safety. Not all patients or health systems adopt technology at the same pace – issues of access, digital literacy, and reimbursement need ongoing attention so that benefits are widespread. Moreover, technology is never a panacea. It works best in conjunction with, not in lieu of, a strong evidence base, well-resourced and trained clinical teams and lots of patient engagement. Many digital tools generate vast amounts of data, necessitating intelligent filtering (often by other digital means like AI) to avoid overwhelm. Privacy and security need to be rigorously safeguarded to maintain trust in digital health solutions. Policy and regulation can help integrate the public health perspective with the market perspective. Despite these caveats, the overall trajectory is encouraging.

Early empirical results suggest that these digital tools that show potential to improve efficiency, enable more proactive care, and support patients in leading healthier lives with CVD or at risk for it. For instance, something as simple as a text-message programme or fitness tracker can lead to better blood pressure and weight control, which in turn translates to fewer heart attacks and strokes. On a system level, digital connectivity allows for learning and quality improvement at scale. If implemented thoughtfully and safely, digital health technologies can help healthcare professionals and the public. By continuing to rigorously evaluate these tools, address implementation challenges, and ensure equitable access, stakeholders can benefit.

The value of these and other technologies is underpinned by leveraging routinely collected health data: registries, EHRs, administrative and mortality records, and (increasingly) patient-generated data, which offer significant potential to improve CVD prevention and care. When linked and made interoperable, these data sources provide a comprehensive view of patient journeys, support large-scale population health insights, and enable proactive, data-driven care. EHRs contribute detailed clinical information, while registries offer quality benchmarking and real-world outcomes for underrepresented groups. Administrative and mortality data help track service use, outcomes, and disease trends. However, countries vary in their capacity to leverage these resources, and the full value of health data can only be realised through robust linkage, cross-system interoperability, and harmonised frameworks across jurisdictions.

Achieving this vision requires overcoming persistent technical, legal, and cultural challenges. Incompatible data systems, lack of unique patient identifiers, and fragmented interpretations of data protection regulations (like GDPR) hinder progress. **At European level, the European Health Data Space (EHDS) Regulation provides the co-ordinated framework needed to realise this potential.** It creates a common structure for the *primary use* of health data, the self-certification of EHR systems – and for the *secondary use* of health data for research, innovation and public-health purposes under clearly defined authorised purposes. Health Data Access Bodies, federated catalogues and Secure Processing Environments ensure that data can be used efficiently and safely across borders, building the trust required for sustained digital transformation. Combined with investments in digital infrastructure, workforce capacity, and common data models and exchange protocols (e.g. ICD, SNOMED CT, HL7 FHIR) these measures can transform routine health data into the backbone of a *self-learning health systems* – supporting personalised prevention, evidence-based policymaking and continuous improvement in cardiovascular outcomes across Europe.

References

- Avi Cherla, I. (2024), "Trends in avoidable mortality from cardiovascular diseases in the European Union, 1995–2020: a retrospective secondary data analysis", *The Lancet Regional Health - Europe*, Vol. 47, <https://doi.org/10.1016/j.lanepe.2024.101079>. [1]
- Carter, H. (ed.) (2020), "Telemedicine in the OECD: An umbrella review of clinical and cost-effectiveness, patient experience and implementation", *PLOS ONE*, Vol. 15/8, p. e0237585, <https://doi.org/10.1371/journal.pone.0237585>. [22]
- Choi, E. et al. (2023), "Heart Failure-Smart Life: a randomized controlled trial of a mobile app for self-management in patients with heart failure", *BMC Cardiovascular Disorders*, Vol. 23/1, <https://doi.org/10.1186/s12872-023-03039-8>. [37]
- Chowdhury, M. et al. (2025), "The Heart of Transformation: Exploring Artificial Intelligence in Cardiovascular Disease", *Biomedicines*, Vol. 13/2, p. 427, <https://doi.org/10.3390/biomedicines13020427>. [44]
- Chua, S. et al. (2020), *Comparison of Arrhythmia Detection by 24-Hour Holter and 14-Day Continuous Electrocardiography Patch Monitoring*, *Acta Cardiologica Sinica*, <https://www.tsoc.org.tw/upload/journal/1/20200531/acs-36-251.pdf>. [31]
- Corral-Acero, J. et al. (2020), "The 'Digital Twin' to enable the vision of precision cardiology", *European Heart Journal*, Vol. 41/48, pp. 4556-4564, <https://doi.org/10.1093/eurheartj/ehaa159>. [10]
- Davidson, J. et al. (2020), "Validity of Acute Cardiovascular Outcome Diagnoses Recorded in European Electronic Health Records: A Systematic Review", *Clinical Epidemiology*, Vol. Volume 12, pp. 1095-1111, <https://doi.org/10.2147/clep.s265619>. [48]
- Dhingra, L. et al. (2023), "Use of Wearable Devices in Individuals With or at Risk for Cardiovascular Disease in the US, 2019 to 2020", *JAMA Network Open*, Vol. 6/6, p. e2316634, <https://doi.org/10.1001/jamanetworkopen.2023.16634>. [28]
- Dhingra, L. et al. (2023), "Cardiovascular Care Innovation through Data-Driven Discoveries in the Electronic Health Record", *The American Journal of Cardiology*, Vol. 203, pp. 136-148, <https://doi.org/10.1016/j.amjcard.2023.06.104>. [18]
- Doherty DA, T. (2023), "Registry randomised trials: a methodological perspective", *BMJ Open*, Vol. 13/3, <https://doi.org/10.1136/bmjopen-2022-068057>. [50]
- Duan, Y. et al. (2017), "Effectiveness of home blood pressure telemonitoring: a systematic review and meta-analysis of randomised controlled studies", *Journal of Human Hypertension*, Vol. 31/7, pp. 427-437, <https://doi.org/10.1038/jhh.2016.99>. [29]
- EC (2025), *European Health Data Space Regulation (EHDS)*, https://health.ec.europa.eu/ehealth-digital-health-and-care/european-health-data-space-regulation-ehds_en. [65]
- Edmiston, K. and J. AlZuBi (2022), *Trends in telehealth and its implications for health disparities*, Center for Insurance Policy and Research, <https://doi.org/10.52227/25241.2022>. [23]

- EHDS (n.d.), *The European Health Data Space (EHDS)*, <https://www.european-health-data-space.com/> (accessed on 11 July 2025). [64]
- Ela Marie Z. Akay, A. (2023), "Artificial Intelligence for Clinical Decision Support in Acute Ischemic Stroke: A Systematic Review", *Stroke*, Vol. 54/6, <https://doi.org/10.1161/STROKEAHA.122.041442>. [8]
- Erlinge D, O. (2017), "Bivalirudin versus Heparin Monotherapy in Myocardial Infarction", *N Engl J Med*, Vol. 377/12, pp. 1132-1142, <https://doi.org/10.1056/NEJMoa1706443>. [53]
- Erlinge, D. (2021), "Registry-based randomized clinical trials in cardiology: opportunities and challenges", *REC Interv Cardiol*, Vol. 3, pp. 157-160, <https://doi.org/10.24875/RECICE.M21000205>. [51]
- ESC (2025), *ESC Chat - Your Guidelines Companion*. [7]
- ESC (n.d.), *EuroHeart Project Development and Data Standards*, <https://www.escardio.org/Research/euroheart/EuroHeart-Project-Development-and-Data-Standards#> (accessed on 11 July 2025). [63]
- ESC (n.d.), *The European Society of Cardiology welcomes the European Commission's initiative to create a European Health Data Space for better healthcare, research, and policymaking*, <https://www.escardio.org/static-file/Escardio/Advocacy/Documents/European%20Health%20Data%20Space%20Final%20Clean.pdf>. [49]
- ESC/EHN (n.d.), *The development of a centralised cardiovascular data collection across the European Union member states*, <https://www.escardio.org/static-file/Escardio/EU-Affairs/centralised-cardiovascular-collection-europe.pdf>. [58]
- ESC/EHN (n.d.), *The development of a centralised cardiovascular data collection across the European Union member states*, <https://www.escardio.org/static-file/Escardio/EU-Affairs/centralised-cardiovascular-collection-europe.pdf>. [59]
- EU (2024), *Regulation (eu) 2024/1689 of the European Parliament and of the Council*. [46]
- EU (2021), *Regulation (EU) 2021/2282 of the European Parliament and of the Council of 15 December 2021 on health technology assessment and amending Directive 2011/24/EU (Text with EEA relevance)*, <https://eur-lex.europa.eu/eli/reg/2021/2282/oj/eng> (accessed on 11 July 2025). [36]
- EUR-Lex (2025), *Regulation (EU) 2025/327 of the European Parliament and of the Council of 11 February 2025 on the European Health Data Space and amending Directive 2011/24/EU and Regulation (EU) 2024/2847 (Text with EEA relevance)*, <https://eur-lex.europa.eu/eli/reg/2025/327/oj/eng> (accessed on 30 November 2025). [60]
- European Commission (2025), *MDCG 2025-6 - FAQ on Interplay between the Medical Devices Regulation & In vitro Diagnostic Medical Devices Regulation and the Artificial Intelligence Act*. [47]
- European Heart Rhythm Association (2014), "The Atrial Fibrillation Ablation Pilot Study: an European Survey on Methodology and results of catheter ablation for atrial fibrillation conducted by the European Heart Rhythm Association", *European Heart Journal*, Vol. 35/22, pp. 1466-1478, <https://doi.org/10.1093/eurheartj/ehu001>. [16]

- Ezeamii, V. et al. (2024), "Revolutionizing Healthcare: How Telemedicine Is Improving Patient Outcomes and Expanding Access to Care", *Cureus*, <https://doi.org/10.7759/cureus.63881>. [25]
- Feigin, V. et al. (2025), "World Stroke Organization: Global Stroke Fact Sheet 2025", *International Journal of Stroke*, Vol. 20/2, pp. 132-144, <https://doi.org/10.1177/17474930241308142>. [2]
- Ferguson, T. et al. (2022), "Effectiveness of wearable activity trackers to increase physical activity and improve health: a systematic review of systematic reviews and meta-analyses", *The Lancet Digital Health*, Vol. 4/8, pp. e615-e626, [https://doi.org/10.1016/s2589-7500\(22\)00111-x](https://doi.org/10.1016/s2589-7500(22)00111-x). [33]
- Gallegos-Rejas, V. et al. (2024), "Key features in telehealth-delivered cardiac rehabilitation required to optimize cardiovascular health in coronary heart disease: a systematic review and realist synthesis", *European Heart Journal - Digital Health*, Vol. 5/3, pp. 208-218, <https://doi.org/10.1093/ehjdh/ztad080>. [26]
- Gold, R. et al. (2022), "Effect of Clinical Decision Support at Community Health Centers on the Risk of Cardiovascular Disease", *JAMA Network Open*, Vol. 5/2, p. e2146519, <https://doi.org/10.1001/jamanetworkopen.2021.46519>. [13]
- Grant, J. et al. (2024), "Digital health innovation and artificial intelligence in cardiovascular care: a case-based review", *npj Cardiovascular Health*, Vol. 1/1, <https://doi.org/10.1038/s44325-024-00020-y>. [11]
- HeartBeat Trust (2025), *What is STOPHF?*. [30]
- He, B. et al. (2023), "Blinded, randomized trial of sonographer versus AI cardiac function assessment", *Nature*, Vol. 616/7957, pp. 520-524, <https://doi.org/10.1038/s41586-023-05947-3>. [39]
- Hirata, Y. and K. Kusunose (2025), "AI in Echocardiography: State-of-the-art Automated Measurement Techniques and Clinical Applications", *JMA Journal*, Vol. 8/1, pp. 141-150, <https://doi.org/10.31662/jmaj.2024-0180>. [40]
- HSE (2025), *Galway virtual initiative brings cardiac care home for patients*. [24]
- InfoCruia (2025), "Judgment of the Court", <https://curia.europa.eu/juris/document/document.jsf?text=&docid=303863&pageIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=16531016>. [66]
- Kao, D. (2022), "Electronic Health Records and Heart Failure", *Heart Failure Clinics*, Vol. 18/2, pp. 201-211, <https://doi.org/10.1016/j.hfc.2021.12.004>. [14]
- Kuan, P. et al. (2022), "Efficacy of telemedicine for the management of cardiovascular disease: a systematic review and meta-analysis", *The Lancet Digital Health*, Vol. 4/9, pp. e676-e691, [https://doi.org/10.1016/s2589-7500\(22\)00124-8](https://doi.org/10.1016/s2589-7500(22)00124-8). [27]
- Kumar, N. (2025), *Smartwatch Statistics (2025) – Users & Market Share*, <https://www.demandsage.com/smartwatch-statistics/>. [32]
- Liu, L. (2024), "The effect of digital therapeutics intervention on improving hypertension management in adults: a meta-analysis of randomized controlled trial", *Hypertension Research*, Vol. 48, pp. 456–469, <https://doi.org/10.1038/s41440-024-01892-4>. [38]

- Maciejewski, C. et al. (2022), “Administrative Data in Cardiovascular Research—A Comparison of Polish National Health Fund and CRAFT Registry Data”, *International Journal of Environmental Research and Public Health*, Vol. 19/19, p. 11964, <https://doi.org/10.3390/ijerph191911964>. [54]
- McClellan, M. et al. (2019), “Call to Action: Urgent Challenges in Cardiovascular Disease: A Presidential Advisory From the American Heart Association”, *Circulation*, Vol. 139/9, <https://doi.org/10.1161/cir.0000000000000652>. [5]
- Mohan, K. et al. (2011), “Risk and Cumulative Risk of Stroke Recurrence”, *Stroke*, Vol. 42/5, pp. 1489-1494, <https://doi.org/10.1161/strokeaha.110.602615>. [3]
- Nadarajah, R. et al. (2023), “Future Innovations in Novel Detection for Atrial Fibrillation (FIND-AF): pilot study of an electronic health record machine learning algorithm-guided intervention to identify undiagnosed atrial fibrillation”, *Open Heart*, Vol. 10/2, p. e002447, <https://doi.org/10.1136/openhrt-2023-002447>. [19]
- NIPH (2024), *About the Norwegian Cardiovascular Disease Registry - NIPH*, <https://www.fhi.no/en/nc/cardiovascular-disease-registry/about-the-norwegian-cardiovascular-disease-registry/> (accessed on 11 July 2025). [62]
- Njie, G. et al. (2015), “Clinical Decision Support Systems and Prevention”, *American Journal of Preventive Medicine*, Vol. 49/5, pp. 784-795, <https://doi.org/10.1016/j.amepre.2015.04.006>. [6]
- OECD (2023), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, OECD Publishing, Paris, <https://doi.org/10.1787/9acc1b1d-en>. [20]
- OECD (2023), “The future of telemedicine after COVID-19”, *OECD Policy Responses to Coronavirus (COVID-19)*, OECD Publishing, Paris, <https://doi.org/10.1787/d46e9a02-en>. [21]
- OECD (2022), *Health Data Governance for the Digital Age: Implementing the OECD Recommendation on Health Data Governance*, OECD Publishing, Paris, <https://doi.org/10.1787/68b60796-en>. [57]
- OECD (2019), *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/e3b23f8e-en>. [17]
- OECD/European Commission (2024), *Health at a Glance: Europe 2024: State of Health in the EU Cycle*, OECD Publishing, Paris, <https://doi.org/10.1787/b3704e14-en>. [56]
- Ole Fröbert, M. (2013), “Thrombus Aspiration during ST-Segment Elevation Myocardial Infarction”, *N Engl J Med*, Vol. 369, pp. 1587-1597, <https://doi.org/10.1056/NEJMoa1308789>. [52]
- Oliveira Hashiguchi, T., L. Slawomirski and J. Oderkirk (2021), “Laying the foundations for artificial intelligence in health”, *OECD Health Working Papers*, No. 128, OECD Publishing, Paris, <https://doi.org/10.1787/3f62817d-en>. [45]
- Palmieri, L. et al. (2018), “Cardiovascular diseases monitoring: lessons from population-based registries to address future opportunities and challenges in Europe”, *Archives of Public Health*, Vol. 76/1, <https://doi.org/10.1186/s13690-018-0283-3>. [55]
- Perez, M. et al. (2019), “Large-Scale Assessment of a Smartwatch to Identify Atrial Fibrillation”, *New England Journal of Medicine*, Vol. 381/20, pp. 1909-1917, <https://doi.org/10.1056/nejmoa1901183>. [35]

- Poterucha, T. et al. (2025), “Detecting structural heart disease from electrocardiograms using AI”, *Nature*, Vol. 644/8075, pp. 221-230, <https://doi.org/10.1038/s41586-025-09227-0>. [42]
- Qi, Y. et al. (2025), “Digital Health Solutions for Cardiovascular Disease Prevention: Systematic Review”, *Journal of Medical Internet Research*, Vol. 27, p. e64981, <https://doi.org/10.2196/64981>. [4]
- Raffaelli, F. et al. (2025), “Unleashing the potential of health data: from vision to reality in the HealthData@EU Pilot Project”, *European Journal of Public Health*, Vol. 35/Supplement_3, pp. iii1-iii2, <https://doi.org/10.1093/eurpub/ckaf003>. [61]
- Singh, M. et al. (2024), “Artificial intelligence for cardiovascular disease risk assessment in personalised framework: a scoping review”, *eClinicalMedicine*, Vol. 73, p. 102660, <https://doi.org/10.1016/j.eclinm.2024.102660>. [43]
- Singh, R. et al. (2025), “How AI is used in FDA-authorized medical devices: a taxonomy across 1,016 authorizations”, *npj Digital Medicine*, Vol. 8/1, <https://doi.org/10.1038/s41746-025-01800-1>. [12]
- Slawomirski, L. et al. (2023), “Progress on implementing and using electronic health record systems: Developments in OECD countries as of 2021”, *OECD Health Working Papers*, No. 160, OECD Publishing, Paris, <https://doi.org/10.1787/4f4ce846-en>. [15]
- Viceconti, M. (2016), “In silico clinical trials: how computer simulation will transform the biomedical industry”, *International Journal of Clinical Trials*, Vol. 3/2, <https://doi.org/10.18203/2349-3259.ijct20161408>. [9]
- Williams, B. et al. (2022), “Establishing a National Cardiovascular Disease Surveillance System in the United States Using Electronic Health Record Data: Key Strengths and Limitations”, *Journal of the American Heart Association*, Vol. 11/8, <https://doi.org/10.1161/jaha.121.024409>. [41]
- Zhu, Y., Y. Zhao and Y. Wu (2024), “Effectiveness of mobile health applications on clinical outcomes and health behaviors in patients with coronary heart disease: A systematic review and meta-analysis”, *International Journal of Nursing Sciences*, Vol. 11/2, pp. 258-275, <https://doi.org/10.1016/j.ijnss.2024.03.012>. [34]

Notes

¹ Comparable data on the number of approved AI-enabled medical devices in the EU context not currently available.

6

Designing and implementing effective policies for CVD prevention and control

This chapter outlines a comprehensive policy framework for cardiovascular disease (CVD) prevention and management, structured around two policy areas: population-level prevention and health system-level care delivery. It emphasises cross-sectoral strategies to address risk factors, such as diet, tobacco, physical inactivity, and environmental determinants. Health system actions focus on early detection, integrated multidisciplinary care, and person-centred approaches, supported by enablers like health literacy, workforce capacity, and robust data systems. Innovative models, including home-based care, rehabilitation, and patient-reported outcomes, aim to improve quality and sustainability. The chapter highlights governance, financing, and resilience as critical levers for implementation, while calling for stronger efforts to embed environmental sustainability and equity across cardiovascular prevention and care pathways.

In Brief

- A comprehensive policy approach is essential for managing cardiovascular prevention and care in the European Union (EU) and meet the needs of **a population increasingly living with chronic conditions and multimorbidity**. This chapter examines **two key intervention areas: population-level prevention and health system care delivery**, encompassing a range of policy actions aimed at reducing the burden of risk factors and strengthening healthcare systems through integrated, person-centred care models, guided by the cross-cutting principles of efficiency, equity, resilience and sustainability.
- The substantial burden of cardiovascular diseases (CVD) on European societies and healthcare systems calls for the prioritisation of prevention policies, supported and sustained by empowering citizens to make healthy choices throughout the life course. **The environments in which people live, work, and age influence health outcomes and therefore warrant consideration in prevention efforts, supported by coordinated cross-sectoral actions.** CVD prevention is increasingly framed as a cross-sectoral priority, with growing recognition of the health co-benefits of policies on diet, tobacco, air pollution, and physical activity. However, there is substantial variation in the implementation of the key policy actions that can reduce the unequal burden of CVD.
- **Diet and nutrition policy continues to evolve, with increasing uptake of structural measures** such as, reducing trans fats in food, sugar-sweetened beverage taxes, and healthy food procurement policies in public institutions like schools. In addition, comprehensive marketing restrictions aimed at reducing exposure to unhealthy food advertising, are not yet extensively applied across Europe, even though available evidence suggests they can contribute positively to improving children's diets.
- **While tobacco control monitoring and taxation policies are effectively implemented across the region, there is potential for improvement.** Implementation of mass media and advertising restrictions **remains more heterogeneous, offering opportunities for strengthening tobacco control efforts.** Tobacco control is among the most developed policy areas, with widespread adoption of effective measures contributing to declining smoking rates and reductions in CVD. Many countries have implemented legislation on smoke- and aerosol-free environments, cessation support, and youth-focussed restrictions, with growing interest in flavour bans and tobacco-free generation laws. **Rising youth vaping and dual use present emerging challenges, with regulatory approaches to e-cigarettes showing considerable diversity.**
- **Physical activity promotion is widely recognised in national policy**, with many countries implementing campaigns, school-based programmes, and infrastructure investments. Promising practices include active travel schemes, physical education in schools, and workplace initiatives; however, their implementation is inconsistent. **Groups living in vulnerable situations** – such as children, older adults, and disadvantaged populations – **remain under-targeted**, and cross-sector co-ordination with areas like transport and urban planning is often limited. Additionally, excessive screen time, online gaming, and gambling contribute to sedentary behaviour, which increases cardiovascular risk through reduced physical activity and can also negatively affect mental health.
- **Policies aiming at decreasing harmful alcohol consumption**, through pricing policies, marketing restrictions, and state-controlled sales, have been implemented – particularly in

Nordic and Baltic regions. Measures like minimum unit pricing have shown measurable health benefits.

- **Environmental determinants of cardiovascular health are receiving increased policy attention** across Europe. air pollution, extreme weather, and climate-related stressors are more and more recognised as important contributors to cardiovascular risks. While low-emission zones and active transport policies offer promising co-benefits, few countries systematically integrate environmental risks into national cardiovascular planning.
- **Preventive care and risk detection play an important role in cardiovascular health**, with programmes like health checks and high-risk prevention initiatives demonstrating effectiveness in identifying and managing cardiovascular risk factors, particularly in underserved populations. These approaches are generally cost-effective and scalable, but challenges remain in reaching groups living in vulnerable situations and sustaining long-term engagement. Behavioural insights offer valuable tools to enhance adherence and design more effective interventions, but their application remains fragmented and limited.
- **Low health literacy hinders behavioural change and timely care-seeking** – while it can be improved through context-specific education, few countries target groups living in vulnerable situations. Early recognition of symptoms of acute coronary syndromes or stroke is essential for timely care that significantly reduces morbidity and mortality. Survival after out-of-hospital cardiac arrest depends on public training and automated external defibrillator (AED) availability. National cardiopulmonary resuscitation policies and AED registries vary across Europe, yet have shown to improve outcomes in some countries. Addressing equity is essential in CV care, as women, some ethnic groups, smokers, and people with diabetes face delays and treatment gaps. A full-pathway approach and regional networks can help reduce these disparities.
- **Improving outcomes in cardiovascular and cerebrovascular care requires a co-ordinated approach** through integrated, multidisciplinary care models across the care continuum – from early detection to post-acute support. Conditions such as atrial fibrillation, cardiomyopathies, diabetes, chronic heart failure, ischemic heart disease, and structural heart diseases benefit from co-ordinated care pathways that emphasise early detection, specialist collaboration, patient self-management, and lifelong risk factor control. Key policy areas include implementing screening programmes, accrediting expert centres, training primary care providers, and ensuring smooth care transitions across settings.
- Early heart failure detection and referral require public and professional awareness, primary care diagnostic tools, and clear referral pathways. Multidisciplinary programmes with home- or clinic-based follow-up and self-management are key to reducing mortality and hospitalisations. Dedicated stroke teams and networks help standardise care and reduce regional disparities in stroke treatment. Mobile Stroke Units improve outcomes and are cost-effective, especially in densely populated areas; they are already in use in countries like France, Germany and Norway. Post-acute stroke care remains limited and needs expansion, being crucial to improve outcomes.
- People-centred care integrates medical treatment with individual preferences, promotes shared decision making, and prioritises overall well-being. **People-centred cardiovascular care improves patient experiences and outcomes, yet lacks widespread adoption.** A few countries are investing in health literacy programmes to support self-care and shared decision making. Enhancing patients' quality of life requires strong investments in discharge planning, self-management and rehabilitation. Early supported discharge accelerates the hospital discharge from hospital by offering specialised multidisciplinary care at home. Few countries have fully implemented early discharge protocols after stroke, acute coronary syndrome and

heart procedures. Home-based care has considerable potential for development across the region and could support the implementation of these innovations across the region.

- Rehabilitation and lifelong management are essential and cost-effective components of secondary prevention for people with cardiac diseases and stroke. However, their availability varies greatly across Europe. **Embedding rehabilitation in national guidelines, standardised care pathways and innovative delivery models may foster its provision.** Alternative approaches like hybrid or home-based rehabilitation, and automatic discharge referrals can boost participation in rehabilitation programmes. Embedding return-to-work programs in national policies can help position them as a core component of healthcare interventions. Nevertheless, most European countries lack clear guidelines and show wide variation of rehabilitation and return-to-work policies
- Condition-specific patient-reported outcome measures (PROMs) for CVD have the potential to improve clinical practice. Some European countries are implementing PROMs to monitor cardiovascular care, yet challenges persist. **The systematic collection and use of PROMs data can be facilitated by their integration into data infrastructures, which is being implemented in some countries.** Improving patient experience has been associated with better cardiovascular health outcomes and Patient Reported Experience Measurements (PREMs) are being increasingly used to compare care providers and support accreditation, although standardising instruments could enhance comparability.
- **Addressing inequalities in cardiovascular care requires a comprehensive approach,** as disparities encompass various dimensions such as gender, ethnicity, and geography. Groups living in vulnerable situations remain under-targeted in health literacy initiatives and under-treated. **Key themes emerge as priorities for enhancing cardiovascular care pathways resilience,** including strengthening workforce, adaptable infrastructure, digital innovation, and supply chain resilience. **Comprehensive policies are important to enhance healthcare environmental sustainability, notably addressing** cardiovascular care delivery.

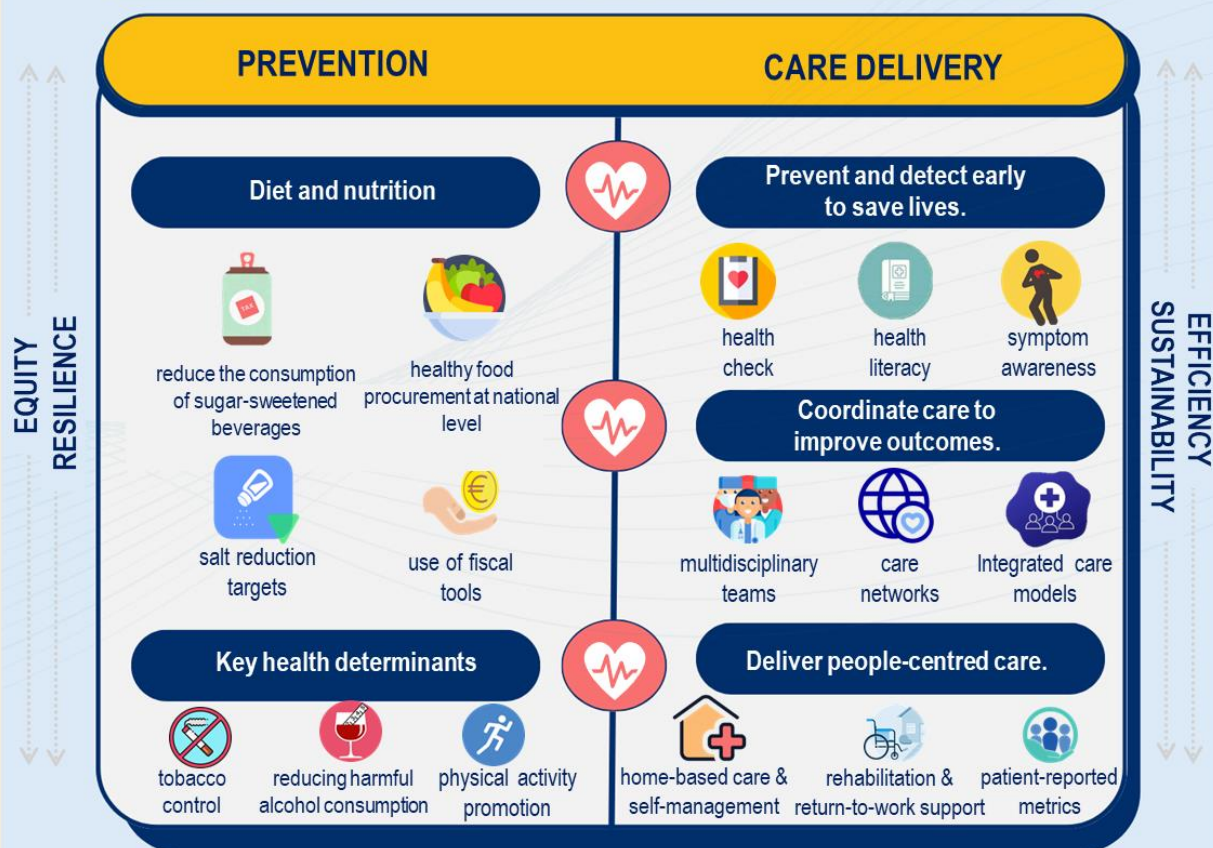
Infographic 6.1. Designing and implementing effective policies for CVD prevention and control

Despite diverse policies and programmes across Europe, **fewer than half of EU member states—only 13 out of 27—currently have a national CVD control plan.**

Several EU countries cover full CVD care pathway, but **gaps remain in equity and patient focus.**

Note: N=10 EU+1 countries (Czechia, Estonia, France, Ireland, Latvia, Luxembourg, Netherlands, Norway, Slovenia, Spain)

Number of Countries Addressing Key CVD Policy Aspects

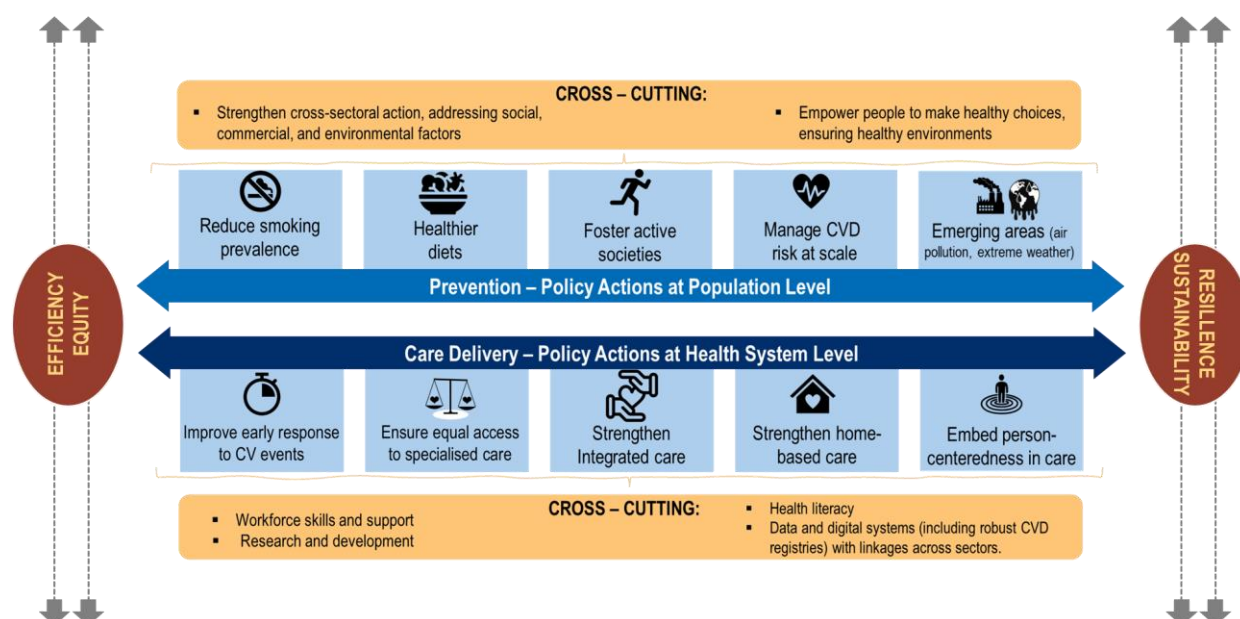


6.1. A comprehensive policy framework encompassing population health efforts and health systems delivery

A comprehensive policy framework is a crucial tool for guiding national efforts to prevent, detect and manage CVD. This chapter explores the CVD policy environment in the EU through two interconnected areas of intervention: 1) population-level prevention and 2) health system-level care delivery (Figure 6.1). These two policy areas relate to the macro-aspects of the health system context and care delivery included in the report framework (see Chapter 1), encompassing a range of policy actions aimed at reducing the burden of risk factors and strengthening health services to improve health outcomes, guided by the overarching principles of sustainability, efficiency, equity, and resilience. These are essential cross-cutting dimensions for building health systems capable of addressing the increasingly complex needs of an ageing population (OECD, 2024^[1]).

The substantial burden of CVD on European societies and healthcare systems calls for the prioritisation of prevention policies, notably primordial, primary and secondary prevention, supported and sustained by empowering citizens to make healthy choices throughout the life course. The environments in which people live, work, and age play a critical role in shaping health outcomes and are therefore central to prevention efforts, requiring co-ordinated action across sectors beyond healthcare. Evidence-based Health in All Policies (HiAP) is an approach to achieve equity and intersectoral action. HiAP provides the overarching strategic goal that will help countries to reduce the burden of CVD disease, identifying a broader set of actors able to implement and monitor structural policies. The benefits will exceed the health gains, not just by reducing the non-communicable disease (NCD) burden and the reduced pressure on healthcare systems, increasing healthy life expectancy and resulting in more equal, sustainable and economically stronger societies (Li et al., 2020^[2]).

Figure 6.1. Key areas of policy interventions for CVD prevention and care



The overlapping risk factors between CVD and other NCDs, such as cancer, dementia, and mental health conditions offer an opportunity to amplify the impact of preventive policies beyond cardiovascular health, fostering relevant co-benefits to citizens and societies. Thus, an integrated approach to prevention is essential, notably addressing social and economic determinants. Five key policy actions are outlined in

this Chapter: 1) reducing tobacco use, 2) promoting healthier diets and sustainable food systems, 3) encouraging physical activity through supportive environments, 4) scaling up risk factor screening and management, 5) addressing emerging issues such as air pollution and climate-related health risks.

Healthcare systems are increasingly managing a greater proportion of patients with complex needs. Results from the OECD Patient Reported Indicator Surveys (PaRIS) showed that 82% of primary care patients aged 45 years or older suffered from two or more chronic conditions (OECD, 2025^[3]). Furthermore, people living with multiple chronic conditions experience worse physical health than people with one chronic condition (OECD, 2025^[3]). While delivering care at the most appropriate and least intensive level improves patient experience and cost-effectiveness, implementing patient-centred and integrated care models can further enhance efficiency and resilience in health systems, while reducing health inequalities. At the health system level, priority policies focus on: 1) enhancing early detection and response to cardiovascular events through enhancing health literacy and health systems response; 2) ensuring equitable access to primary care and specialised cardiovascular services; 3) promoting integrated care pathways; 4) expanding home-based and community care services, and 5) embedding person-centred care approaches. The implementation of these policies can be underpinned by four cross-cutting enablers which will be addressed throughout the chapter, notably: 1) improved health literacy, 2) a well-resourced and supported workforce, 3) robust cardiovascular data systems and registries, and 4) sustained investment in research and innovation.

6.2. National policies are evolving to address multimorbidity and the challenges of an ageing population

6.2.1. From national CVD plans to disease-specific strategies, diverse approaches are being adopted across Europe

Across Europe, countries are implementing a wide range of strategies to address the growing burden of chronic diseases, notably CVD (Table 6.1). In some countries, these efforts are embedded within broader national frameworks, including National Health Plans, non-communicable diseases (NCD) prevention and/or management programmes, and National CVD control plans. Hybrid models combining prevention and disease-specific strategies within acute care services are in place in some countries. Other countries implemented disease-specific national control plans, such as for diabetes and stroke or disease management programmes. Disease management programmes are the process of care co-ordination of patients suffering from specific chronic conditions during their care transitions. It has been proposed as a model to optimise care for patients with complex health needs (Sochalski et al., 2009^[4]). Figure 6.2 illustrates how comprehensively national CVD policies address various components of the cardiovascular care pathway. While most countries include elements such as health promotion, disease prevention, early detection, and diagnosis and treatment in their national plans, critical areas such as tackling inequalities and promoting patient-centredness are the least frequently covered.

Table 6.1. Comprehensive overview of national policies to address NCDs and CVD

	NCDs policies are part of National Health Plans	National NCDs Prevention Programmes	National NCDs Management Programmes	National CVD Control Plan	National Diabetes Control Plan	National Stroke Plan	Disease Management Programmes for CVD
Austria					☑	☑	
Belgium							
Bulgaria		☑				☑	
Croatia		☑	☑	☑	☑		
Cyprus							
Czechia				☑		☑	
Denmark						☑	
Estonia	☑			☑		☑	
Finland	☑	☑	☑	☑	☑	☑	
France	☑	☑	☑	☑			
Germany	☑						☑
Greece					☑		
Hungary						☑	
Ireland	☑	☑	☑			☑	☑
Italy	☑	☑	☑		☑		
Latvia	☑			☑			
Lithuania						☑	
Luxembourg				☑			
Malta					☑		
Netherlands				☑	☑		
Poland				☑			
Portugal				☑	☑		
Romania				☑	☑		
Slovak Republic					☑		
Slovenia	☑	☑			☑		
Spain		☑		☑	☑	☑	
Sweden				☑			
Iceland							
Norway				☑		☑	
Canada					☑		
Japan				☑			
Türkiye				☑	☑	☑	
United Kingdom				☑		☑	

Note: Disease management programmes are the process of care co-ordination of patients suffering from specific chronic conditions during their care transitions, which has been proposed as a model to optimise care for patients with complex health needs (Sochalski et al., 2009^[4]).

Source: 2025 OECD Cardiovascular Policy and Data Survey (ESO, 2023^[5]; IDF Europe^[6]; Amgen, 2025^[7]; Romanian Ministry of Health, 2025^[8]; PWC, 2025^[9]; Italian Ministry of Health, 2025^[10]; Spanish Ministry of Health, 2022^[11]; Bulgarian Ministry of Health, 2021^[12]; French Ministry of Solidarity and Health, 2018^[13]).

Germany implements a wide array of health policies and programmes targeting CVD. Some are broad in scope, targeting general NCD risk factors, while others are more targeted, including Disease Management Programmes for conditions such as coronary heart disease, heart failure, and diabetes. In **Denmark**, the government introduced a major health reform in September 2024, titled “Health Close to You” (“*Sundhed tæt på dig*”), shifting responsibilities and resources from hospitals to community-based services. Key measures include training and redistributing more doctors to underserved areas and enhancing collaboration across sectors, aiming to foster high-quality care close to home, thereby reducing inequalities and improving outcomes for patients with complex health needs (Indenrigs- og Sundhedsministeriet^[14];

Kleja, 2024^[15]; Kromann Reumert, 2024^[16]). **Italy** embeds NCD policies in national health plans through the *Piano Nazionale della Prevenzione* (2020-2025) which sets national prevention strategies and is implemented via regional prevention plans – and includes equity as a cross-sectional objective (Italian Ministry of Health, 2025^[10]), complemented by the *Piano Nazionale della Cronicità* (updated in 2024) for chronic disease management (Italian Ministry of Health, 2025^[17]) and a dedicated National Diabetes Plan (Italian Ministry of Health, 2025^[18]). While no single integrated national plan exists for CVD, regionally structured *pathways* provide organised management for the conditions.

Box 6.1. The Portuguese National Health Plan 2030

The Portuguese National Health Plan 2030 (PNS 2030) underscores **inequality reduction** and **sustainable health** as central objectives. It calls for integrated intervention across prevention, health promotion, and management of chronic diseases (communicable and non-communicable). Within the field of cardiovascular health, the **Strategic Plan for Cardiovascular Health in Portugal** (led by the Portuguese Society of Cardiology) explicitly links to PNS 2030 goals. It recognises that premature cardiovascular mortality is a major health priority and frames CVD as a “problem of high magnitude.”

The Plan emphasises that sustained progress requires investments in **health literacy, research, organisation of services, allocation of resources, and monitoring / evaluation**. In line with these priorities, Portugal aims to build a more **equitable and evidence-informed cardiovascular health system**, ensuring that prevention and treatment strategies reach all segments of the population – particularly those most affected by premature mortality and gender disparities in cardiovascular outcomes.

Source: Ministry of Health (Portugal), National Health Plan 2030.

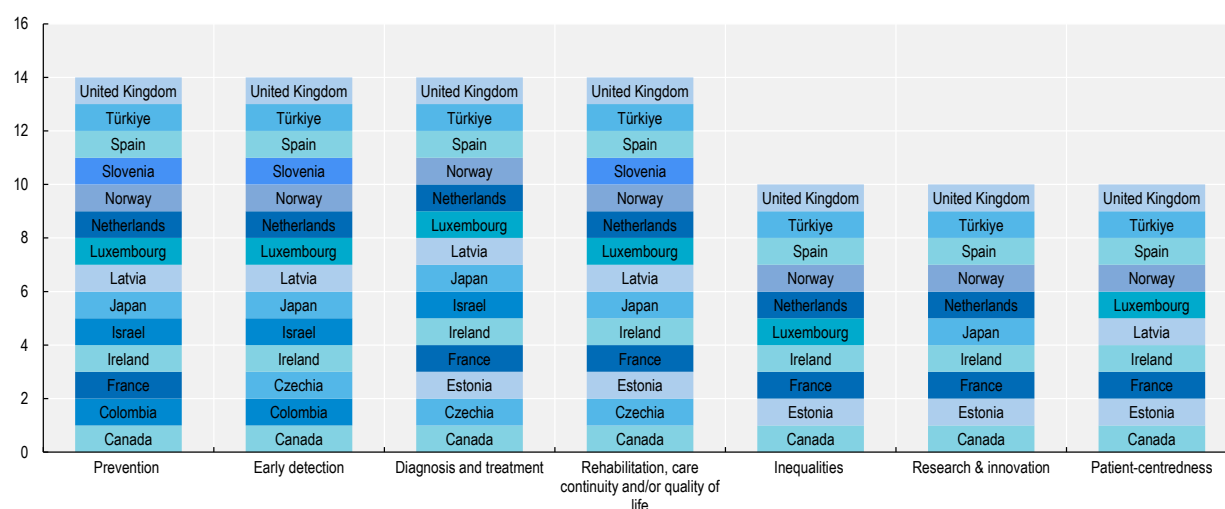
Some countries have launched national strategies specifically targeting cardiovascular conditions across the full care pathway. In **Portugal**, the Strategic Plan for Cardiovascular Health explicitly links to the Portuguese National Health Plan 2030 goals (Portugal Ministry of Health, 2025^[19]). **Spain** has launched the first national Cardiovascular Health Strategy in 2022, aiming to promote equity in cardiovascular health promotion, prevention, and care (Bueno et al., 2025^[20]). The strategy is expected to unfold over five years, with each region adapting it based on local priorities, and marks a shift from disease-specific care to a broader focus on cardiovascular health. **Poland**'s National Programme for Cardiovascular Diseases (2022-2032) aims to reduce CVD burden through prevention, early detection, and effective treatment, focussing on five priority areas: education, screening, workforce investment, CVD management, and innovation (PWC, 2025^[9]).

Living with cardiovascular disease is not just about managing a medical condition; it is about navigating a complex web of physical, emotional, and social challenges. Decision-makers need to prioritise patient-centred care, equitable access to resources, and effective prevention strategies. Listening to patients' lived experiences is key to creating policies that truly meet their needs.

Caius, artist, researcher, patient advocate, and heart attack survivor.

In **Ireland**, chronic disease prevention and management are supported by initiatives like the National Heart Programme, the National Clinical Programme for Stroke, and the Chronic Disease Management Programme, focussing on prevention, early detection, and integrated care. The National Stroke Strategy (2022-2027) aims to improve integrated stroke care, expand access to treatments like thrombolysis and thrombectomy, enhance rehabilitation, and promote equity, data-driven planning, and sustainable investment. These efforts align with the Healthy Ireland Framework (2013-2025), which underpins key strategies such as the National Obesity Policy and the National Physical Activity Plan, also seeking to reduce inequalities. The “Sláintecare Healthy Communities Programme” supports groups living in vulnerable situations with targeted local health interventions. The “Guide for Referral of Patients to the Chronic Disease Specialist Integrated Services”, launched in 2024, supports General Practitioners (GPs) in managing complex cases. The “Enhanced Community Care” programme aims to foster community care, targeting particularly older people and people living with chronic conditions. In this context, partnerships with non-governmental organisations play a relevant role. For instance, the Irish Heart Foundation has established tailored support after hospital discharge for stroke survivors and heart failure patients (Irish Heart Foundation, 2025^[21]; Hospital Professional News, 2023^[22]).

Figure 6.2. Several European countries cover the entire CV care pathway in national plans, yet inequalities and patient-centredness receive limited attention. Response to question “If your country has a national CVD policy, does it address the following aspects?”



Note: N=20 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Spain, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Multimorbidity – where individuals live with multiple chronic conditions – poses a growing challenge due to its complexity, often leading to fragmented care and poorer outcomes. Some countries have adopted **pan-disease strategies**, which go beyond individual illnesses to address social, cognitive, and functional needs (Onder et al., 2015^[23]) (see Box 6.2). Such approaches aim to better co-ordinate care and reduce over-testing, medication overuse, and promote person-centred care. The bidirectional relationship between CVD and cancer requires particular attention (see Box 6.3). Tackling overlapping risk factors, ensuring a person-centred multidisciplinary approach to prevent and manage treatment-related complications among cancer patients, and fostering collaboration between cardiologists and oncologists are key aspects to improve care and outcomes for a population with complex needs (Kuwabara, 2025^[24]).

Box 6.2. Pan-disease strategies to integrate services for people with multimorbidity – Country examples

Denmark’s “Multimorbidity strategy”: Denmark’s multimorbidity strategy is a patient-centred, cross-sectoral approach aimed at enhancing integrated and personalised care through prevention, early detection, and long-term management. It features multi-sector collaboration, digital health tools, patient empowerment, and structural reforms to improve care coherence. The strategy has been evolving since the 2010s and aligns with Denmark’s broader 2030 health goals (Healthcare Denmark^[25]).

UK’s “Major conditions strategy”: A five-year initiative (2023-2028) targeting six major disease groups – cancer, CVD (including stroke and diabetes), chronic respiratory disease, dementia, musculoskeletal disorders, and mental health. It focusses on prevention, early diagnosis, integrated long-term care, and improved co-ordination across services. The strategy promotes community-based, person-centred care and holistic care models (DHSC, 2023^[26]).

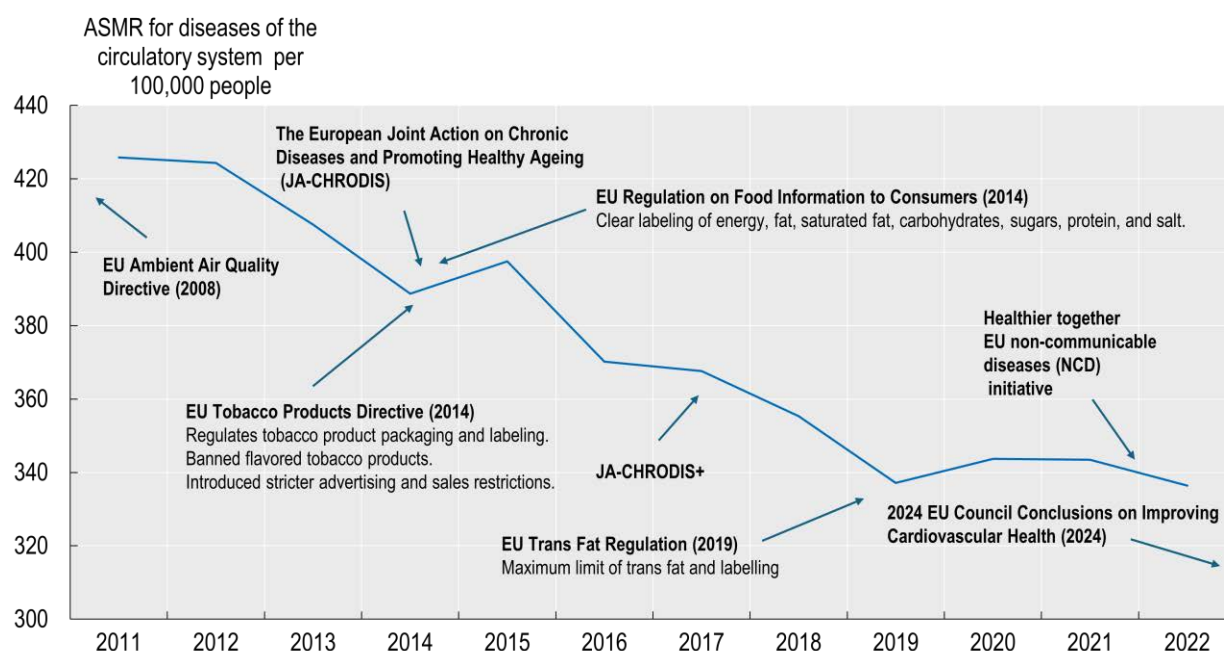
Finland’s “Chronic Care Model for Patients with Multiple Diseases in Primary Care”: Primary care model for multimorbidity developed under the ICARE4EU project (2013-2016), which continues to guide practices in hospital districts and local health centres. It features structured care pathways, shared budgets, digital tools, and self-management support, promoting multidisciplinary, patient-centred care through collaboration between health and social care sectors. The model enables seamless co-ordination across all levels of care (Hujala et al.^[27]).

At the supranational level, the EU has also played a role in shaping cardiovascular policy. Co-ordinated policy actions have contributed to declines in mortality due to circulatory diseases in recent years (Figure 6.3). These actions have addressed key drivers of CVD through prevention and management, reflecting strong recognition and leadership in tackling CVD and the broader NCD burden as major societal challenges. Additional details on recent EU policies can be found in Annex 6.A and throughout the remainder of this chapter. The WHO leads global efforts: the 2030 Agenda for Sustainable Development identifies noncommunicable diseases (NCDs) as a major obstacle to sustainable development to co-ordinate and promote actions toward the goal of cutting premature NCD mortality by one-third by 2030 through prevention and treatment (SDG target 3.4).

Box 6.3. The interconnection between CVD, cancer and ageing requires a multifaceted approach

- Cancer and CVD share overlapping risk factors and pathophysiological mechanisms (Wilcox, 2024^[28]). Evidence shows an increased risk of cancer among people living with CVD (de Boer RA, 2019^[29]), an increased risk of CVD (especially heart failure) and higher CVD mortality among cancer survivors (Florido R, 2022^[30]) (Sturgeon KM, 2019^[31]).
- The expected increase in cancer incidence is foreseen to increase the incidence of CVD related to cancer treatments (Wilcox, 2024^[28]). Furthermore, CV risk factors and CVD increase the risk of CV toxicity after cancer therapy, especially in older adults with cancer, which makes this population a particularly vulnerable one (Ioffe D, 2024^[32]).
- Management of CVD in people living with cancer and cancer survivors, notably older adults, requires innovative management approaches and people-centred multidisciplinary care (Ioffe D, 2024^[32]).

Figure 6.3. European circulatory disease mortality has declined over time, in parallel with health advancements and EU actions



Note: Data for EU27.

Note: This figure highlights various EU-level initiatives related to cardiovascular diseases. Assessing improvements in circulatory disease mortality requires consideration of additional contributing factors.

Source: Authors/ EUROSTAT 2025, hlth_cd_asdr2.

6.3. Cross-sectoral prevention policies amplify their impact beyond cardiovascular health

6.3.1. Addressing CVD risk factors has a number of co-benefits

Tackling CVD on our societies requires action at both the individual and population level, though can bring co-benefits in reducing the burden of other NCDs. The same risk factors that contribute to the CVD burden also contribute to explain the occurrence of obesity, cancers and dementia, such that tackling them fosters co-benefits and multiplies the impact of preventative action beyond the heart and vascular system. One clear example of this is tobacco use, a major modifiable risk factor for CVD, that also contributes to the prevention of multiple other NCDs such as cancer, chronic respiratory conditions, and even cognitive decline. Population-level interventions have demonstrated wide-reaching health benefits, underscoring the value of integrated prevention strategies that extend beyond cardiovascular health.

Multisectoral action is needed to adequately address the social, behavioural, environmental and commercial factors of NCDs and tackle their burden. *Health in All Policies* recognises that population health is not merely a product of health sector programmes but largely determined by policies that guide actions in areas such as environment, education, food and agriculture, and economic development among others (Green et al., 2021^[33]). For example, though air pollution poses serious health risks, its regulation often falls under environmental, transport, or industrial policy domains rather than health authorities. Indeed, policy in every sector of government has the potential to influence health outcomes and equity. Addressing the prevention of NCDs more broadly therefore requires a multidisciplinary approach that mobilises sectors well beyond healthcare, with health authorities playing a central co-ordinating role. The environments in which people live, work, study, and play shape daily behaviours and exposures, and thus have a substantial impact on overall health. Co-ordinated action across sectors is essential to create conditions that support healthier choices and reduce the burden of NCDs. In that sense, CVD prevention policies need to be understood broadly, and actions across sectors is crucial, including mobilising citizens and civil society (European Observatory on Health Systems and Policies & Beger, 2022^[34]).

I wish policymakers understood that living with cardiovascular disease is a lifelong journey that affects every aspect of life, not just physical health. Mental health support, social services, and patient-centered care must be integral to all healthcare systems. Investment in prevention, equitable access, and patient education can save lives and reduce long-term costs.

Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Health promotion and prevention benefit from a broad approach that extends beyond interventions delivered solely within the healthcare system. Most of the focus is on primary and secondary prevention, usually based on the healthcare system. However, primordial prevention, e.g. prevent drivers of CVD risk, is a substantial aspect of prevention that needs to be prioritised. Legislation on smoke- and aerosol-free environments illustrates how prevention efforts can benefit from broad societal collaboration. Such measures have been shown to reduce CVD and offer a model that can be adapted to many national contexts. A notable example is Ireland's pioneering legislation on smoke- and aerosol-free environments,

which helped establish this approach across Europe through a well-co-ordinated public health policy involving multiple sectors and industries (Box 6.4). Likewise, the WHO-led SAFER initiative provides governments with cost-effective actions to reduce harmful alcohol consumption through stronger regulation, pricing policies, enforcement and treatment access (WHO, 2025^[35]).

However, implementation of policies tackling NCD appears to be slowing: between 2021 and 2023, the proportion of countries fully implementing NCD risk factor surveys – including objective measurement – fell from 28% to just 19%. Over the same period, the share of countries with operational multisectoral NCD strategies also declined, dropping from 60% to 55% (WHO, 2025^[36]).

6.3.2. Population-level, structural interventions have the strongest impact on health equity and CVD outcomes

There is a hierarchy of effects where more structural, population-based interventions often result in larger health and equity gains, particularly when targeting lifestyle risk factors such as diets and smoking. Interventions aimed at key CVD risk determinants – such as diet and tobacco use – have shown substantial, rapid, and equitable reductions in cardiovascular mortality (Hyseni et al., 2017^[37]; Capewell and O’Flaherty, 2011^[38]; Popkin et al., 2021^[39]). The nature of the implementation plays a critical role: mandatory regulatory approaches are generally more effective at improving health behaviours related to CVD, while voluntary measures show mixed results (Blanchard et al., 2023^[40]). Voluntary industry agreements – such as those setting targets for salt or sugar reduction – can be effective, but only when targets are ambitious, progress is independently monitored, and actions are rigorously evaluated (see Section 6.4.2).

Behavioural insights (BI) offer powerful tools for CVD prevention and management by going beyond individual “nudges” to inform systemic, regulatory, and economic policies. While traditional CVD strategies often focus on individual behaviour change – like healthier eating or increased physical activity – BI can also address broader systemic barriers such as food accessibility, pricing, and environmental design. Effective interventions often require a policy mix, combining behavioural tools (e.g. labelling, defaults) with structural measures (e.g. regulation, subsidies). CVD chronic disease management insights can help in improving medication adherence, care co-ordination and patient engagement. BI helps identify leverage points within systems, align policy coherence across sectors (such as health, agriculture and environment among others), and ensure policies are grounded in real human behaviour (EU Policy Lab, 2016^[41]).

Box 6.4. Legislation on smoke- and aerosol-free environments shape the environment where we live and work in a positive way for health and the economy: The Irish Public Health (Tobacco) Acts 2002 and 2004 is an example

Ireland's introduction of smoke-free legislation through the Public Health (Tobacco) Acts of 2002 and 2004 stands as a landmark example of structural, cross-sectoral public health policy. By framing second-hand smoke not only as a population health issue but also as a matter of occupational safety, the legislation gained strong legitimacy and public support. Although there was some initial hesitation from the hospitality industry, evidence later showed that venues experienced no negative economic effects, which helped build confidence in the policy. Importantly, the policy led to substantial reductions in CVD morbidity and mortality while also supporting progress toward narrowing health inequalities (Akter et al., 2023^[42]).

Ireland's bold step catalysed a wave of legislative action across Europe. Scotland and the rest of the United Kingdom followed in 2006-2007 with comprehensive legislation on smoke- and aerosol-free environments, contributing to a regional shift in tobacco control. This momentum continued with the EU's Tobacco Products Directive 2014/40/EU (TPD) which became applicable in the Member States in May 2016. The Directive introduced several effective tobacco control measures including larger combined health warnings, a ban on characterising flavours and the regulation of ingredients in tobacco products and electronic cigarettes.

In retrospect, Ireland's approach has been recognised as an example of effective public health framing-aligning the issue to both human rights and workplace safety. This strategic positioning helped generate broad societal support and offered a useful model for other countries such as the United Kingdom, New Zealand, and France. Ireland's leadership demonstrated how well-framed, evidence-based legislation can transform environments, protect health, and inspire international policy shifts.

6.4. Strengthening public policy to tackle modifiable drivers of CVD requires actions in several domains

6.4.1. Policy frameworks for CVD prevention

Reducing the burden of CVD requires not only clinical responses but also sustained policy action on key behavioural risk factors – particularly poor diet, physical inactivity, and tobacco use, always with equity lens. In recent years, several international and regional policy frameworks have been developed to help governments translate evidence into effective, scalable interventions. These frameworks (Box 6.5) offer practical tools to navigate complex policy environments, enhance accountability, and foster multisectoral collaboration. Crucially, they shift attention from individual choices to structural determinants, supporting healthier environments and advancing health equity. This section introduces key frameworks that, when strategically applied, can strengthen national prevention efforts and accelerate progress in reducing CVD.

Box 6.5. Policy Frameworks Referenced in this Chapter

NOURISHING (World Cancer Research Fund):

- The **NOURISHING framework** is a policy tool to promote healthy diets and reduce obesity and non-communicable diseases (NCDs). It offers a structured approach for governments to design, implement, and monitor evidence-informed interventions across three domains: **food environment, food system, and behaviour change communication**. The acronym “NOURISHING” highlights ten policy areas that support healthier eating, including nutrition labelling, healthy food provision in public institutions, and the use of economic tools such as taxes and subsidies. By encouraging action across these areas, the framework supports a whole-of-society approach to creating healthier food environments and improving dietary behaviours.

MOVING (World Cancer Research Fund)

- The **MOVING framework** is a policy tool to support physical activity promotion and reduce the burden of NCDs. It helps governments develop and assess comprehensive strategies by focussing on six key policy areas: **Mass media campaigns, Opportunities for physical activity in schools, Volunteer and community programmes, Infrastructure and urban design, National guidelines, and Governance**. These components encourage environments that make physical activity more accessible and appealing across populations. The framework supports integrated, multisectoral action to embed physical activity into daily life and promote long-term health benefits.

MPOWER (World Health Organization)

- The **MPOWER framework** is a set of evidence-based measures to assist countries in implementing effective tobacco control policies and reducing tobacco-related harm. Each letter in MPOWER stands for a key action area: **Monitor** tobacco use and prevention policies, **Protect** people from tobacco smoke, **Offer help** to quit, **Warn** about the dangers of tobacco, **Enforce** bans on advertising, promotion, and sponsorship, and **Raise taxes** on tobacco products. Together, these six strategies provide a practical roadmap for governments to reduce tobacco use, save lives, and meet international commitments under the WHO Framework Convention on Tobacco Control.

6.4.2. Food and nutrition policy

Dietary risks remain an important contributor to the CVD burden and a one of the key factors in the rising prevalence of obesity and diabetes (see Chapter 3). Encouraging healthier diets will benefit from continued efforts to reduce salt, fat and sugar intake and to support shifts toward alternatives to ultra-processed foods (UPF), usually calorie dense, with high salt, fat and sugar content. The energy share from UPFs across 22 European countries varies from 14 to 44%, with the lowest intakes in Italy and Romania, while the highest intakes are in Sweden and the United Kingdom (Mertens, Colizzi and Peñalvo, 2021^[43]). With the exception of Finland, Spain and the United Kingdom, most countries are reporting increases in UPF, matching a global trend on increasing dominance of UPF in food systems (Mertens, Colizzi and Peñalvo, 2021^[43]; Popkin and Ng, 2021^[44]).¹

Using the NOURISHING policy index (Table 6.2), the policy landscape shows considerable variation across European countries, both in scope and intensity of action. EU-level food environment policies were rated as weak for 65% and very weak for 23% of the 26 policy indicators covering food composition,

labelling, promotion, prices, provision, retail and trade domains. Countries such as Norway, Finland, and the UK nations (England, Wales, and Northern Ireland) demonstrate relatively broad engagement, implementing policies across nearly all domains, including front-of-pack labelling, school food standards, reformulation strategies, marketing regulation, and public awareness campaigns. These countries have also taken steps in areas such as creating healthy retail environments and healthier food supply chains. Germany and Czechia have implemented measures in areas such as labelling and food quality, but have introduced fewer policies in domains such as advertising regulation and public awareness. Outside Europe, Singapore has several public health policies that are in place or under development to reduce CVD risk factors by targeting sugar, sodium, saturated fat, and trans-fat intake. Key upcoming measures include extending the current Nutri-Grade labelling and advertising restrictions on beverages to key contributors of sodium and saturated fat intake for residents by mid-2027. Particularly underdeveloped across most countries are the domains related to retail environment incentives and cross-sectoral supply chain actions. This uneven implementation underscores the need for greater policy ambition, and highlights both the diversity of policy environments and the uneven progress toward creating healthier food environments in the region. This heterogeneity is consistent with analyses done using the FOOD-EPI index to identify important gaps in policies and particularly in infrastructure support. For the 24 infrastructure support indicators (including considerations on Health in All Policies, system-based approaches, funding, monitoring, governance and leadership), 63% were rated as moderate and 33% as weak (the PEN Consortium, 2022^[45]).

Marketing regulations on food advertising can be a powerful tool to improve dietary quality, particularly in children (WHO, 2023^[46]; Boyland et al., 2022^[47]). Marketing restrictions on unhealthy food – particularly to children – are implemented in the European Region, with few countries adopting comprehensive measures, some with mandatory policies (Norway, Portugal, and the United Kingdom for example) (Norwegian Ministry of Health and Care Services, 2025^[48]; HSPM, 2017^[49]; UK Parliament, 2025^[50]). Best practice countries include restrictions across multiple media platforms (e.g. TV, digital, packaging) and in settings such as schools, with strict monitoring and penalties for non-compliance (Taillie et al., 2019^[51]).

Table 6.2. NOURISHING Framework Policy Index for selected European Countries

	N	O	U	R	I	S	H	I	N	G
	Nutrition label standards and regulations on the use of claims and implied claims on food	Offer healthy food and set standards in public institutions and other specific settings	Use economic tools to address food affordability and purchase incentives	Restrict food advertising and other forms of commercial promotion	Improve nutritional quality of the whole food supply	Set incentives and rules to create a healthy retail and food service environment	Harness food supply chain and actions across sectors to ensure coherence with health	Inform people about food and nutrition through public awareness	Nutrition advice and counselling in healthcare settings	Give nutrition education and skills
Austria	★★★★	★★	N/A	N/A	★★★★	N/A	N/A	★★	N/A	★
Belgium	★★★★	★★	★★	★	★★★★	★★★	★	★★★	N/A	★★
Bulgaria	★★	★★★★	★	★	★★★★	N/A	N/A	★★	N/A	N/A
Croatia	★★★★	★★★★	★★★	★	★★★★	N/A	N/A	★★★	★★	★
Czechia	★★	★★	★	★	★★★★	N/A	N/A	N/A	N/A	★
Denmark	★★★★	★★★★	★★	★	★★★★	N/A	★	★★★★★	N/A	★★
Estonia	★★	★★★★	★★	★★	N/A	N/A	N/A	★★★★	★★	★★
Finland	★★★★	★★★★	★★★	★	★★★★	N/A	★	★★★★	★★	★
France	★★★★	★★★★	★★★	★	★★★★	N/A	★	★★★★	★★	★★
Germany	★★★★	★★★★	★	N/A	★★★★	N/A	★	★★★★	N/A	★★
Greece	★★	★★★★	★	N/A	★★★★	N/A	N/A	★★★★	★★	★
Hungary	★★	★★★★	★★★	★	★★★★	N/A	★	★★★	N/A	N/A
Ireland	★★★★	★★★★	★★	★★	★★★★	N/A	N/A	★★★★	★★	★★
Italy	★★	★★★★	★	★	★★★★	N/A	N/A	★★★	★★	★
Latvia	★★	★★★★	★★★	★★	★★★★	★★	★★★	★★★★	★★	★★★★
Lithuania	★★★★	★★★★	★★	★	★★★★	N/A	★	★★	★★	N/A
Malta	★★	★★	★	★	★★★★	★★	★	★★	N/A	★
Netherlands	★★	★★★★	N/A	★★	★★★★	★	★	★★★★	★★★★	★★★★
Poland	★★	★★	★★★	★	★★★★	N/A	N/A	★★★	N/A	★★
Portugal	★★	★★★★	★★★	★	★★★★	★★	★	★★★★	★★	N/A
Romania	★★	★★★★	★★	★	★★★★	N/A	N/A	★★★★	★★★★	★★
Slovak Republic	★★	★★★★	★	★	N/A	N/A	N/A	★★	N/A	N/A
Slovenia	★★★★	★★★★	★★	★	★★★★	N/A	★	★★★	★★	★★
Spain	★★	★★	★★★	★★	★★★★	N/A	★	★★★★	★★	★★
Sweden	★★★★	★★	★★	★	N/A	N/A	★	★★	★★	★★
Northern Ireland	★★★★	★★★★	★★★	★★	★★★★	★	★★	★★★★	N/A	★★★★
Norway	★★★★	★★★★	★★	★★★★	★★★★	★	★	★★★★	★★★★	★★
England	★★★★	★★★★	★★★	★★	★★★★	★★★	★	★★★★	★★	★★
Scotland	★★★★	★★	★★★	★★	★★★★	★★★	★	★★★	N/A	★
Wales	★★★★	★★★★	★★★	★★	★★★★	N/A	★	★★★★	★★	★

Note : Results are placed in 5 categories: poor (1), fair (2), moderate (3), good(4) and excellent (5) or no policies identified (N/A), as assessed against the NOURISHING policy benchmarking tool, <https://www.wcrf.org/research-policy/policy/nutrition-policy/nourishing-nutrition-policy-benchmarking-tool/>.

Source: WCRFI (2023^[52]), NOURISHING nutrition policy index brief, <https://www.wcrf.org/research-policy/library/nourishing-nutrition-policy-index-brief/>.

Salt reduction

Most countries in the WHO European Region (52 out of 53, or 98%) reported salt consumption levels exceeding the WHO's recommended maximum. In nearly all of these countries, men consume more salt than women and on-average, Western and Northern European countries tend to have the lowest salt intake, while the highest levels are observed in Central and Eastern European countries (Kwong et al., 2022^[53]). (see Chapter 3 for more discussion).

Mandatory targets, legally binding limits on the amount of salt in food products, seem to provide potentially the highest health and economic benefits. For example, recent analysis in Australia suggest that implementing mandatory WHO benchmarks could lead to cost savings within the first decade, potentially preventing around 2 743 deaths from CVD and 43 971 new cases, and highly cost-effective over the course of a lifetime (Marklund et al., 2024^[54]).

Policy reversals can result in missed opportunities to improve population health and equity. An illustrative example is the UK's shift from the Food Standards Agency (FSA) salt reformulation programme to the Responsibility Deal. While voluntary, the FSA programme included strict, externally audited compliance and the credible threat of mandatory, enforceable targets. In contrast, the Responsibility Deal diluted many of these features, particularly around monitoring. Between 2003 and 2010, salt intake in England fell steadily (by 0.20 g/day in men and 0.12 g/day in women), but after the Responsibility Deal introduction in 2011, reductions slowed to 0.11 g/day in men and 0.07 g/day in women. This slowdown is linked to around 9 900 additional CVD cases between 2011 and 2018, with up to 26 000 more projected by 2025, and may have worsened health inequalities.

While progress is happening, few countries have implemented national salt reduction policies. Best practices include mandatory salt limits in Portugal, comprehensive reduction programmes in Finland and Ireland, and procurement standards in Northern Ireland. Most countries rely on voluntary agreements, indicating a major opportunity in this area (WCRFI, 2023^[52]). The WHO European Salt Action Network (ESAN) – established in 2007 and currently comprising 35 Member States – provides a key technical and policy platform to support countries in the World Health Organization European Region to accelerate sodium reduction through evidence-based strategies, co-ordinated action, and shared lessons, directly addressing the high salt consumption levels and policy gaps discussed (WHO, 2025^[55]).

Taxing added salt has been explored as one possible approach to help reduce population sodium intake and support improvements in cardiovascular health, particularly when applied broadly to processed and packaged foods. Simulation studies suggest that comprehensive salt taxation could contribute to reductions in salt consumption of around 5-15%, with potential long-term health benefits. While only a few countries have introduced such measures, Hungary's Public Health Product Tax (PHPT) – in place since 2011 – provides a useful early example. The policy includes a levy on salty snacks and has been associated with decreases in the consumption of taxed products and reformulation efforts in a number of items (WCRFI^[52]).

Added sugar

Excessive added sugar consumption contributes to the NCD burden in Europe and is an issue not only for adults but more concerningly for children. In Europe, sugar intake contributes 15%–21% of energy in adults and 16%–26% in children. Added sugars account for 7%–11% of adults' and 11%–17% of children's energy intake (Azaïs-Braesco et al., 2017^[56]). Recent European studies highlight concerning levels of sugar consumption among children and adolescents. According to the Identification and Prevention of Dietary- and Lifestyle-Induced Health Effects in Children and Infants study (IDEFICS), young children already consume high amounts of sugar – boys average 98 grammes of total sugars per day, while girls consume around 93 grammes. Of that, free sugars account for the majority: 81 grammes for boys and

77 grammes for girls, making up approximately 18% of their daily energy intake – well above health recommendations (< 10%) (Graffe et al., 2019^[57]).

The situation appears even more critical among adolescents. The Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study found that teenagers consume an average of 137.5 grammes of total sugars daily, with 110 grammes coming specifically from free sugars. This represents nearly 20% of their energy intake from free sugars alone. Alarming, 94% of adolescents exceed the World Health Organization's recommendation that free sugars make up no more than 10% of daily energy intake. (Mesana et al., 2016^[58]).

Taxing and regulating sugar – especially through taxes on sugary drinks and healthy school food policies – is an increasingly adopted approach to reducing excessive sugar consumption (European Commission, 2025^[59]). Countries like England, Ireland, Hungary, Northern Ireland and Scotland are at the forefront of this movement, implementing comprehensive approaches that combine fiscal measures with marketing restrictions and nutrition education. These integrated policies not only incentivise product reformulation by manufacturers but also promote healthier consumer choices, especially among children and vulnerable populations. (Box 6.6) (WCRFI, 2023^[52]).

Fruit and vegetables

Fruit and vegetable intake varies considerably across European countries, providing a unique opportunity to promote policy action to improve its accessibility and affordability (see Chapter 3). Subsidies on healthy foods, particularly fruits and vegetables, are consistently effective in increasing their consumption across diverse populations. On average, a 10% price subsidy leads to a 14% increase in fruit and vegetable intake, with stronger effects observed in lower-income groups, thus improving both diet quality and health equity. Subsidies not only enhance affordability but also lead to greater reductions in diet-related risk factors, especially when combined with taxes on unhealthy foods (Wolfenden et al., 2021^[60]; Pearson-Stuttard et al., 2017^[61]).

Trans-fats

As of April 2021, the European Union implemented a regulation capping trans-fat at 2 grammes per 100 grammes of fat in food products, harmonizing standards across member states (European Commission^[62]). Evidence from England suggests the measure could reduce coronary heart disease mortality by around 3% and generate net economic benefits of approximately EUR 350 million over five years, while also contributing to reduced health inequalities. Other states follow suit such as Canada, the United States, Singapore, South Africa and Brazil and WHO has set an ambition to eliminate artificial trans-fats from food systems and supply chains (WHO^[63]). Thereafter, following WHO's ambition, Singapore implemented a full ban on partially hydrogenated oils (PHOs), the main source of artificial trans-fats, as an ingredient in all foods in 2021.

Box 6.6. The implementation of the UK's Soft Drinks Industry Levy (SDIL)

Introduced:

- April 2018, following government consultation and inclusion in the Budget 2016 and Finance Bill 2017 (HM Revenue & Customs, 2016^[64]).
 - New policy for the United Kingdom, but similar policies existed
 - Momentum gained from work in Mexico and mobilisation of public opinion, strong support from public (Pell et al., 2019^[65])

Design:

- A two-tier tax targeting manufacturers/importers:
 - 18p per litre for drinks with 5-7.9 g sugar/100 ml
 - 24p per litre for drinks with 8 g+ sugar/100 ml.
 - Exemptions include pure fruit juice, milk-based drinks ($\geq 75\%$ milk), milk alternatives, powdered drinks, and small producers (Action on Sugar, 2025^[66]).

Incentivised Reformulation:

- By 2019, 65% of drinks originally above 5 g/100 ml were reformulated to below the threshold – reducing the levy-labile range from 52% to 15% of market share (Action on Sugar, 2025^[66]).
- Between 2015-2020, the sugar content in affected drinks dropped by ~46% (Action on Sugar, 2025^[66]).

Impacts on Purchasing & Consumption:

- Households bought 15 g less sugar from drinks per week (overall), with the largest reductions in the most deprived areas (Cobiac et al., 2024^[67]).
- Promotions and sales shifted toward lower-sugar products.

Health Outcomes (Modelling):

- Over 10 years, predicted avoidance of ~64 100 cases of childhood overweight/obesity and ~3 600 fewer dental caries in children/adolescents (Cobiac et al., 2024^[67]).
- Also modelled improvements in life expectancy and a small reduction in health inequalities.

Industry Economics:

- Initial announcement caused a short-term dip in manufacturers' domestic turnover, but these effects did not persist post-implementation (Law et al., 2020^[68]).

Revenue & Reinvestment:

- Raised an estimated GBP 520 million in its first year, though later revised to ~GBP 240 million after reformulation reduced tax liability (Action on Sugar, 2025^[66]).
- Funds supported school sports infrastructure and breakfast clubs (Action on Sugar, 2025^[66]).

Policy Evolution:

- Annual consumer price index (CPI)-linked rate increases began April 2025 (HMRC, 2025^[69]).
- Formal consultation in 2024-2025 proposes:
 - Lowering the levy threshold to 4 g sugar/100 ml,
 - Including previously exempt milk-based drinks (with lactose allowance),
 - Potentially adding a third tier or increasing rates for highest-sugar drinks (HMRC, 2025^[69]).

6.4.3. Modifying the places where we learn, work and entertain to improve diets

Sports stadia have strong potential to support public health but are often associated with unhealthy behaviours due to the promotion of unhealthy food, harmful alcohol use, and tobacco. A study across 88 stadia in 10 European countries, part-funded by the EU, examined existing health-related practices. Using a detailed questionnaire, researchers collected data on food offerings, physical activity, tobacco policies, mental health, sustainability, and social responsibility. Results showed wide variation across countries and sports. Despite these differences, the study identified examples of good practice and emphasised the untapped opportunity for stadia to promote healthier lifestyles and a way to reach “hard to reach” populations. This led to the creation of the European Healthy Stadia Network, an active, ongoing campaign to improve not only diets but smoke-free stadiums and overall health and well-being of sports fans, stadium staff and their communities (Healthy Stadia, 2024^[70]).

Schools significantly influence children’s dietary habits, with robust evidence showing that nutrition policies combining healthy food provision and education improve intake of fruits and vegetables and reduce sugary food consumption (Hodder et al., 2022^[71]). National evaluations – for example, Finland’s free school meals and Scotland’s meal standards – report improved diet quality and equity. The EU School Scheme has also shown positive effects on awareness and short-term eating behaviours when educational components are interactive and consistent (EPRS, 2022^[72]).

At the policy level, the EU supports school-based nutrition through the EU School Scheme (Regulation (EU) 2016/791), which funds the distribution of fruit, vegetables, milk, and related educational activities. The EU supports actions to improve dietary habits, including through the food industry-led EU Code of Conduct on Responsible Food Business and Marketing Practices, as well as Food 2030 (European Commission^[73]; European Commission^[74]). In addition, the EU supports national reformulation initiatives to reduce the levels of saturated fats, sugar and salt and promotes the consumption of fruit and vegetables. The Commission has completed a review of the successful EU school scheme on fruits, vegetables and milk and milk products, and proposed its continuation beyond 2027 (European Commission^[75]). WHO Europe also collaborates with member states to develop and align national school food policies (European Commission, 2025^[76]). Crucially, this set of actions can result also in positive impact in the local food environments where the schools are, multiplying the benefits of the intervention (Bryant et al., 2023^[77]). In this aspect, an interesting proposal is the SCHOOLS4CHANGE project, that elaborated a comprehensive, legally robust, and adaptable framework of innovative, sustainable, and healthy public food procurement criteria and practices designed to transform school meals and food systems by integrating environmental, social, economic, and health dimensions to achieve improved quality, accessibility, and sustainability across diverse local contexts (SchoolFood4Change, 2023^[78]).

The Commission is supporting Member States in addressing risk factors via policies, projects and funding on health promotion and disease prevention. The ‘Healthier together’ non-communicable diseases initiative provides the strategic framework for action to prevent and manage non-communicable diseases and their risk factors. Through the EU4Health programme, support has been provided to implement relevant actions of the ‘Healthier together’ initiative. Collaborative actions between Member States such as the Joint Action PreventNCD are important tools in preventing and managing non-communicable diseases (NCDs). By targeting health determinants, the European Commission supports Member States and stakeholders in developing and implementing actions on health promotion and disease prevention. Through sustained investment and collaboration, preventive measures can significantly reduce the NCD burden, promoting healthy and active lifestyles and reducing the burden healthcare systems.

Box 6.7. Finland School Meals Programme

- **Universal and Free:** All pupils in basic education receive a free, hot meal every school day, mandated since 1948 and now also extended to upper secondary education.
- **Nutritionally Balanced:** Meals follow national nutrition guidelines and cover about one-third of daily nutritional needs, including a main dish, vegetables, bread, and milk or alternatives.
- **Educational Role:** School meals are treated as part of nutrition education, with teachers encouraged to eat with students and healthy eating integrated into the curriculum.
- **Inclusive and Monitored:** Special diets are accommodated, and quality is assessed using the Meal Quality Index developed by Finland's public health institute (THL).
- **Equity and Health Impact:** The programme supports equal access to healthy food, improves dietary habits, and reduces food insecurity and health disparities among children.

Source: FAO (2023^[79]), School Food Global Hub: Finland, <https://www.fao.org/platforms/school-food/around-the-world/europe-and-central-asia/finland/en>; LSHTM/SMC (2023^[80]), School Meals Case Study: Finland, https://www.schoolmealscoalition.org/sites/default/files/2024-05/Kuusipalo_Manninen_2023_Food_Meals_Case_Study_Finland.pdf.

A widely recognised example of leveraging the education sector to improve diets is Finland's School Meals Programme, which provides a comprehensive approach to realising the full potential of a place-based intervention (Box 6.7). However, key evidence gaps remain in assessing long-term health impact, differential effects by socio-economic status or ethnicity, and there are only a few in-depth studies of policy implementation across countries. For example, a recent mapping exercise of schools and various municipalities showed that many countries has procurement policies that integrate as well sustainability requirements, but barriers persists, such as the high cost of healthier food alternatives, rigid legal frameworks precluding healthier food procurement decisions, and the burden of administrative loads, particularly for smaller localities (SF4C, 2022^[81]).

6.4.4. Substantial progress has been made on controlling tobacco smoking

There are significant differences in smoking prevalence across Europe (Chapter 3), though controlling tobacco remains crucial in all countries to tackle CVD. Approximately one fifth of coronary heart diseases are attributable to tobacco use and exposure to second-hand smoke. In 2023, an average of 18% of adults smoked daily across EU countries. In 2023, an average of 18% of adults smoked daily across EU countries. While individual policies – such as taxation, smoking restrictions, and health warnings – are effective on their own, the most impactful approach is implementing them simultaneously (Akter et al., 2024^[82]) (Figure 6.3). Other measures, such as flavour bans and free or discounted nicotine replacement therapy, also show positive impacts on quit rates, with flavour bans reducing e-cigarette consumption. Comprehensive implementation of MPOWER policies at the national level has been associated with a 7% reduction in smoking prevalence and a 13.8% decrease in cigarette consumption (Ngo et al., 2017^[83]). Furthermore, smoke-free legislation correlates with lower risks of CVD events (OR 0.90; 95% CI 0.86-0.94) and hospitalisations for CVD or respiratory diseases (OR 0.91; 95% CI 0.87-0.95) (Akter et al., 2023^[42]).

The whole spectrum of effective policy actions to reduce the harms of tobacco smoking are considered or under implementation in EU countries. Particularly relevant are the interest in flavour restrictions – a key issue particularly to reduce smoking in the youth- in 15 countries, alongside with age restrictions, marketing restrictions, and educational and behavioural interventions. Furthermore, end game goals and consideration of tobacco-free generation policies are also increasingly attracting policy attention.

Among the MPOWER components, most countries in Europe have strong policy measures on monitoring and taxation. The greatest variation amongst not complete measures is observed in smoke-free

environments, mass media campaigns, and advertising regulation. For smoke-free environments, scores range widely: countries like Belgium, Denmark, Estonia and Italy tend to have more limited implementation, while others such as Czechia and Lithuania have moderate to strong policies. In terms of reach and frequency of anti-tobacco messages in mass media, disparities are stark – Austria, Portugal, Sweden and Switzerland showed less intensity in public campaigns, whereas countries like Latvia, Lithuania and Poland are closer to have stronger actions in place. These variations reflect differing levels of commitment to structural and promotional tobacco control policies and point to clear areas for policy strengthening in several countries, and a more harmonised approach to implementation across the region.

Cigarette affordability across Europe continues to be a concern. Only seven countries – Belgium, Czechia, Finland, France, Germany, the Slovak Republic and the United Kingdom – have made cigarettes less affordable since 2014, indicating effective use of price and tax policies to reduce tobacco consumption. In contrast, 11 countries – Estonia, Ireland, Latvia, Lithuania, Iceland, Poland, Portugal, Slovenia, Spain, Sweden and Türkiye – have seen cigarettes become more affordable. The remaining countries – Austria, Denmark, Greece, Italy, the Netherlands, Norway, Luxembourg and Switzerland – show no significant change, reflecting stagnation in tobacco affordability measures. This imbalance highlights the need for stronger and more consistent tax and pricing policies across the region to ensure cigarettes become less affordable over time.

On 16 July 2025, the Commission proposed modernising the Tobacco Taxation Directive to raise minimum excise rates from 2028. Aligned with the EU's Beating Cancer Plan to reduce smoking below 5% by 2040, from a 24% prevalence, the revision harmonises tax definitions for tobacco and tobacco related products, notably e-cigarettes and nicotine pouches, partially adjusting the tax rates to purchasing-power adjustments average income. It is also extending the scope of the directive to new products (such as e-cigarettes) to be covered by new minimum taxes, as well as including raw tobacco in the existing electronic system for recording and monitoring the movement of excise goods within the EU to further curb illicit trade. The proposal will not only boost revenues by EUR 15 billion, but will save EUR 6 billion in healthcare (European Commission, 2025^[84]). Furthermore, the European Commission has recommended strengthening smoke-free environments by extending restrictions to outdoor areas such as playgrounds, transport hubs, and spaces near healthcare and education facilities, and including emerging products like heated tobacco and e-cigarettes (European Commission, 2024^[85]).

Most European countries have well established and strong approaches to smoking cessation (Table 6.4). For this it is essential to educate the workforce and adopt best practices. The European Network for Smoking and Tobacco Prevention, a network collaborating institutions from 15 countries worked to develop an accredited eLearning course and curriculum on Tobacco-Treatment Delivery, highlighted as a best practice by the EU commission, and aligned with WHO guidelines for compliance with Article 14 of the FTCC (European Commission, 2021^[86]; FCTC, 2013^[87]). Amongst European best practices is EPIC, a Danish endgame-aligned programme offering free, personalised cessation support via hospital referrals, municipal follow-up, and medication – targeting disadvantaged smokers and achieving strong quit rates, reduced inequalities, and high satisfaction – serving as a scalable model for EU tobacco-control efforts (European Commission^[88]).

The EU aims for a tobacco use prevalence of less than 5% by 2040 with its Tobacco-Free Generation goal, aligning with the tobacco endgame approach (EU, 2021^[89]). Most countries in the region have implemented effective tobacco control measures, but further progress is needed to achieve this ambition. Eight countries had official governmental endgame goals, and an additional six EU MS had similar proposals from government, civil society or research entities (Ollila et al., 2024^[90]). These actions include restrictions on the sale of tobacco and related products and raising the age limit to above 18 years. Product standards were mainly used to regulate flavours, whereas no measures to substantially reduce addictiveness were reported. Market-oriented measures targeting industry profits were predominantly missing, and countries often did not have concrete tools to prevent potential industry influence.

Tobacco-free generation (TFG) legislation is gaining policy momentum across Europe, with several countries such as Finland, France, Ireland, Luxembourg, the Netherlands, Norway and Türkiye considering this approach to achieve the endgame tobacco goal, while the United Kingdom has introduced a bill to support it. Unlike traditional age-limit laws, TFG communicates that there is no safe age to begin tobacco use, while allowing access for older, already dependent individuals. Successful implementation relies on public support, strong retail licensing, and complementary measures such as excise taxes and youth-focussed education campaigns. The policy anticipates resistance from ideological, practical and the tobacco industry opposition. The New Zealand law was repealed a year after it was passed, suggesting that it requires careful framing and legal design to withstand pushback and maximise long-term public health gains (Berrick, 2025^[91]).

E-cigarettes may pose a risk to tobacco control progress. The increased use of e-cigarettes is resulting in policy action and sparking public health concerns, especially among the youth (WHO, 2024^[92]). The Tobacco Products Directive (2014/40/EU) partially harmonised e-cigarette regulations across Europe, allowing individual countries to set their own rules regarding certain aspects such as their public use and flavours (European Parliament, 2014^[93]). (see also Annex 6.A). Variation in regulations across countries can complicate oversight. Flavoured products, popular with adolescents, have been linked to health risks such as oxidative stress and other adverse effects. (Stratton, Kwan and Eaton, 2018^[94]).

The concurrent use of e-cigarettes and cigarettes (“dual use”) is a concern, highlighted by results from the recent Tackling second-hand tobacco smoke and electronic cigarette emissions (TackSHS) survey. TackSHS involved a face-to-face survey conducted in 2017-2018 in 12 European countries (Bulgaria, England, France, Germany, Greece, Ireland, Italy, Latvia, Poland, Portugal, Romania and Spain) (TackSHS Project Investigators, 2023^[95]). It found that 2.4% of people surveyed reported current use of electronic cigarette, ranging from 0.6% in Spain to 7.2% in England. Importantly, amongst 272 electronic cigarette users, 52.6% were dual users (TackSHS Project Investigators, 2023^[95]).

The rise in teen addiction and in particular dual use among young people is concerning, though emerging evidence suggests targeted policy interventions can counter this trend. Across 32 European countries, more than one in four adolescents aged 15-16 reported ever using both e-cigarettes and cigarettes (dual use), while 6% were current dual users (Ollila et al., 2023^[96]). However, more comprehensive national e-cigarette regulations have been linked to reduced dual use (OR=0.80; 95% CI 0.67 to 0.95), as was perceived difficulty in obtaining cigarettes (Ollila et al., 2023^[96]; Hamoud et al., 2024^[97]), emphasising the role of comprehensive tobacco and e-cigarette regulations in tackling the dual use trend.

There are concerns that the use of e-cigarettes by youths may serve as a gateway to traditional smoking. Longitudinal studies from the United Kingdom and other countries indicate that adolescent vapers are more likely to initiate combustible cigarette use compared to their non-vaping (Tokle, Brunborg and Vedøy, 2021^[98]; Aladeokin and Haighton, 2019^[99]). These findings raise concerns that e-cigarettes may undermine tobacco control progress by fostering new nicotine dependencies and renormalising smoking behaviours (Parnham et al., 2024^[100]). In response to such risks, Singapore has in place a multi-pronged approach to reduce nicotine use through a mix of regulatory measures, public education initiatives and cessation services. Recent regulatory moves include the expansion of smoke-free areas, Standardised Packaging measures with graphic health warnings for tobacco products, increase in tobacco taxation and raising the minimum legal age for purchase of tobacco products to 21. Specific to vaping, the import, distribution, sale, supply, use and possession of e-vaporisers/e-cigarettes is strictly prohibited in Singapore.

European countries have adopted diverse regulatory approaches to e-cigarettes. The EU Tobacco Products Directive (2014/40/EU) limits nicotine concentrations to 20 mg/mL, restricts refill containers volumes to 10 mL and cartridges/tanks volume to 2 mL, and mandates child-resistant packaging, product health warnings (European Parliament, 2014^[93]). Age restrictions (18+) are enforced across Member States, while many have implemented or are considering flavour bans to reduce youth appeal. Croatia, for example, has introduced policies on tobacco and vaping, including age restrictions, price increases,

marketing controls, flavour restrictions, and educational and behavioural interventions, and is currently moving towards a stricter regulatory approach. Several countries are now addressing environmental concerns through bans on single use (disposable) vapes. Belgium's ban is set to take effect in 2025, with similar measures in progress in France and the United Kingdom (Gov.UK, 2025^[101]; Public, 2025^[102]). Ireland's proposed legislation also includes advertising restrictions and plain packaging rules for vaping products (Institute of Public Health, 2024^[103]).

6.4.5. Progress in tackling harmful use of alcohol

Countries across Europe have overall advanced policies to tackle harmful alcohol consumption based on key European and International frameworks, though there are differences among countries. Specifically, the European Framework for Action on Alcohol 2022-2025 sets out six key priority areas: pricing policies, marketing restrictions, availability controls, health information and labelling, health services' response, and community action (WHO, 2022^[104]). Specifically, the SAFER initiative, led by WHO, includes cost-effective actions to help governments reducing the alcohol related harm and strongly targets commercial factors directly through stronger regulation, pricing policies, enforcement of the regulations including driving laws and treatment access (WHO, 2025^[105]).

There is uneven implementation across Europe. Norway and Sweden have implemented state alcohol monopolies and strict marketing controls (WHO, 2024^[106]), while Estonia and Lithuania adopted WHO "best buy" policies, resulting in marked reductions in alcohol-related mortality (Rehm et al., 2023^[107]). These measures align closely with the WHO Global Alcohol Action Plan 2022-2030 (WHO, 2024^[108]) and the European Framework for Action on Alcohol 2022-2025 (WHO, 2022^[109]). The COVID-19 pandemic added complexity, as drinking patterns shifted and highlighted disparities in policy reach (Kilian et al., 2022^[110]). For example, while Ireland and Scotland have adopted minimum unit pricing to target cheap alcohol (Berdzuli et al., 2020^[111]), other countries rely primarily on taxation and availability measures. Some countries have rolled back policies, leading to increased alcohol-related harm (Rehm et al., 2023^[107]). Overall, the region has made progress, and further sustained actions are needed to fully align with WHO frameworks.

6.4.6. Policies to promote physical activity can reduce cardiovascular risk across the life course

Physical activity benefits cardiovascular health at every stage of life – from foetal development to older adulthood. Starting and maintaining an active lifestyle can help prevent heart disease and reduce other health risks as people age. Physical activity levels remain insufficient, with one in three adults not meeting recommended levels and almost half of the population never engaging in sports or exercise (see Chapter 3). This is even more concerning among children and teenagers, of whom very few achieve recommended levels. The COVID-19 pandemic compounded the issue by restricting physical activity and increasing sedentarism. Additionally, excessive screen time, online gaming, and gambling contribute to sedentary behaviour, which increases cardiovascular risk through reduced physical activity and can also negatively affect mental health (Council of Europe, 2025^[112]).

Increased physical activity can play a substantial role in helping to control cardiovascular risk factors. For example, it can lower systolic blood pressure by 7 mmHg, increase "good" high-density lipoprotein (HDL) cholesterol by 5-10%, reduce triglycerides by 50% and reduce "bad" low-density lipoprotein (LDL) cholesterol by 5%. Crucially, physical activity improves glycaemic control, reduces fat mass and increases well-being and mental health, which can contribute to reducing the progression to obesity and diabetes. Mobile and technology-assisted health applications can be a helpful aid in increasing physical activity uptake, increase step counts, increase vigorous health activity and decrease sedentary behaviours (Singh et al., 2024^[113]). At the same time, addressing behavioural addictions such as excessive internet use, online gaming, and gambling is increasingly recognised as part of prevention strategies; for instance, Italy recently allocated EUR 5 million to initiatives targeting these issues among youth (Council of Europe,

2025^[112]). Most European countries have at least one national policy or action plan spanning health, education, sports, transport, and urban planning. Policies that target very high-need groups, such as young children, the elderly, or socially disadvantaged groups, need to be developed (Table 6.3) (Box 6.8).

Table 6.3. MOVING Framework Policy index for Selected European countries

	M	O	V	I	N	G
	Make opportunities and initiatives that promote physical activity in schools, the community and sport and recreation	Offer physical activity opportunities in the workplace and training in physical activity promotion across multiple professions	Visualise and enact structures and surroundings which promote physical activity	Implement transport infrastructure and opportunities that support active societies	Normalise and increase physical activity through public communication that motivates and builds behaviour change skills	Give physical activity training, assessment and counselling in healthcare settings
Austria	★ ★ ★	★ ★ ★	★ ★	★ ★	★ ★ ★	★
Belgium	★ ★ ★ ★	★ ★ ★	★	★ ★	★ ★ ★ ★	★ ★
Bulgaria	★ ★	N/A	★	★	★ ★ ★ ★	★ ★
Croatia	★ ★ ★	★ ★	N/A	N/A	★ ★	★
Czechia	★ ★	★ ★	N/A	★ ★	★ ★	N/A
Denmark	★ ★ ★ ★	★ ★ ★	★ ★	★ ★	★ ★ ★ ★	★ ★
England	★ ★ ★	★ ★	★ ★	★ ★	★ ★ ★ ★	★ ★
Estonia	★ ★ ★	★ ★ ★	★	★	★ ★ ★	N/A
Finland	★ ★ ★	★ ★ ★	★ ★	★ ★ ★	★ ★ ★ ★	N/A
France	★ ★ ★	★ ★ ★ ★ ★	★ ★	★ ★	★ ★ ★	★ ★ ★ ★ ★
Germany	★ ★ ★ ★	★ ★ ★	★ ★	★ ★ ★	★ ★ ★	★ ★
Greece	★ ★ ★	★ ★ ★ ★	★ ★ ★ ★ ★	N/A	★ ★ ★ ★	★
Hungary	★ ★ ★	★ ★ ★	★ ★ ★ ★ ★	★ ★	★ ★	★
Ireland	★ ★ ★ ★	★ ★ ★ ★	★ ★	★ ★	★ ★ ★ ★	★ ★
Italy	★ ★ ★	★ ★	N/A	N/A	★ ★ ★ ★	★
Latvia	★ ★	★ ★	★	N/A	★ ★	N/A
Lithuania	★ ★ ★	★ ★ ★ ★	★	★ ★	★ ★ ★ ★	★ ★
Malta	★ ★ ★ ★	N/A	N/A	N/A	★ ★	N/A
Netherlands	★ ★ ★	★ ★ ★ ★	★ ★	★	★ ★	★
Poland	★ ★ ★ ★	★ ★ ★	★	N/A	★ ★	N/A
Portugal	★ ★ ★	★ ★ ★	★	★ ★	★ ★ ★	★ ★ ★ ★
Romania	★ ★	N/A	N/A	N/A	★ ★	N/A
Slovak Republic	★ ★	★ ★ ★	★	★ ★ ★	★ ★ ★	★ ★
Slovenia	★ ★	★ ★	★	★ ★ ★	★ ★ ★	★ ★
Spain	★ ★ ★	★ ★ ★	★	★ ★	★ ★ ★ ★	★ ★
Sweden	★ ★	★ ★ ★	★ ★	★	★ ★	★
Northern Ireland	★ ★ ★	N/A	★	★ ★	★ ★	★ ★
Norway	★ ★ ★	★ ★ ★ ★	★ ★ ★	★ ★ ★	★ ★	★ ★
Scotland	★ ★	★ ★	★	★ ★	★ ★	★ ★
Wales	★ ★ ★	★ ★	★ ★	★ ★	★ ★ ★	★ ★

Note: Results are placed in 5 categories: poor (1), fair (2), moderate (3), good (4) and excellent (5) or no policies identified (N/A), as assessed against the assessed against the MOVING Physical Activity Policy Benchmarking Tool.

Source: WCRF (2025^[114]), MOVING physical activity policy benchmarking tool, World Cancer Research Fund, <https://www.wcrf.org/research-policy/policy/physical-activity-policy/moving-physical-activity-policy-benchmarking-tool/> (accessed on 15 July 2025); WCRF (n.d.^[115]), MOVING physical activity policy index, World Cancer Research Fund, <https://www.wcrf.org/research-policy/policy/physical-activity-policy/moving-physical-activity-policy-index/> (accessed on 15 July 2025).

Fostering a life course approach can guide policy action. Starting as early as pregnancy, where prenatal exercise may improve foetal heart development and reduce gestational complications. In childhood, promoting active play and reducing sedentary behaviour in home and childcare settings helps develop motor skills and lowers long-term CVD risk. For adolescents and adults, interventions include school sports, workplace wellness programmes, and community efforts like walkable environments and active commuting incentives. Older adults benefit from low-impact activities such as walking or tai chi, which support heart health while accommodating mobility limitations, emphasising regular movement over extended inactivity (Perry et al., 2023^[116]).

Box 6.8. Policy Landscape in Europe for health enhanced physical activity

Co-ordination & Funding: 78% of EU countries have a national co-ordination mechanism for HEPA (Health-Enhancing Physical Activity), and 93% allocate specific funding – mainly from health, sports, and education sectors. These structures are vital for multisectoral collaboration.

Policy Implementation: All countries reported at least one national sports-for-all policy. 204 total HEPA policies were noted, mostly multisectoral. 93% target specific population groups (e.g. older adults, low-income populations), and all countries include evaluation plans.

Sports & Health Settings: Only 30% EU countries implemented the “Sports Club for Health” programme, though more have similar national initiatives. 74% promote physical activity counselling by health professionals, and 81% include physical activity in health curricula, mainly for doctors and physiotherapists.

Schools & Workplaces: All Member States include physical education in schools and related promotion programmes. 96% train PE teachers in HEPA. 59% promote active travel to school, 77% to work, and 78% have workplace activity programmes.

Urban Planning & Special Populations: Only 26% apply the IMPALA (improving infrastructure for leisure-time physical activity in the local arena) infrastructure guidelines; 81% have frameworks for access to facilities for disadvantaged groups and active ageing.

Public Awareness: 89% of countries conducted national campaigns, using TV, social media, and public events to raise awareness of physical activity benefits.

Source: WHO (2024^[117]), *Health-enhancing physical activity in the European Union, 2024*, <https://iris.who.int/handle/10665/379360>.

6.4.7. Policies targeting environmental risk factors for CVD are emerging in response to multiple environmental crisis

Air pollution is associated with a range of NCDs, including CVD. Both short- and long-term increases in air pollution have an impact. Short-term increases in air pollution are linked to increased incidence of and mortality from ischemic heart disease, and long-term exposure increase the risk of atrial fibrillation and hospitalisation or death from heart failure (Rajagopalan and Landrigan, 2021^[118]).

Policy interventions in Europe are key to reducing the harmful impact of air pollution on health, and progress has been made. Mortality attributable to air pollution has decreased substantially across Europe, in particular for asthma, ischemic heart disease and stroke, moving Europe closer to achieving the target of 55% reduction in attributable deaths set by the Zero Pollution action plan (European Commission, 2025^[119]). Policy on low emission zones are particularly impactful, and involve reducing car use in urban centres. They have been linked to 1 to 8% reductions in CVD outcomes in several German cities, in London

and in Tokyo (Chamberlain et al., 2023^[120]). Indoor air pollution is also becoming an increasingly important public health consideration for high income countries, particularly for older adults (Ndlovu and Nkeh-Chungag, 2024^[121]). Benefits extend to other respiratory conditions and accident reduction, emphasising the role of these structural policies in increasing policy co-benefits.

Extreme weather events are associated with cardiovascular morbidity and mortality. For example, in a recent meta-analysis, exposure to environmental stressors like extreme temperature and hurricanes were associated with increased morbidity and mortality from CVD, disproportionately affecting older adults, individuals from racial and ethnic minoritised groups, and lower-wealth communities. This highlights the need to tackle the ongoing challenges posed by climate change and extreme weather events and to adapt the healthcare system to respond appropriately (Kazi et al., 2024^[122]). Finally, an* emerging association of ambient noise in communities and CVD is increasingly compelling, although more research is needed to conclude on concrete public health action (Lyzwinski, 2014^[123]).

6.5. Policies targeting screening, early detection and risk factor management

Detecting CVD early and controlling clinical risk factors at the individual can save money and improve equity. There are many effective ways to control CVD at the primary, secondary and tertiary prevention level, however approaches and implementation vary across Europe. The Conclusions on the improvement of cardiovascular health in the European Union have recommended scaling up timely screening and early detection, including the assessment of kidney function as part of the European strategy to improve cardiovascular health (European Council, 2024^[124]). A survey of 13 European countries showed that the majority implemented some form of CVD prevention strategy between 2011 and 2021, yet the scale and consistency of delivery remain limited. National strategies exist in a few countries, such as Estonia, while others rely on fragmented measures, often without adequate infrastructure or reimbursement, such as the absence of funded cardiac rehabilitation in Romania (ESC, 2023^[125]).

Population-level interventions that focus on high-risk groups can be highly effective for early detection and screening of CVD. Systemic screening programmes for conditions such as hypertension and diabetes, combined with proactive management strategies, can significantly improve early diagnosis and timely initiation of treatment (Groenewegen et al., 2024^[126]; Handelsman et al., 2023^[127]). Leveraging primary care for routine blood pressure checks and diabetes screening, alongside timely initiation of treatment, is critical to prevent progression to severe disease. Increasing statin use among adults over 40, particularly those with diabetes, also demonstrates strong evidence for reducing CVD risk (Galea G, 2025^[128]). These measures align with existing EU capacities and can deliver measurable health gains within a single political term.

6.5.1. Risk assessment as a mechanism to target higher risk individuals

CVD risk assessment is a mechanism for identifying individuals who are more likely to experience events like heart attacks or strokes, especially those without a prior diagnosis. Its primary purpose is to enable early intervention through personalised prevention strategies – such as lifestyle changes or medications – before any symptoms appear. By estimating a person's future risk, healthcare providers can tailor treatments, allocate resources more efficiently, and empower patients to make informed decisions.

Targeting high-risk individuals with preventive measures leads to greater impact, as interventions yield more benefit when applied to those with higher baseline risk. Example risk assessment tools include the WHO cardiovascular risk charts and SCORE2 (Systematic COronary Risk Evaluation 2) – as well as a number of nationally validated tools (WHO^[129]; ESC Cardiovascular risk collaboration, 2021^[130]).² Most recommendations emphasise conducting cardiovascular risk assessments in adults over 40 who have identifiable and easily measurable risk factors – such as smoking, obesity, family history of CVD, or

hypertension – but who have not yet been diagnosed with CVD. However, the implementation of these assessments needs to align with the capacity of each health system and follow national protocols, ensuring that global recommendations are adapted to local contexts.

Individual-level approaches to detect and reduce cardiovascular risk by tackling cardiovascular risk lifestyle and clinical factors can be effective, cost-effective, and equitable. For example, the National Health Service (NHS) Health Checks programme showed increased detection of elevated risk factors, obesity, diabetes, and chronic kidney disease (in the context of CVD prevention), with increased participation of women and people aged 60 and over, but studies reporting conflicting results in terms of reducing inequalities. The statutory review of the programme in 2021 concluded that the programme is achieving largely its objectives, is cost-effective and targeted interventions can reduce inequalities. (Office for Health Improvement & Disparities, 2021^[131]). Targeting the programme to communities socio-economically disadvantaged can further improve the reduction on inequalities (O’Flaherty et al., 2021^[132]; Kypridemos et al., 2018^[133]).

The scalability of this type of systemic approach is complex, and effectiveness in specific populations need to be shown. The piloting of a High-Risk Prevention Programme (HRPP) in Ireland showed measurable improvements in weight, BMI, and physical activity in socio-economically disadvantaged populations, suggesting its potential as a scalable intervention (Broughan et al., 2024^[134]).

Patient engagement with CVD prevention programmes continues to be challenging, and often people with the most need or from disadvantaged groups are the least likely to benefit. The Scaling up Packages of Interventions for CVD prevention in selected sites in Europe and Sub-Saharan Africa (SPICES) project in France, which leveraged trained community champions and brief advice, highlighted the limitations of individual-level engagement, particularly when public awareness and readiness to change are low and the population is more disadvantaged (Le Goff et al., 2024^[135]). Understanding the behavioural drivers behind prevention disengagement can enhance participation in prevention initiatives, and particularly in reducing health inequalities (Stuart-Shor et al., 2012^[136]). The NHS Health Checks in England has identified as a priority to improve individual uptake of the programme and achieve sustained engagement, including more integration with national and local government and integrated care boards to maximise opportunities for participation and increase prescription rates of evidence-based interventions to improve cardiovascular risk (Office for Health Improvement & Disparities, 2021^[131]).

Training in preventive care remains uneven, and public awareness campaigns have limited measurable impact. The European Society of Cardiology’s (ESC) introduction of accreditation and certification for prevention centres and professionals is a step toward harmonising standards and improving quality, but broader and more co-ordinated implementation efforts are still needed (ESC, 2023^[125]).

6.6. Strengthening citizens and health system early response is crucial to improve care to acute life-threatening conditions

6.6.1. Health literacy improvements could prevent and reduce treatment-seeking delays for life-threatening conditions

Understanding behavioural drivers behind disengagement is key to strengthening CVD prevention and reducing inequalities. Patient-centred and multifaceted interventions – engaging patients, providers, and systems – can improve outcomes such as blood pressure control, obesity, regardless of literacy level (Halladay et al., 2017^[137]; AHA, 2018^[138]).

However, limited public awareness and low engagement, especially in underserved areas, remain barriers. The SPICES project in France, leveraging trained community champions, highlighted the limitations of individual-level engagement in underserved rural areas (Le Goff et al., 2024^[135]). Cardiomyopathies –

frequently inherited primary myocardial diseases – may cause severe symptoms and increase the risk of sudden cardiac death. Policies to strengthen patient and family screening programmes, including health literacy initiatives and adherence to guidelines for screening and care for these patients, may enhance cardiomyopathy care (see Chapter 3).

Early recognition of symptoms of acute coronary syndromes (ACS) or stroke is essential to ensure timely care, significantly reducing morbidity and mortality. For ischemic stroke, clinical benefits from thrombolytic therapy and mechanical thrombectomy are both time-dependent (AHA/ASA_[139]). Similarly, in ACS, particularly ST-elevation myocardial infarction (STEMI), delays in reperfusion therapy are directly associated with increased mortality. From the four phases of the timeframe of acute CVD, the first two are dependent on citizens behaviour. These phases are: 1) time from symptom onset to the decision to seek care, 2) time from the decision to seek care to first medical contact, and 3) time from first medical contact to hospital arrival, and 4) time from admission to treatment (Moser et al., 2006_[140]; Lachkhem, Rican and Minvielle, 2018_[141]).

I have experienced sudden heart-related symptoms in situations where help was not immediately available – twice while driving alone on the highway, and once while swimming. In each case, I felt intense tachycardia, dizziness, and fear, unsure if I was about to lose consciousness or have a more serious event like a stroke or cardiac arrest. These moments were terrifying and left me feeling vulnerable and unsafe in everyday situations. They also highlight the unpredictability of living with a heart condition and the need for better emergency planning, public awareness, and personal support tools for people managing chronic cardiovascular disease.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

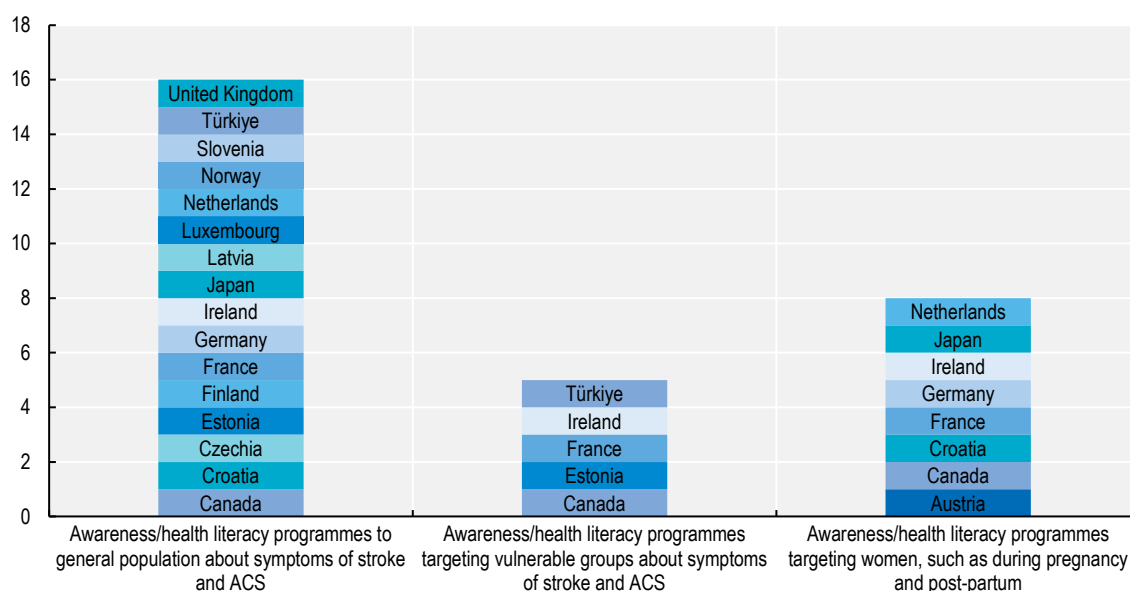
Low health literacy can delay care for life-threatening events, yet it is a modifiable factor through targeted education context-specific education (Nutbeam and Lloyd, 2021_[142]). Many individuals fail to seek care quickly due to a lack of awareness or knowledge. Factors influencing acute stroke delays are often related to pre-hospital phase, notably recognition of stroke symptoms (Lachkhem, Rican and Minvielle, 2018_[141]). Investing in public education to recognise warning signs – such as facial drooping, arm weakness, and speech difficulties in stroke, or chest pain in ACS – can enhance timely care and improve outcomes. In specific contexts, instead of self-presenting to a primary care physician without the resources to diagnose ACS, it is important that the public can recognise ischemic symptoms and activate the pre-hospital pathway.

6.6.2. Countries are developing health literacy initiatives to improve early response to acute cardiovascular events, although challenges persist to ensure country-level dissemination

Several countries have implemented health literacy initiatives focussed on early response to life-threatening cardiovascular events (Box 6.7). According to the OECD Policy Survey on Cardiovascular

Health, 15 countries reported public awareness initiatives related to symptoms of stroke and ACS. **The Netherlands** provides health resources through the Heart Foundation and media campaigns on timely access and automated external defibrillator (AED) education. In **Sweden**, health campaigns are often led by NGOs or local authorities, which hinders national-level assessments. **Canada** collaborates with provincial governments on public awareness campaigns.

Figure 6.4. Several EU+2 countries have public awareness initiatives related to symptoms of acute life-threatening conditions, although only a few target populations living in vulnerable situations



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

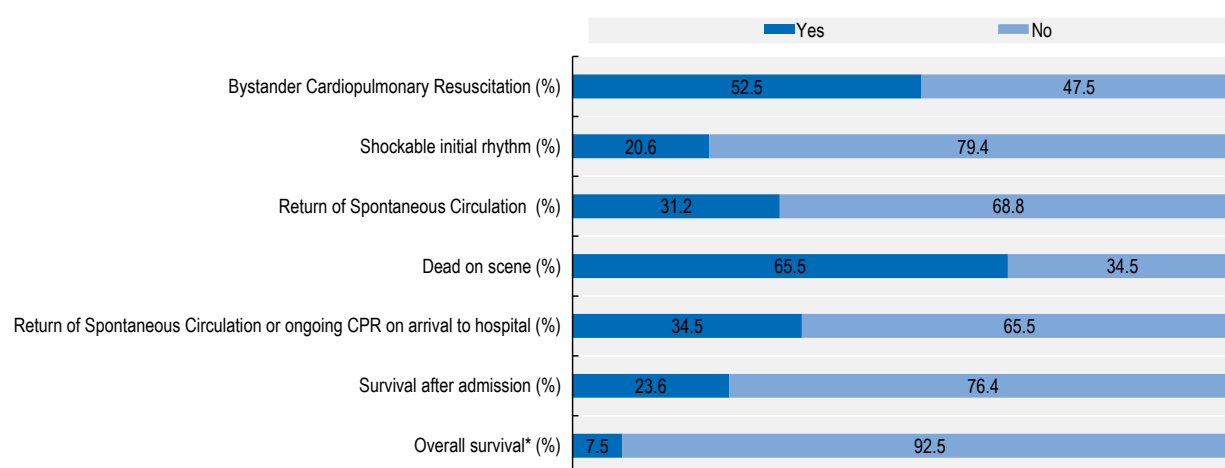
National awareness campaigns can include assessments of their effects on clinical outcomes, such as reductions in morbidity and mortality. The National stroke awareness campaign in **England**, the “Act FAST”, which stands for “*Face, Arms, Speech, Time to call 999*” (Kothari et al., 1999^[143]), has improved public recognition of stroke symptoms and improved emergency responses, leading to a notable rise in thrombolysis treatments and a shift away from GP referrals toward emergency services (Flynn et al., 2014^[144]). However, effectiveness varied across populations, with lower impact in minority groups and limited recognition of symptoms not addressed by the campaign. In September 2025, **Ireland** has launched a 3-year stroke public awareness campaign, also emphasising the FAST approach, aiming to raise awareness to stroke symptoms and the importance of seeking care early (HSE, 2025^[145]).

Population training and availability of registered automated external defibrillator in public spaces vary widely in Europe and are crucial to improve survival after cardiac arrest

Sudden cardiac death (SCD) comprises a leading cause of death in European countries (see Chapter 2). At the community level, out-of-hospital cardiac arrest (OHCA) frequently results in poor outcomes, showing wide variation in incidence and outcomes across Europe (Gräsner et al., 2016^[146]; Gräsner et al., 2020^[147]). An international prospective study including registry data from 28 countries, collected between September and November 2022, reported that 66% of patients with OHCA died on scene (Gräsner et al., 2025^[148]) (Figure 6.5).

The majority of OHCA cases are attributed to Acute Coronary Syndromes, therefore primary PCI may be a potential component of post-resuscitation care for selected patients. Streamlining patient transfer to specialised hospitals – specifically, cardiac arrest centres – may improve clinical outcomes, although further evidence is needed (Yeung J, 2019^[149]). European clinical guidelines recommend the implementation of tailored strategies to ensure that patients with suspected ACS, following successful resuscitation, are directly transferred to a primary PCI centre (ESC, 2023^[150]). Indicators to monitor time-critical care for people with STEMI and OHCA need further standardisation across European countries (see Chapter 4).

Figure 6.5. Registry data from 28 European countries reported that 66% of patients with out-of-hospital cardiac arrest died on scene



Note: Data from 32 033 confirmed out-of-hospital cardiac arrest where cardiopulmonary resuscitation was initiated by emergency medical services (EMS) or bystanders, across 28 countries. *Includes patients discharged alive or at 30 days, based on all CPR started by EMS.

Source: Gräsner et al. (2025^[148]), "European registry of cardiac arrest study THREE (EuReCa- THREE) – EMS response time influence on outcome in Europe", <https://doi.org/10.1016/j.resuscitation.2025.110704>.

Considering that around 80% of the OHCA occur at home, raising population awareness and training is crucial (ESC, 2025^[151]). Each five-minute delay to return of spontaneous circulation after OHCA was associated with a 38% increased risk of death (Gräsner et al., 2020^[147]). Furthermore, outcomes after a bystander-witnessed shock are better than Emergency Medical Services (EMS)-treated OHCA: 30-day survival after bystander-witnessed shockable OHCA ranged from 12% to 47%, compared to 3% to 20% for EMS-treated OHCA (Kiguchi et al., 2020^[152]).

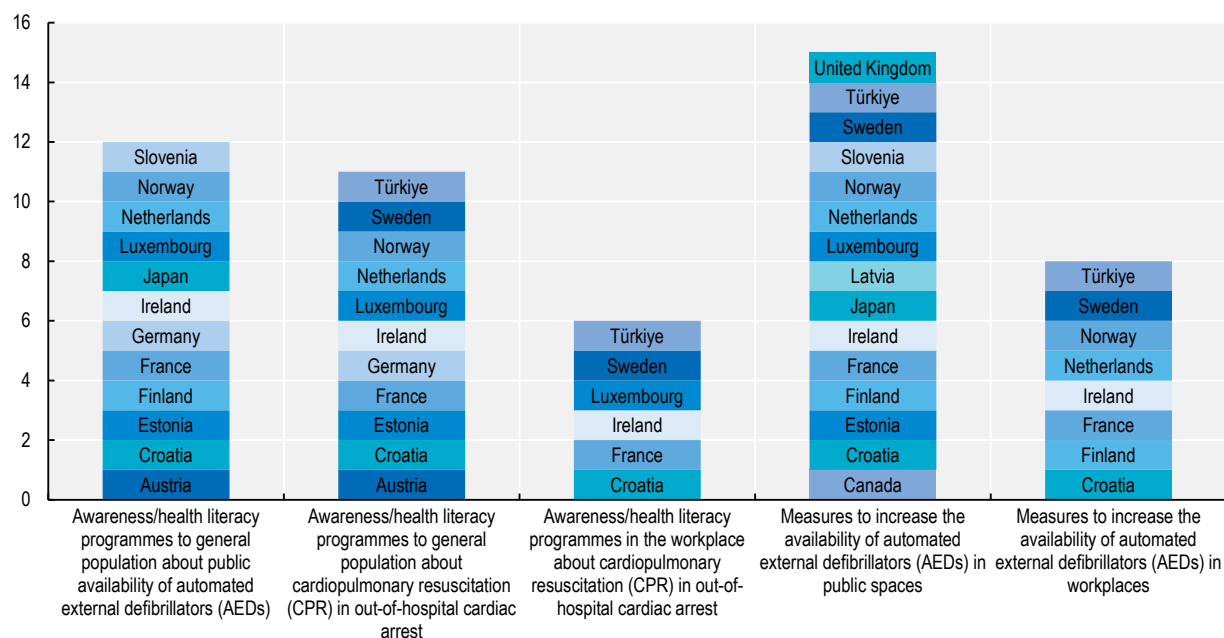
Expanding CPR training at population level could boost bystander CPR and AED use. CPR training rates were reported as 44% in high-income and 40% in upper-middle-income populations (Birkun, 2023^[153]). Across Europe, bystander CPR rates vary widely, averaging 58% (range 13-82%), while AED use remains low at 28% (range 4-59%) (Gräsner et al., 2021^[154]). Community-based interventions have shown to improve OHCA outcomes, including survival with a favourable neurological outcome (Simmons, McIsaac and Ohle, 2023^[155]). The presence of bystanders at symptom onset may also decrease the pre-hospital delay by overcoming low patient knowledge (Lachkhem, Rican and Minvielle, 2018^[141]). Health literacy interventions can also target caregivers and coworkers of patients at high-risk of stroke. Most of the calls to activate EMS during a stroke are conducted by family members (60%), 18% by paid caregivers, and 18% by coworkers (Wein et al., 2000^[156]).

Measures to improve immediate care by the community in the event of OHCA have been implemented in some European countries (Figure 6.6). According to the 2025 OECD Cardiovascular Policy and Data

Survey, ten countries are implementing health literacy programmes related to OHCA and 11 countries are addressing the public availability of AED. Since 2005, **Denmark** implemented various nationwide strategies (see Box 6.9), resulting in an increase of bystander CPR, from 21% in 2001 to 45% in 2010 and an increase in 30-day survival following OHCA from 4% to 11% (Wissenberg et al., 2013^[157]).

Norway launched its national AED registry in 2017, where AEDs are registered and linked to an emergency medical communication centre (Steenstrup, Kramer-Johansen and Berge, 2025^[158]), alongside initiatives to raise population awareness. The national registry allows the communication centres to guide bystanders to retrieve an AED in the event of a cardiac arrest. In 2023, 79% of OHCA in Norway received bystander CPR before ambulance arrival. AED use before arrival rose from 13% in 2017 to 18% in 2023 (Tjelmeland et al., 2024^[159]). In the **Netherlands**, a citizen alert system dispatches two ambulances and notifies nearby certified volunteers to provide CPR in suspected cardiac arrests within their vicinity. Delivery of AED via equipped drones present the potential to reduce time to defibrillation in people suffering an OHCA (Schierbeck et al., 2021^[160]). Recent studies in Sweden and Denmark showed positive results regarding its feasibility, safety and time gains when compared to ambulance arrival (Jakobsen LK, 2025^[161]; Schierbeck et al., 2023^[162]). At the supra-national level, the EU has co-funded various projects to improve early detection and integrated care of heart rhythm disorders and sudden cardiac death (see Annex 6.A).

Figure 6.6. Some EU+2 countries are addressing response to out-of-hospital cardiac arrest with health literacy programmes to the general population



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Box 6.9. Policies to improve bystander cardiopulmonary resuscitation implemented across Europe

Population training: Mandatory resuscitation training in schools (Denmark), at workplace (e.g. hospitality, education, industry, corporate offices), when acquiring a driver's licence (Denmark) and Voluntary Cardiopulmonary Resuscitation (CPR) courses and distribution of CPR training kits.

Implementation of community response systems: Organisation of citizen assistance platforms (community first responders) (Netherlands, Norway, Ireland).

Support to people witnessing a cardiac arrest: Telephone guidance from emergency lines to bystanders witnessing a cardiac arrest, including remote instructions and real-time verbal encouragement (Denmark).

Availability of automated external defibrillators (AED) in public spaces and AED registry: Development of a network of AED in public spaces, including regular maintenance and documentation, namely at schools, commercial places and at workplaces (Denmark).

AED registry linked to emergency medical communication centre to guide bystanders to retrieve AED in the event of a cardiac arrest (Norway, Ireland).

Developing cardiac arrest registries could support improving care provided to people suffering an out-of-hospital cardiac arrest

The European Registry of Cardiac Arrest (EuReCa), led by the European Resuscitation Council and involving 28 countries, aims to improve understanding of OHCA incidence and outcomes. Despite progress, data collection remains inconsistent and lacking standardisation across Europe (Gräsner et al., 2020^[147]). National OHCA registries in **Denmark**, **Ireland**, and **Sweden** support more accurate tracking and promote standardised data collection across countries and regions. These efforts enable better international comparisons to inform evidence-based improvements in emergency response systems.

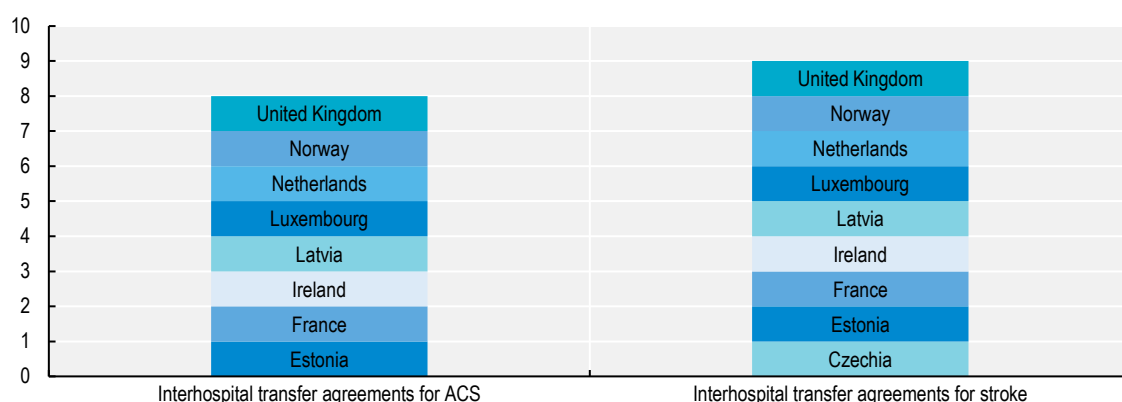
Effective pre-hospital care relies on well-equipped and co-ordinated Emergency Medical Services and optimising patient flows

Enhancing health literacy is a critical lever for improving early recognition and timely response to cardiovascular emergencies. Community-based training and the strategic deployment of AEDs are cost-effective and scalable interventions that empower the population to act. However, their impact depends on a well-equipped and co-ordinated EMS to ensure rapid, seamless care. Strengthening these connections is essential to improving cardiovascular outcomes (see Chapter 4).

Emergency medical services (EMS) are often the first point of care for life-threatening cardiovascular events, providing early diagnosis, triage, transport, and treatment. For ACS, EMS should activate the catheterisation laboratory after a STEMI diagnosis and bypass the ED (ESC Guidelines, 2023^[163]) (see Chapter 4). In hyper-acute stroke, timely dispatch, pre-notification, and transport to stroke-capable centres are critical, especially for patients eligible for thrombolysis and thrombectomy, both highly time-sensitive procedures (AHA, 2019^[164]; Turc et al., 2019^[165]) (see Chapter 4). Despite the potential, safety and communication challenges can arise during patient transfers that can have negative effects on patient outcomes and system effectiveness – so processes need to be implemented carefully. In addition, direct admission to specialised care often has better outcomes than patient transfers (Lomi et al., 2014^[166]; Abdeldayem and Gunarathne, 2022^[167]). In **Italy**, interhospital transfers have been shown to direct patient flows to hospitals with capacity to deliver higher quality of care and were associated with lower mortality

(Lomi et al., 2014^[166]; Berta, Vinciotti and Moscone, 2022^[168]) Overall, this policy lever could be further adopted, with appropriate safeguards. In the **United States**, the American Heart Association Guidelines recommend that when patients with STEMI present to non – PCI-capable hospitals that they receive an immediate emergency transfer to a STEMI receiving centre (Neumar et al., 2015^[169]). To streamline care, eight countries implemented interhospital transfer agreements for ACS and stroke (Figure 6.7).

Figure 6.7. Only a few European countries have established interhospital transfer agreements for acute coronary syndromes and stroke



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

6.6.3. Measuring and improving equity is essential to tackle the burden of CVD

Groups living in vulnerable situations remain under-targeted in health literacy initiatives and under-treated, though emerging pilot initiatives show promise

Addressing inequalities in cardiovascular care requires a comprehensive approach, as disparities encompass various dimensions such as gender, ethnicity, and geography – each playing a distinct role in delaying diagnosis, treatment, and recovery. Likewise, the HiAP approach is considered crucial. Studies have shown that certain population groups are more likely to delay seeking care, highlighting the need for targeted interventions and inclusive policy responses. Delays in seeking care were linked to race, smoking, and diabetes (Frisch et al., 2019^[170]). The EU-co-funded Joint Action on CVDs and diabetes, JACARDI (11/2023-2010/27), applies the “4Cs” framework as a structured approach to integrate the principle of equity and diversity into the implementation of 142 national-level pilot projects, which entails “Critical reflection”, “Context and data”, “Co-design”, “inclusive and accessible Communications” (B Armocida, 2024^[171]). Enhancing health systems ability to meet the needs of individuals from varied backgrounds requires ongoing self-reflection, recognising power imbalances, and ensuring commitment to respectful partnerships with diverse communities, to ensure that services are inclusive and equitable.

France launched a national pilot initiative in January 2024 to improve hypertension awareness and management in disadvantaged regions. Also, as part of JACARDI, a health literacy project in the region of Aragon, **Spain**, is addressing disparities in stroke care for people living in different geographical areas, including the most remote. The first phase involved surveying over 400 patients and caregivers to map health literacy profiles, followed by multi-stakeholder workshops to co-design tailored interventions. Two primary care centres are piloting these actions, with a view to integration into stroke care protocols. In **Ireland**, the Irish Heart Foundation’s “*Her Heart Matters*” campaign directly targets women’s awareness of MI symptoms. In the **United Kingdom**, high-risk cardiovascular conditions remain under-treated,

particularly among Black and mixed ethnic groups, who face lower rates of monitoring, treatment, and appropriate prescriptions (CVDPREVENT, 2025^[172]). The CVDPREVENT national primary care audit aims to support early identification and improved management of high-risk individuals in primary care (see Box 6.10).

Box 6.10. Improvement targets to support equity improvements in cardiovascular care, defined by the CVDPREVENT in the United Kingdom

CVDPREVENT is a national NHS audit using GP data to monitor and improve detection and management of high-risk CV conditions. As of September 2024, key measures and goals are in place:

Clinical area	Indicator name	Target improvement
Atrial fibrillation (AF) – Prevention of stroke	% people with AF at high risk of stroke treated with an oral anticoagulant medicine	Overall increase and Reduce the gap between ethnic groups
High blood pressure – Secondary prevention	% of adults with diagnosed hypertension who are treated to age-appropriate target levels of blood pressure	Overall increase according to national clinical guidelines and Reduce the gap between ethnic groups
High cholesterol – Secondary prevention	% of adults with diagnosed CVD with a current prescription for lipid lowering therapy	Overall increase and Reduce the gap between ethnic groups
High cholesterol – Secondary prevention	% of adults with diagnosed CVD whose lipid profile is treated to target	Overall increase according to national clinical guidelines and Reduce the gap between ethnic groups

Source: CVDPREVENT (2025^[172]), Cardiovascular Disease Prevention (CVD) CVDPREVENT Healthcare Quality Improvement (QI) Plan.

Coordinated actions to improve women's cardiovascular care are not widespread

Across the care pathway, several factors are driving gender disparities in ACS care and outcomes (see Box 6.11). Addressing these gaps requires a comprehensive pathway approach, including inclusive representation in clinical trials to ensure evidence-based, gender-sensitive care (Haupt, Carcel and Norton, 2024^[173]). Women are less likely to accurately assess their cardiovascular risk and take longer to call emergency services when suffering from a myocardial infarction (see Chapter 4) (Moser et al., 2006^[140]; Lachkhem, Rican and Minvielle, 2018^[141]). Furthermore, certain CVD risk factors and conditions are unique to women, while others disproportionately affect them (Garcia et al., 2016^[174]). Sex-specific differences also influence how CVD presents and how women respond to treatment (Vogel et al., 2021^[175]).

Box 6.11. Factors driving gender disparities in Acute Coronary Syndrome care and outcomes

- **Age gap at first event and higher comorbidity burden:** Women typically experience their first ACS episode about 7 years later than men and present with more coexisting health conditions;
- **Higher mortality rates:** Women have higher mortality rates – 10% vs. 7% in-hospital, 16% vs. 12% at 30 days, and 44% vs. 34% for death or cardiovascular readmission at 2 years;
- **Elevated risk in younger women:** Women under 65 face particularly high risks, influenced by a mix of age, health status, ethnicity, and socio-economic background;
- **Adverse pregnancy outcomes** (e.g. gestational diabetes, hypertensive disorders, pregnancy loss), increase women's risk of presenting CVD risk factors and of developing CVD (Nisha I. Parikh, 2021^[176]).
- **Under-recognised conditions:** Women are more likely to experience conditions like myocardial infarction with non-obstructive coronary artery disease (MINOCA) and spontaneous coronary artery dissection (SCAD) – both associated with severe complications and mortality. SCAD an increasingly recognised cause of acute coronary syndromes, especially in women under 50 and those during the peripartum period. (Ciliberti et al., 2023^[177])
- **Gaps in care:** Despite facing higher ischemic risk, women are less likely to receive guideline-directed care, including invasive diagnostic, such as invasive angiography.

Source: Vranckx, Valgimigli and Aleksic (2024^[178]), "Shaping the future of acute coronary syndrome management: a look back at 2024", <https://doi.org/10.1093/ehjacc/zuac143>.

The integration of sex-specific strategies into national health policies and clinical guidelines has been proposed to ensure equitable access to high-quality care (see Box 6.12) (Lundberg et al., 2018^[179]; Gulati et al., 2021^[180]). Specialised women's heart centres are emerging as a response to persistent sex disparities in cardiovascular care, supported by growing evidence that specialised care improves women's outcomes. These centres adopt a team-based, multidisciplinary approach tailored to the unique biological and clinical characteristics of heart disease in women (Gulati et al., 2021^[181]; Parvand et al., 2022^[182]). Globally, around 50 women's heart programmes have been established, including six in Canada and others across the United States and Europe, such as the Women's Heart Center at the *Cardiologico Monzino* in Italy (Parvand et al., 2024^[183]; *Cardiologico Monzino*^[184]). In **Ireland**, a Women's Health Research Network was established in March 2025, including patient representatives, healthcare professionals, researchers, and policymakers. It aims to promote integrated approaches to women's cardiovascular health, particularly focussing on heart failure.

I was prescribed four medications, but they caused strong side effects and were not tested on women in menopause. Some also interacted with each other, making my condition worse. Over time, I stopped three of them, and I'm now reducing the last one (a beta-blocker). One of the medications – a diuretic – led to the development of osteoporosis, which was not identified early. This shows how important it is for doctors to monitor how medications affect the body over time and to adjust treatment quickly when it's not working or causing harm. It also shows the need for more personalized and gender-aware care.

Angela, 53, mother, in menopause and living with multiple chronic conditions.

Box 6.12. Addressing the gender gap in cardiovascular care calls for a comprehensive approach across the care pathway

- Investment in cross-sectoral prevention policies to **improve health environments** for girls and women (see sub-section Prevention) (Vervoort et al., 2024^[185])
- Improvement of **women's awareness** to cardiovascular health needs, notably to adjust their perception of CVD risk factors and symptoms (Manzo-Silberman et al., 2024^[186]).
- Raising **professionals' awareness** about women's unique risk factors, symptoms diseases, and the importance of evidence-based care.
- Assessing **cardiovascular health routinely among young women**, including traditional CVD risk factors, sex-specific and gender-related CVD risk factors (Roeters van Lennep et al., 2023^[187]).
- Investing in **multidisciplinary, personalised care to women-** before, during and after pregnancy. **Women heart centres** and **pregnancy heart teams** can support guideline-based care and improve clinical trial participation. (Rakisheva et al., 2024^[188]).
- Increase **women's representation in clinical trials**, notably from minority groups, who face a higher burden of CVD risk factors (Manzo-Silberman et al., 2024^[186]).
- Investment in **sex-specific CV research** and **research on non-traditional risk factors**, such as autoimmune diseases and reproductive health factors (Manzo-Silberman et al., 2024^[186]).

Regional networks for STEMI can reduce inequalities in emergency care access by improving co-ordination with PCI centres

Regional networks play a critical role in improving equity in care delivery. By standardising access to life-saving interventions regardless of geographic location, they contribute to bridge the gap between urban and rural healthcare facilities, reduce treatment delays, ensuring that all patients – regardless of where they live – receive guideline-directed, evidence-based care. Establishing a regional reperfusion strategy is, therefore, recommended to ensure timely and high-quality care for patients with suspected STEMI,

connected to an efficient Emergency Medical Service. This can be achieved through the development of STEMI networks with explicit definitions of geographic areas of responsibility and pre-established transfer protocols from community hospitals to percutaneous coronary intervention (PCI) capable centres. Randomised trials have consistently shown that transferring STEMI patients to PCI centres for primary PCI results in better outcomes than administering reperfusion therapy at non-PCI-capable hospitals (Dalby et al., 2003^[189]). STEMI networks between hospitals have also been associated with a higher adherence to reperfusion guidelines (Claeys et al., 2012^[190]). In centres where the expected transfer time to primary PCI is expected to exceed the timeframe recommended, tailored protocols are recommended to be established. These protocols should ensure treatment initiation within ten minutes after first medical contact and immediate transfer for a PCI-capable centre (ESC, 2023^[150]).

6.7. Advancing care integration is key to improve care for a population living with chronic conditions and multimorbidity

Integrated care aims to deliver co-ordinated, high-quality services for individuals with complex health needs by addressing fragmented care. It involves connecting services of providers across the care continuum to improve patient outcomes (European Commission, 2017^[191]). As highlighted by the PaRIS survey, gaps in care co-ordination persist for people living with chronic conditions (OECD, 2025^[3]).

Care coordination was one of the most challenging aspects of my journey. The transition between different healthcare providers, especially during my transfer to Budapest, was stressful and disjointed. A dedicated care coordinator could have alleviated much of this burden, ensuring a smoother pathway and better communication between teams.

Caius, artist, researcher, patient advocate, and heart attack survivor.

The “*Gesundes Kinzigtal*” programme in southwest **Germany** is a leading example of population-based integrated care in Europe. Launched in 2005, it brings together health insurers, physicians, and care managers to co-ordinate services across sectors, focussing on prevention, self-management, patient-centred care, and electronic networking system (Struckmann, Boerma and Van Ginneken^[192]). The model has demonstrated improved health outcomes compared to usual care (Busse and Stahl, 2014^[193]; Hildebrandt, Schulte and Stunder, 2012^[194]).

For patients living with CVD, integrated care models support continuity across care settings and facilitate early intervention through multidisciplinary collaboration. While early care models focussed on single diseases, a shift toward population-based models focussed on chronic diseases, such as the Chronic Care Model (Table 6.4), have shown to improve outcomes for patients with multiple chronic conditions in some settings through co-ordinated, patient-centred care (Box 6.13).

Table 6.4. Integrated Care Models to improve chronic disease management

Model	Characteristics	Core Components
Chronic Care Model	A multidimensional framework developed with literature review and an advisory panel, considering six interrelated components within primary care.	1. Self-management support 2. Clinical information systems 3. Delivery system design 4. Decision support 5. Healthcare organisation 6. Community resources
Integrated Multimorbidity Care Model	Developed by the Joint Action on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle (JA-CHRODIS), piloted tested within the JA CHRODIS PLUS. It demonstrated a positive impact across healthcare systems where it was implemented.	1. Patient-centred care 2. Multidisciplinary teams 3. Care co-ordination 4. Self-management support 5. Health IT 6. Community/social support 7. Continuous monitoring and evaluation
Development Model for Integrated Care	An expert- and evidence-based model with nine clusters; has proven useful in evaluating services for stroke, acute myocardial infarction, and dementia in the Netherlands.	1. Patient-centredness 2. Delivery system 3. Performance management 4. Quality of care 5. Result-focussed learning 6. Interprofessional teamwork 7. Roles and tasks 8. Commitment 9. Transparency

Source: Rodriguez-Blazquez, C. et al. (2020^[195]), “Assessing the Pilot Implementation of the Integrated Multimorbidity Care Model in Five European Settings: Results from the Joint Action CHRODIS-PLUS”, *International Journal of Environmental Research and Public Health*, Vol. 17/15, p. 5268, <https://doi.org/10.3390/ijerph17155268>; Bodenheimer, T., E. Wagner and K. Grumbach (2002^[196]), “Improving Primary Care for Patients With Chronic Illness”, *JAMA*, Vol. 288/15, p. 1909, <https://doi.org/10.1001/jama.288.15.1909>; Vat et al. (2016^[197]), “The Development of Integrated Stroke Care in the Netherlands a Benchmark Study”, <https://doi.org/10.5334/ijic.2444>.

Overall, the cost-effectiveness of integrated care remains inconclusive, largely due to limited system-level data, inconsistent definitions, and varying evaluation methods that hinder comparability. However, emerging evidence suggests that well-designed integrated care models – particularly those targeting people with multimorbidity in primary and community settings – can reduce unplanned hospital admissions and potentially save costs (Schjøtz et al., 2011^[198]). The design and implementation of integrated care appear to be critical factors in achieving both clinical and economic benefits.

6.7.1. Further investment is needed to advance integrated care delivery

Several policy levers were previously identified as key to design and implement integrated care frameworks (Table 6.5). Strengthening governance structures by breaking down silos across administrative systems in health and social care is one key aspect. Financial incentives to healthcare providers have been associated with measures of enhanced access and increased quality of care (Flodgren et al., 2011^[199]; Heider and Mang, 2020^[200]). Furthermore, primary care-oriented health systems, with GPs as gatekeepers, stronger financial incentives directed to GPs and better care continuity, have been associated with lower avoidable hospitalisations in a previous OECD analysis (OECD/The Health Foundation, 2025^[201]). Various European countries are strengthening governance models, changing legal frameworks and piloting the systematic collection of integrated cardiovascular care indicators to enhance cardiovascular care integration (Table 1.2.).

Table 6.5. System levers and key recommendations to enhance integrated care

System levers	Recommendations
Political support and commitment	Ensuring political commitment at all levels, frequently leading to innovative regulation and legal frameworks to support implementation. National-level support is key for systemic shifts and funding, while regional and local political engagement plays a key role in federal systems.
Governance	Strengthening governance structures by breaking down silos across administrative systems in health and social care.
Stakeholder engagement	Involvement of all stakeholders, including people with lived experience, in the development, implementation and dissemination of the new models and formalisation of agreements between parties.
Organisational change	Adapting integrated care models to the needs of groups living in vulnerable situations.
Leadership	Strong and sustained leadership – both at national and local levels – is vital. Clinical champions, particularly GPs, and continuity in scientific, managerial, and clinical leadership fosters engagement, stability, and successful transformation across care systems.
Collaboration and trust	Utilising existing frameworks that measure a region's readiness to implement best practice integrated care models to facilitate their expansion, as well as promote close ties between owners and adopters of best practice models.
Workforce education and training	Investing in training programmes to teach health professionals new skills and supporting new professional roles, such as case managers.
Patient focus / empowerment	Investing in health literacy programmes to reduce health inequalities.
Financing and incentives	Exploring innovative payment models that encourage providers to deliver co-ordinated care.
ICT infrastructure and solutions	Implementing digital inclusion activities targeting populations living in vulnerable situations as well as promoting digital tools and health information systems.
Monitoring / evaluation system	Strengthening the evidence-base supporting integrated care by measuring structural, process and outcome indicators specific to integrated care that are comparable across countries.

Source: The column on the left is adapted from European Commission (2017^[191]), "Blocks – Tools and methodologies to assess integrated care in Europe – Report by the Expert Group on Health Systems Performance Assessment", <https://doi.org/10.2875/69305>. The column on the right is based on OECD (2023^[202]), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, <https://doi.org/10.1787/9acc1b1d-en>.

Health information systems with data linkages also need to be strengthened, to monitor longer care trajectories, patient trajectories between health and social care, and home-based care. Findings from the PaRIS survey showed that only half of primary care participating centres were able to exchange electronic health records with other centres (OECD, 2025^[3]). The first OECD pilot on the collection of Integrated Care indicators to support international comparisons, undertaken in 2020-2021 with 15 countries demonstrated feasibility, nonetheless, data linkage remained a challenge (Barrenho et al., 2022^[203]).

Table 6.6. European countries are developing policies to enhance cardiovascular care integration

Country	Strengthening governance models	Changes in legal framework	Systematic collection of integrated CV care indicators
Austria	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Croatia	N/A	N/A	N/A
Czechia	N/A	N/A	N/A
Estonia	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Finland	N/A	N/A	N/A
France	<i>In development</i> 	<i>In development</i> 	<i>Fully implemented</i> 
Germany	N/A	N/A	<i>Fully implemented</i> 
Ireland	<i>In development</i> 	N/A	<i>In development</i> 
Latvia	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Luxembourg	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Netherlands	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Slovenia	N/A	N/A	N/A
Sweden	<i>In development</i> 	<i>Fully implemented</i> 	N/A
Iceland	N/A	N/A	N/A
Norway	<i>In development</i> 	<i>In development</i> 	<i>In development</i> 
Canada	N/A	N/A	N/A
Japan	<i>Not implemented</i> 	<i>Not implemented</i> 	<i>Not implemented</i> 
Türkiye	N/A	N/A	N/A
United Kingdom	<i>In development</i> 	<i>Fully implemented</i> 	<i>In development</i> 

Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey. N/A: information not available.

Box 6.13. Key policy areas to enhance integrated care for selected CVDs

Atrial fibrillation (AF): AF poses a growing burden on health systems due increased risk of stroke, bleeding, and mortality. Integrated care models – centred on the **ABC pathway** (Anticoagulation, Better symptom control, and Cardiovascular risk management) (Lip, 2017^[204])—have shown to reduce adverse events, improve outcomes, and lower costs (Camacho and Lip, 2023^[205]) by co-ordinating care across all settings, leveraging multidisciplinary teams, technology, and self-management (Bhat et al., 2021^[206]; Machado, Leite and Pereira, 2025^[207]).

Cardiomyopathies: Cardiomyopathies, often inherited and affecting up to 1 in 250 people, can lead to severe complications such as heart failure, stroke, and sudden cardiac death, and are a leading cause of heart transplantation in young patients. **Effective care requires a multidisciplinary approach**, including smooth transition from paediatric to adult care and a **shared approach between cardiomyopathy specialists and general cardiology centres**. **Networks** like European Reference Network for Rare and Low Prevalence Complex Diseases of the Heart (ERN GUARD-Heart) and national expert networks in Spain and France enable professionals to share expertise and improve care (ESC Guidelines, 2023^[208]). Key policy actions include promoting screening programmes, accrediting expert centres and developing co-ordinated networks, implementing care guidelines, and supporting data-sharing infrastructures for inherited cardiac diseases.

Diabetes: Integrated care models involving diabetes specialists collaborating with primary care teams have shown clinical benefits, including improvements in blood glucose and blood pressure, although further research is needed to better characterise specific intervention types leading to successful outcomes (Zarora et al., 2022^[209]). A meta-analysis found that **multidisciplinary collaborative care – including closer follow-ups, self-monitoring, and lifestyle support** – improved outcomes in patients with uncontrolled diabetes. It also maintained or improved patient-reported outcomes, with healthcare costs comparable to usual care, highlighting the value of co-ordinated approaches in diabetes management (Siaw and Lee, 2018^[210]).

Ischemic heart disease (IHD): The “Lancet Commission on Rethinking Coronary Artery Disease” (April 2025), calls for a fundamental shift in how coronary artery disease (CAD) is understood and managed (Zaman et al., 2025^[211]). Key goals include reclassifying CAD as atherosclerotic coronary artery disease (ACAD), promoting early detection and prevention, supporting lifelong risk factor management, and realigning healthcare systems and research to focus on the root causes of atherosclerosis rather than late-stage ischaemic events, namely acute coronary syndromes. Multidisciplinary intervention is key to successful preventive measures (ESC, 2017^[212]).

Structural heart disease, congenital or acquired, including:

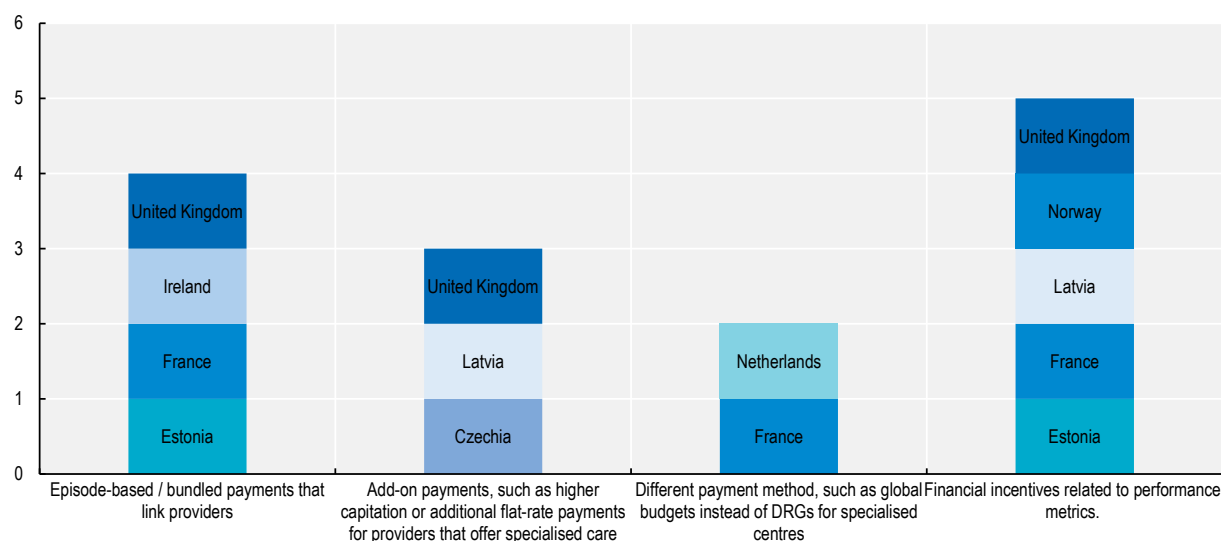
Heart valve disease (HVD): HVD, a complex and often overlooked part of cardiovascular care, can lead to serious complications like heart failure. As **structural heart programmes** grow – driven by ageing populations and innovations like transcatheter aortic valve replacement – success depends on **multidisciplinary services** (Almanfi, 2018^[213]) and **targeted policies across the care pathway**, including symptom awareness, primary care training, improved referrals, access to diagnostics and new treatments, and co-ordinated follow-up care (Global Heart Hub, 2020^[214]).

Adult congenital heart disease (ACHD): Adults with ACHD now live longer thanks to advances in care, but face long-term complications requiring **specialised, multidisciplinary management to manage the complex trajectory of ACHD** (Liu et al., 2022^[215]; Marshall V. et al., 2025^[216]). All ACHD patients should be assessed at least once in a specialist centre, with close co-ordination between general cardiologists and ACHD teams, especially in complex or acute cases (ESC Guidelines, 2020^[217]).

Improving integrated cardiovascular care delivery in Europe will require continued attention to the challenges countries face and further investment in key policy areas, including governance models, cross-sector health information systems, financing approaches, workforce training and the scale-up of innovation (Figure 6.8 and Figure 6.9). **Sweden** is investing in integrated care through regional and municipal initiatives in the last decade. Legislative changes have been introduced, particularly by clarifying procedures for care transitions, namely after hospital discharge. **Norway** has long-standing policies addressing cardiovascular care integration, with ongoing development to refine these measures. **Germany** has implemented mandatory follow-up outcome indicators for acute coronary syndrome and stroke in hospitals. The **United Kingdom** has enacted the Health and Care Act 2022, which defines 42 Integrated Care Systems in England, which plan health and care services at the local level. **Ireland** has established integrated care hubs including cardiology specialist teams to deliver care in the community in an integrated manner.

Singapore is currently expanding its national Stroke and CHF National Value Base Care programme beyond acute care to encompass prevention, diagnosis, acute interventions, chronic care, and end-to-end care pathways. This expansion will ensure better integration across care settings and reflect real-life patient journeys, supported by internal reporting systems, provider education, and decision-support mechanisms. Beyond Value-Driven Care, Singapore has also included CHF, one of the ambulatory care sensitive conditions, under the list of Medisave claimable complication of selected Chronic Disease Management Programme conditions, like Diabetes, Hypertension and Lipid disorders (DHL) and Chronic Obstructive Pulmonary Disease (COPD). This hence functions as a financial leverage to improve CHF integrated care. **Colombia** has strengthened integrated care by implementing regulations that promote prospective payment models based on health outcomes, improving contractual relationships between providers and payers. These reforms aim to reduce information asymmetries, enhance transparency, and build trust among stakeholders to improve care co-ordination and population health.

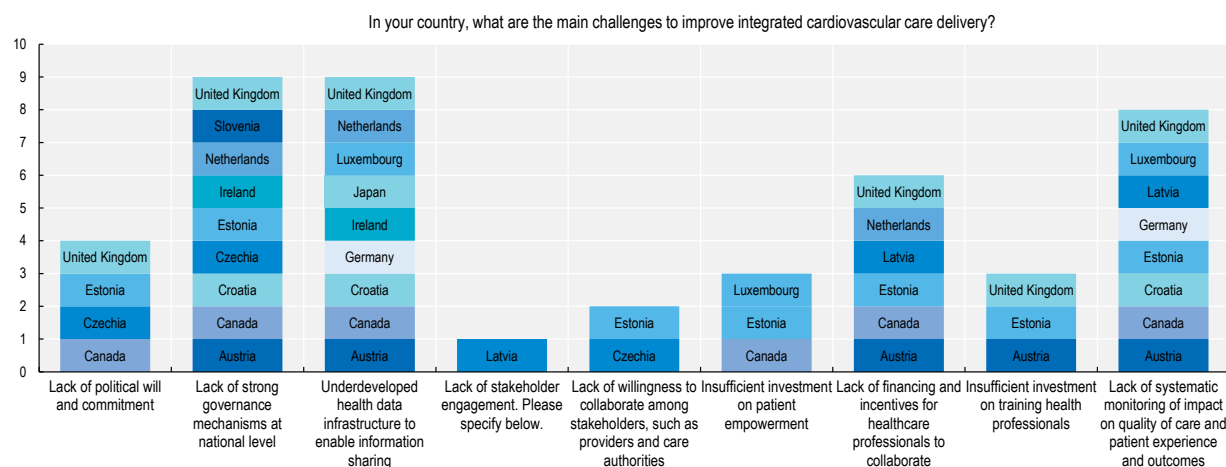
Figure 6.8. A number of countries are leveraging financial incentives to improve integration of care



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Figure 6.9. Strengthening governance and data infrastructure is critical to improve integrated cardiovascular care



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

6.7.2. Chronic heart failure care – Strengthening integrated care from early diagnosis to rehabilitation

Improving early recognition and referral of heart failure patients is essential to improve outcomes

Timely diagnosis of heart failure in primary care remains a challenge, with significant delays in referral and investigation (Hayhoe et al., 2018^[218]). This is partly due to the gradual onset and non-specific nature of symptoms, often misattributed to other conditions by both patients and clinicians (Taylor et al., 2017^[219]). The ESC recommends natriuretic peptide testing for early diagnosis (ESC Guidelines, 2021^[220]), yet access in primary care is limited – only 20% of surveyed healthcare professionals reported availability in community settings (Bayes-Genis et al., 2024^[221]). Access also varies widely across Europe due to differing reimbursement policies, highlighting the need for broader implementation to reduce diagnostic delays (Box 6.14). In the “STOP-HF Screening Programme”, launched in **Ireland** as a research study in 2004, natriuretic peptide testing is conducted to identify people at high risk of developing heart failure. The frequency of medical visits is then tailored to each person’s risk status.

Box 6.14. Key policy areas to improve diagnosis, referral and management of chronic heart failure

Improving early diagnosis and referral of heart failure requires a multifaceted approach, including:

- **Public education campaigns**, such as the BEAT campaign – Breathlessness, Exhaustion, Ankle swelling, and Time to act – implemented across the United Kingdom to educate the public (BeatHF^[222]).
- **Raising healthcare professionals’ awareness, particularly in primary care.** The adoption of natriuretic peptide testing in primary care settings is a key step forward (NICE, 2023^[223]).
- **Integrating heart failure diagnostic strategies** into national cardiovascular care plans and developing clear referral pathways to streamline patient journeys.

The most relevant components of heart failure management programmes include:

- **Multidisciplinary management:** evidence-based recommendation (class IA), recommended to reduce heart failure (HF) mortality and the risk of hospitalisation (ESC Guidelines, 2021^[220])
- **Self-management strategies:** evidence-based recommendation (class IA), recommended to reduce HF mortality and the risk of hospitalisation (ESC Guidelines, 2021^[220])
- **Home-based and/or clinic-based programmes:** recommended to reduce HF mortality and the risk of hospitalisation (ESC Guidelines, 2021^[220]) for follow-up after hospital discharge and to monitor and treat of new signs/symptoms of HF.

Source: Adapted from ESC Guidelines (2021^[224]), 2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure, <https://doi.org/10.1093/eurheartj/ehab368>.

Multidisciplinary heart failure programmes and care networks could harness integrated care, with stronger primary care involvement

Multidisciplinary heart failure management programmes have shown to reduce healthcare costs and improve clinical outcomes, being recommended in the ESC HF clinical guidelines (ESC Guidelines, 2021^[220]). This model of care ensures co-ordinated care transitions and may result in the establishment of networks of care pathways (ESC, 2011^[225]). National clinical networks connect providers with HF centres to manage heart failure patients, improving access and promoting evidence-based care. (Luedike et al., 2022^[226]). In **Germany**, the programme HF-NET (Heart Failure Network) links hospital and outpatient services within regional networks through standard operating procedures and care pathways (Heart Failure Policy Network, 2020^[227]). A systematic review assessing the effectiveness of transitional care services following hospitalisation for heart failure showed that nurse home visits and disease management clinics significantly reduced all-cause mortality of heart failure patients, when compared with usual care (Van Spall et al., 2017^[228]).³ Nurse home visits and disease management clinics have also shown to decrease all-cause readmission and to save costs (Van Spall et al., 2017^[228]).

I think after a diagnosis of a heart disease, especially for young people, there should be a team helping out, not just a cardiologist. I am thinking of a psychologist, a movement expert, a dietician. Because we work as a full body, and if we have a strong and healthy one, it benefits the heart as well.

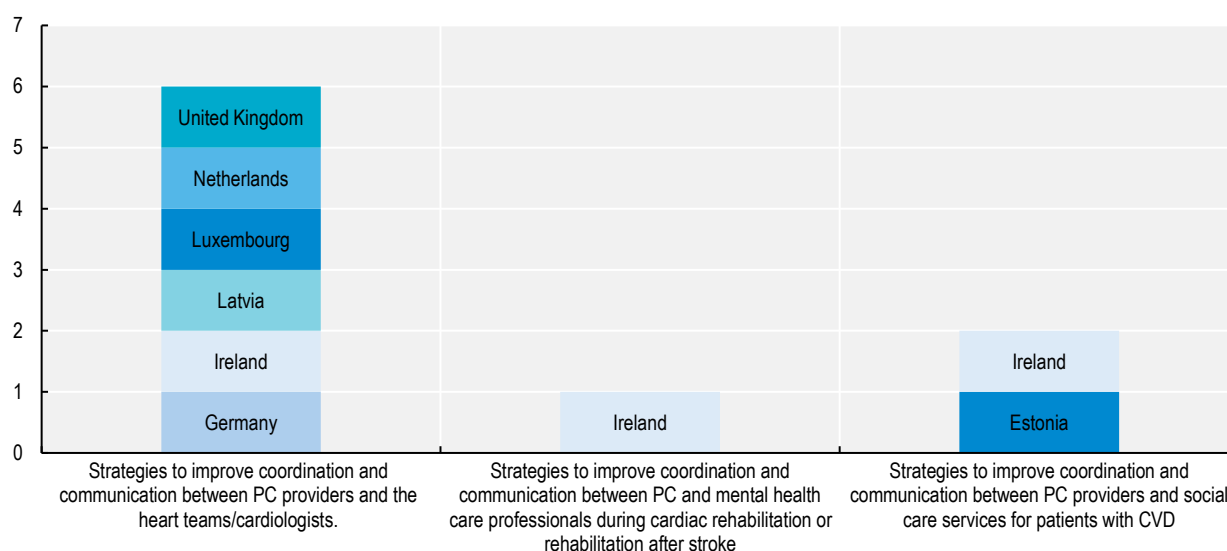
Francesca, 34, female living with hypertrophic cardiomyopathy and an implantable cardioverter-defibrillator.

Implementation of HF management programmes require multidisciplinary collaboration across the entire care pathway, from diagnosis, through acute events, and terminal phases (ESC, 2011^[225]) (ESC Guidelines, 2021^[220]) and should apply a holistic approach, addressing comorbidities, such as diabetes, renal dysfunction, and mental conditions (ESC, 2011^[225]) (Box 6.14). Continuous quality improvement initiatives can play a role in assessing and refining these programs. In **France**, the French Hospitals Federation (Fédération Hospitalière de France, FHF) launched a pilot project in five territorial hospital

groups to implement an integrated model of heart failure care to enhance care quality and promote more efficient resource use (Heart Failure Policy Network, 2020^[227]). In **Ireland**, a HF referral pathway is being implemented nationally, including an electronic referral system and virtual consultations between cardiologists and GPs (Heart Failure Policy Network, 2020^[227]).

Primary care plays a critical role in improving outcomes for people living with heart failure, particularly when integrated into multidisciplinary care models. Observational studies from Spain, Sweden and France have shown that strong collaboration between hospitals and primary care can reduce heart failure readmissions by up to 20% (Raat et al., 2021^[229]). However, only a minority of multidisciplinary heart failure programmes actively involved primary care professionals, highlighting a missed opportunity for more co-ordinated care (Raat et al., 2021^[229]) (Figure 6.10).

Figure 6.10. Some countries are enhancing collaboration with primary care



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

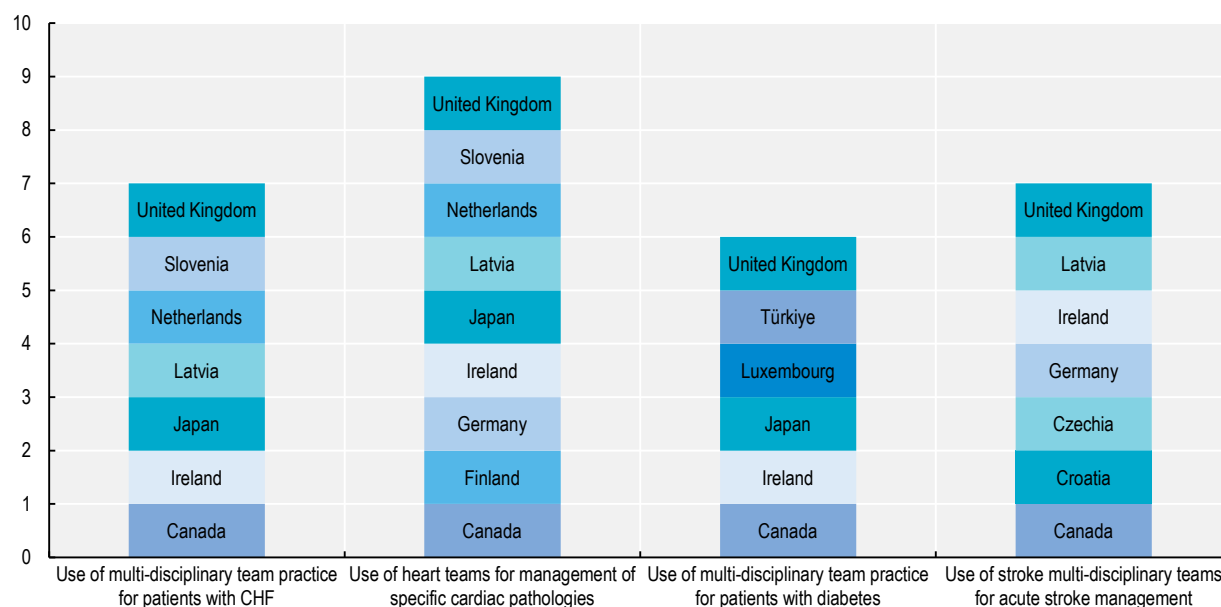
Implementation of heart teams varies widely across Europe

The heart team approach, well established in European and other international clinical guidelines, enables a patient-centred and tailored therapeutical approach and long-term management for patients with complex cardiac conditions, while fostering multidisciplinary collaboration and promoting research and innovation (Scott-Herridge et al., 2022^[230]). Dedicated heart teams, which are specialised on specific cardiac conditions, are recommended for various cardiac diseases, given the increasingly clinical complexity of patients and the development of new treatment approaches and devices. Previous studies have shown improved outcomes when patients with specific cardiac pathologies were evaluated by dedicated heart teams, such as mitral valve disease (Sardari Nia et al., 2021^[231]), while further research is needed to define best practices and document their impact on efficiency of care delivery and patient experiences and outcomes (Batchelor et al., 2023^[232]).

An European survey assessing the execution of heart teams across 26 countries showed wide variability in the composition and adoption of heart teams across Europe (Imran Hamid et al., 2023^[233]). The existence of a regional referral system was reported by 50% of the respondents, 77% reported lack of

re-imbursement for the heart teams meetings, and 67% acknowledged a lack of auditing process for heart team decisions (Imran Hamid et al., 2023^[233]). In the 2025 OECD Cardiovascular Policy and Data Survey, nine countries reported the use of heart teams to manage specific cardiac pathologies (Figure 6.11).

Figure 6.11. Countries are adopting multidisciplinary teams to enhance CVD management



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

6.7.3. Stroke care – Improving patient care across the stroke care pathway, with timely, standardised and co-ordinated care

Ensuring the provision of dedicated stroke teams and stroke units promotes acute stroke care standardisation

Evidence-based pathways guide national stroke care, ensuring equal access irrespective of region, time of hospitalisation, and patient characteristics. Stroke units are defined by the European Stroke Initiative as organised in-hospital facility that is mostly or entirely devoted to care for patients with stroke, staffed by a multidisciplinary team knowledgeable in stroke care (see Chapter 4). Dedicated “stroke units” (SU) are the first level of care for both types of strokes, ischemic and haemorrhagic. Irrespective of age and stroke severity, treatment in dedicated stroke units significantly reduces the risk of death, institutional care and disability (Stroke Unit Trialists' Collaboration, 2013^[234]). Comprehensive or primary “stroke centres” (SC) are “fully equipped institution providing the same service as a stroke unit, and in addition offering thrombectomy and other neuro-radiological and surgical interventions” (Waje-Andreassen et al., 2018^[235]). Involvement of stroke teams reduces delays, particularly when the team is pre-notified that the patient will arrive.

Improving the performance of local stroke centres and the referral pathway can play a part in developing efficient and effective ischemic stroke care. Current care pathways for patients with suspected large vessel occlusion strokes often include pre-hospital triage decisions that either send patients directly to a facility equipped for mechanical thrombectomy (usually comprehensive stroke centres) or to a closer hospital that

lacks endovascular treatment capabilities but can administer intravenous thrombolysis (acute/primary stroke centres or telestroke centres). Studies assessing the difference in outcomes of these strategies have showed mixed results. Some showed lower mortality and better functional outcomes of patients directly admitted to Comprehensive Stroke Centres (Venema E, 2019^[236]). The Rapid Arterial Occlusion Evaluation Trial (RACECAT), conducted in Spain (LINNC, 2023^[237]) showed similar outcomes for people triaged direct to the Comprehensive Stroke Centre when compared to those who were initially treated at an acute stroke unit, although the door in-door out times in this trial were remarkably short. A randomised clinical trial assessing the influence of the characteristics of the local stroke centres on the optimal initial transport strategy concluded that the centre characteristics and performance may influence patients outcomes (Olive-Gadea et al., 2024^[238]). The decision on whether direct transport to a thrombectomy-capable stroke centre is superior to transport a closer local stroke centre remains a subject of intense research. Hospital characteristics, such as the level of care of the local stroke centre and the delay to systematic thrombolysis, are important factors, thus improving the performance of stroke centres remains an avenue to help improve overall outcomes.

Unfortunately, when I arrived at the stroke unit (after being misdiagnosed), I was already outside the window of time to perform thrombolysis or thrombectomy. My survival is a miracle! Despite having lasting aftereffects for the rest of my life, if today I am able to walk unassisted, drive, and take care of my children, it is thanks to family support and intensive rehabilitation for months after the stroke.

Diana, 48, stroke survivor.

To optimise the stroke pathway, formal mechanical thrombectomy networks have been established in the UK to streamline patient transfer, minimise treatment times and optimise outcomes (Halvorsrud et al., 2018^[239]). Mechanical thrombectomy networks include the ambulance services, professionals from the referring Acute Stroke Centres and professionals from the comprehensive stroke centres performing the mechanical thrombectomy. Furthermore, effective networks include monitoring of quality standards, allowing for a regular review of protocols to improve quality (Mortimer et al., 2021^[240]).

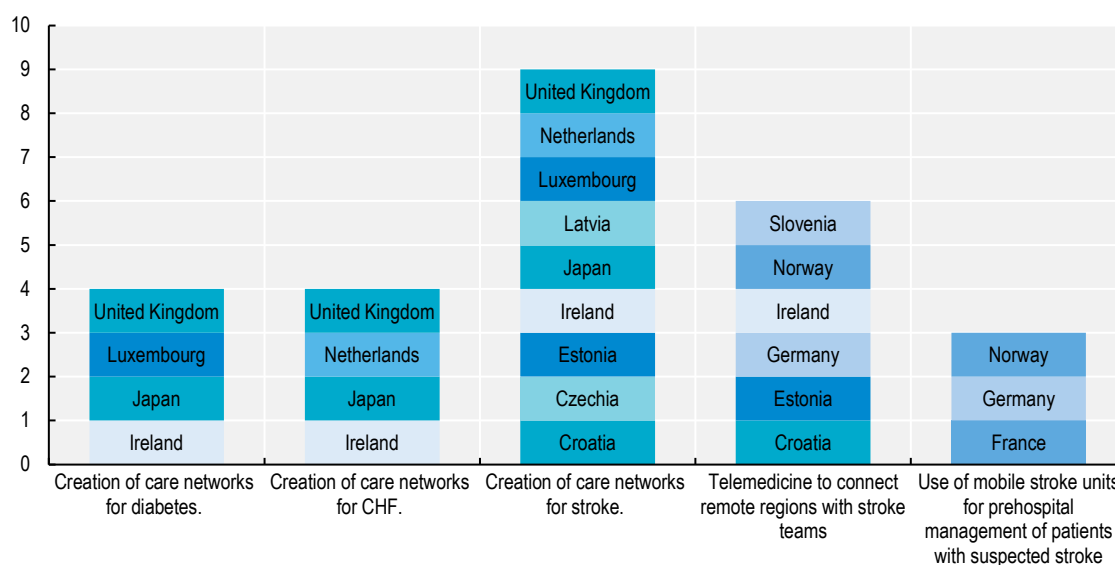
Designing stroke care networks based on the level of the expertise and performance in each centre helps reduce regional inequalities

Stroke care networks help reduce regional inequalities in access to thrombolysis and thrombectomy in patients with acute ischemic stroke. Stroke care networks allow lower-care-level hospitals located in remote areas to be associated to hospitals equipped with specialised stroke units and stroke centres (Schoenfelder et al., 2021^[241]). These specialised hospitals may also provide additional assistance such as continued training and quality management. Stroke care networks are being implemented in several EU+2 countries (Figure 6.12).

Since the 1990s, the **Netherlands** has promoted integrated stroke care through regional networks linking hospitals, rehabilitation centres, and primary care. This approach has improved outcomes, with more patients returning home and less reliance on home care. A study assessing the performance of the design of stroke care networks in Bavaria, **Germany**, proposed improvements in the stroke network design in Bavaria to reduce average travel distances (Schoenfelder et al., 2021^[241]). In **Ireland**, the National Clinical Programme for Stroke is developing a two-centre model to meet the country's needs for endovascular

treatment of stroke. Plans for expanding services will be guided by national data collected by the Irish National Audit of Stroke and the National Thrombectomy Service.

Figure 6.12. Countries are addressing disparities in healthcare access through care networks and telemedicine



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Telemedicine can be a useful tool in stroke. In particular, in connecting local centres to hospitals with strong neurological expertise, helping to reduce regional and rural disparities in care (see also Chapters 4 and 5). Through telemedicine, local physicians can consult with expert stroke physicians, transmit digital brain images and decide next steps. If needed a real-time clinical examination of the patient can also be performed via videoconferencing. Telemedicine enables the coverage of large areas, not densely populated, increasing the use of evidence-based care across all European regions and countries where there is no onsite expertise (Hubert et al., 2018^[242]). When compared to traditional models of care, telestroke networks have been shown to be cost-effective and carry the potential to reduce regional inequalities of acute stroke care (Schoenfelder et al., 2021^[241]). A German study evaluating a 10-year experience of telestroke units as a model of care in rural areas showed a substantial increase in the number of stroke patients treated in telestroke units (from 19% to 78%), in the proportion of intravenous thrombolysis (from 3% to 16% of patients with ischemic stroke) and shorter treatment times (Müller-Barna et al., 2014^[243]). Estonia, Ireland, Germany, Norway and Slovenia are using of telemedicine to connect remote regions with stroke teams (Figure 6.12).

Mobile Stroke Units (MSUs) are specialised ambulances equipped with CT scanner, lab testing, and telemedicine, staffed by stroke-trained teams. MSUs improve prehospital care of people with suspected stroke, with relevant reductions in time to thrombolysis, and may facilitate prehospital triage directly to comprehensive stroke centres (Walter et al., 2022^[244]). European guidelines recommend MSUs over conventional care for suspected stroke cases, with evidence supporting their cost-effectiveness in densely populated regions (Oliveira Gonçalves et al., 2023^[245]). France, Germany, Norway have implemented MSUs (Figure 6.12). A Norwegian study found that optimising the base location of a MSU in the Oslo area could improve patient coverage by 17% compared to the current site and shorten treatment times

(Markhorst et al., 2025^[246]). This study highlighted the importance of careful site selection for the MSUs to maximise timely treatment and improve outcomes.

Standardising post-acute stroke care delivery is crucial to improve outcomes

A systematic review assessing integrated care in stroke, showed that it improved quality of life, reduced the risk of recurrent strokes, and reduced anxiety and depression, with some favourable effect on certain cardiovascular risk factors (Eustace et al., 2025^[247]). Nonetheless, a standardised definition of the components of integrated care in stroke lacks consensus, in both acute and post-acute settings, and additional research is needed to identify which specific components offer the greatest benefits. A post-stroke ABC pathway was proposed as a holistic approach to integrated stroke care, including three components: A) Appropriate antithrombotic therapy; B) Better functional and psychological status; C) Cardiovascular risk factors and comorbidity optimisation. Full adherence to the ABC stroke pathway showed a significant reduction in stroke recurrence (Sagris et al., 2024^[248]) and a reduction in the risk of adverse outcomes (Tsang et al., 2024^[249]).

Managing medications has been a challenge, especially given the side effects and the need for frequent adjustments. For example, blood-thinning medication may have contributed to my electrical storm episodes. Clearer communication about medication risks and benefits, as well as regular follow-ups, are essential for effective management.

Caius, artist, researcher, patient advocate, and heart attack survivor.

Although the importance of standardised and co-ordinated post-stroke care and follow-up after rehabilitation is clear, the availability of these services remains limited. These structured programmes can enhance the overall quality of care through reducing the inconsistencies in patients care pathways. They also play a key role in informing quality standards, enabling benchmarking of services against standards. In **Italy**, the Friuli-Venezia Giulia region has developed a comprehensive care pathway for stroke spanning the pre-hospital, hospital, and post-hospital care (The Health Policy Partnership, 2021^[250]). The post-acute phase includes services delivered in community settings, outpatient clinics, residential facilities, and rehabilitation centres. The discharge process includes patient and caregiver education, co-ordinated multidisciplinary medication management, standardised discharge documentation, and a clear overview of community-based follow-up care.

6.8. Embedding people-centredness in service design and care delivery is essential to improve experiences and outcomes

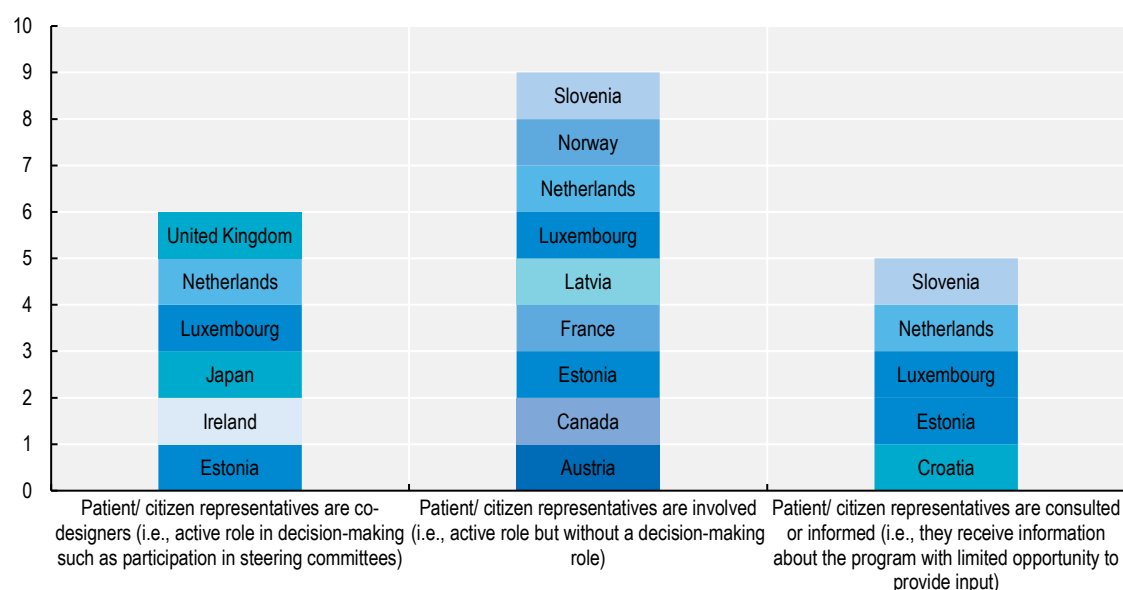
6.8.1. People-centred care entails co-production and shared decision making

People-centred care acknowledges that medical care is integrated within individual context and preferences (Ekman et al., 2011^[251]), promoting shared decision making (NEMJ, 2017^[252]), and prioritising physical and emotional well-being. It entails key elements: voice, choice, co-production, respectfulness and integration. People centredness is positioned at the core of health system in the OECD's Health System Performance Assessment Framework, recognised as both a health system objective and an instrument to achieve other policy objectives (OECD, 2024^[1]).

The first European standard on person-centred care, initiated by the University of Gothenburg's Centre for Person-centred Care, was in 2020 by the European Committee for Standardization (CEN) (GPCC, 2024^[253]). It outlines minimum requirements for patient involvement for patient involvement across care delivery, research, and in the design and implementation of quality indicators. It focus on patient narratives, partnerships, care planning, and public engagement. Ongoing research is essential to evaluate its practical and policy impact (Stjernswärd and Glasdam, 2022^[254]).

In the 2025 OECD Cardiovascular Policy and Data Survey, eight of the EU27+2 countries reported that citizen or patient representatives were involved in developing policies related to access and quality of CV care. However, only four European countries reported citizen or patient representatives participating as co-designers (Figure 6.13). **Estonia** promotes participatory practices by involving patient representatives in policymaking and through patient advisory boards in public hospitals. In **France**, patient representatives contribute to national health policy through various committees. **Norway** also involves patients in the development of national guidelines, though not always in clinical guideline creation. In **Slovenia**, patient organisations are generally engaged in working groups that design healthcare regulations and policies. In **Canada**, people with lived experience contribute to the development of the Canadian Stroke Best Practice recommendations and participate in provincial planning and hospital advisory committees.

Figure 6.13. Citizen participation in CVD policy development can be strengthened across Europe



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom).

Source: 2025 OECD Cardiovascular Policy and Data Survey.

6.8.2. People-centred cardiovascular care improves patient experiences and outcomes, yet lacks widespread adoption

The operationalisation of people-centred care across the entire CV care pathway includes various components across healthcare settings. According to the Gothenburg Centre for Person-Centred Care, three main routines should be considered, namely: 1) *to establish* a person-provider partnership, where the person's personal description of symptoms and impact on quality of life is the starting point; 2) *to maintain the partnership*, ensuring shared decision making throughout the care pathway, and jointly agreed

goals are set and monitored, 3) to *safeguard* the partnership, by documenting patient values, preferences and involvement in decision making in patient records (Britten et al., 2020^[255]).

Ensuring people-centred care in the management of people suffering from CVD improves patient outcomes and quality of life. A study assessing the outcomes of patients hospitalised with worsening chronic heart failure treated according to principles of person-centredness care, showed shorter length of hospital stay and improved functional performance, when compared to usual care (Ekman et al., 2011^[256]). Person-centred care approach after an acute coronary syndrome improved patient-reported outcomes in a previous trial, such as return to work (Fors et al., 2017^[257]), as well patient experiences regarding the information received (Wolf, Vella and Fors, 2019^[258]). In this Swedish clinical trial (Wolf, Vella and Fors, 2019^[258]), the person-centred care approach developed by the Gothenburg Centre for Person-Centred Care showed positive effects on patient experiences, which were more marked among lower educated individuals (Wolf, Vella and Fors, 2019^[258]).

Despite its benefits and the broad acknowledgement of person-centred care as a relevant component of care, this practice is not systematically practiced nor documented (Ekman et al., 2011^[251]). Healthcare professionals' perception of person-centred care has been described as an extremely complex innovation and as an abstract notion (Fridberg, Wallin and Tistad, 2021^[259]). In **Sweden**, laws and policies supporting the patient as a central actor in the communication with healthcare professionals have been put in place to help ensure the patient is viewed as a co-producer of health and care (Hedberg et al., 2022^[260]).

Guidance to patients and providers may support people-centred care. The Gothenburg Centre for Person-Centred Care has developed tools for person-centred care, such as online courses, conversation guides to support professionals interacting with adults with heart failure and fragile elderly patients, and health planning documents and tools for evaluation and measurement (GPCC^[261]). A Dutch half-year pilot study in primary care, showed that a programme offering professionals training and tools to organise integrated and person-centred care for chronically ill patients was feasible and acceptable (Smeets et al., 2023^[262]). Team commitment and strong network ties were found crucial for effective implementation.

6.8.3. Shared decision making is key for people-centred care and could be further prioritised

Shared decision making (SDM) is a cornerstone of patient-centred care, particularly in the management of CV diseases such as heart failure, atrial fibrillation, and coronary artery disease. It entails professionals and patients working jointly to make informed choices tailored to personal preferences. Evidence shows that shared decision making improves treatment adherence, patient satisfaction, and health outcomes. The American Heart Association's guidelines emphasise SDM as a way to ensure the communication with patients allows to make healthcare decisions tailored to each individual (AHA, 2023^[263]).

I have appreciated healthcare professionals who engage in clear communication and involve me in decisions about my care. Education classes and patient training programs have been valuable but are not always widely available. Having a care plan co-developed with my care team helped me manage medications and lifestyle changes better, though such plans are not standard everywhere.

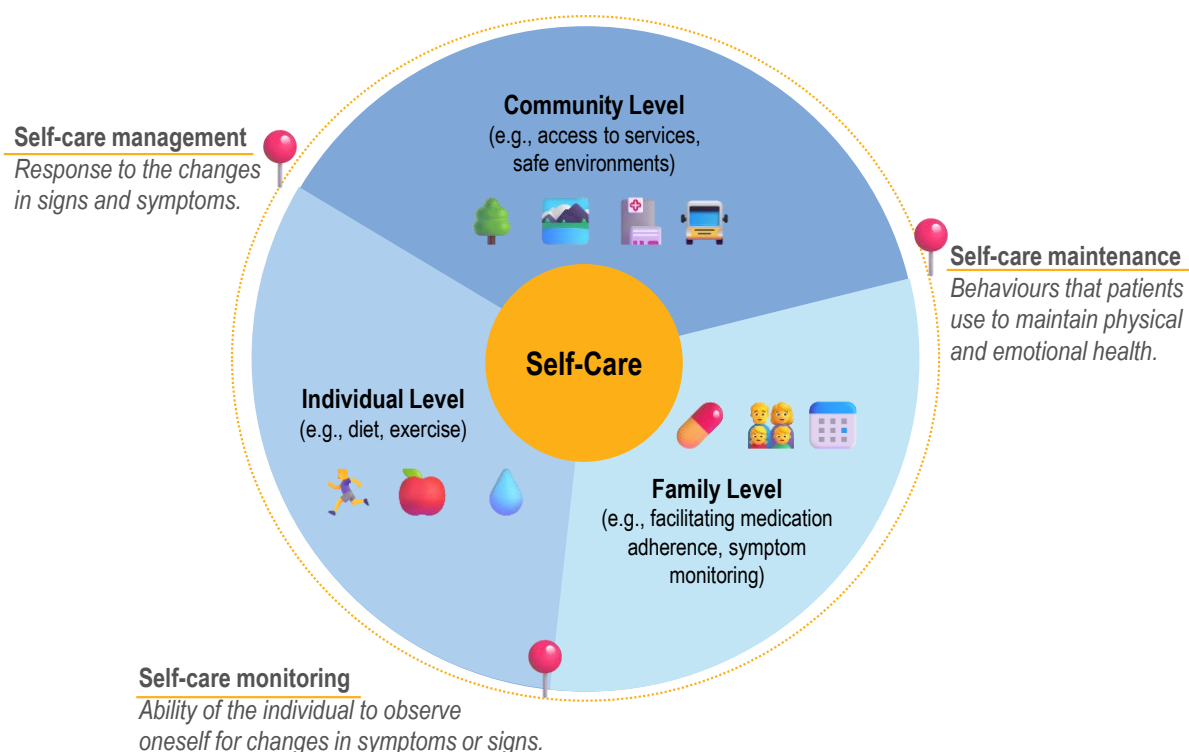
Antonis, 58, congenital heart disease patient and advocate for digital health and patient empowerment.

Germany's SHARE TO CARE program, implemented in one of the ten largest university medical centres in Germany, across 22 departments supports shared decision making through physician and nurse training, patient activation, and decision aids (SHARE TO CARE^[264]). It proved feasible within a period of four years (2018-2021) and effective hospital-wide, with improved patient-reported involvement in care. As a result, SDM is now reimbursed by major insurers, and a national rollout has been recommended by the German Federal Joint Committee (Scheibler et al., 2023^[265]). In **England**, the NHS has developed decision support tools tailored to specific conditions, aiming to embed SDM into routine practice.

6.8.4. Innovative self-management interventions may improve long-term outcomes in a cost-effective manner

Self-care can be defined as a “process of maintaining health through health promoting practices and managing illness” (Riegel, Jaarsma and Strömberg, 2012^[266]) and it is a key component to improve health and quality of life (AHA, 2017^[267]). The Theory of Self-care of Chronic Illness has evolved from clinical practice with heart failure patients and addresses the prevention and management of chronic conditions, including three core elements: self-care *maintenance*, self-care *monitoring*, and self-care *management* (Riegel, Jaarsma and Strömberg, 2012^[266]) (Figure 6.14). Self-care implies individuals, families and communities to maintain health through health-promoting behaviours and to be able to manage illness.

Figure 6.14. Effective self-care includes individual-, family- and community-level behaviours and entails three key elements: self-care *maintenance*, *monitoring* and *management*



Source: Adapted from AHA: (2017^[267]), “Self-Care for the Prevention and Management of Cardiovascular Disease and Stroke”, <https://doi.org/10.1161/jaha.117.006997> and Riegel, Jaarsma and Strömberg (2012^[266]), “A Middle-Range Theory of Self-Care of Chronic Illness”, <https://doi.org/10.1097/ans.0b013e318261b1ba>.

Evidence shows that self-care interventions focussed on lifestyle changes may improve outcomes in coronary heart disease (AHA, 2017^[267]). A meta-analysis to evaluate stroke self-care programmes showed

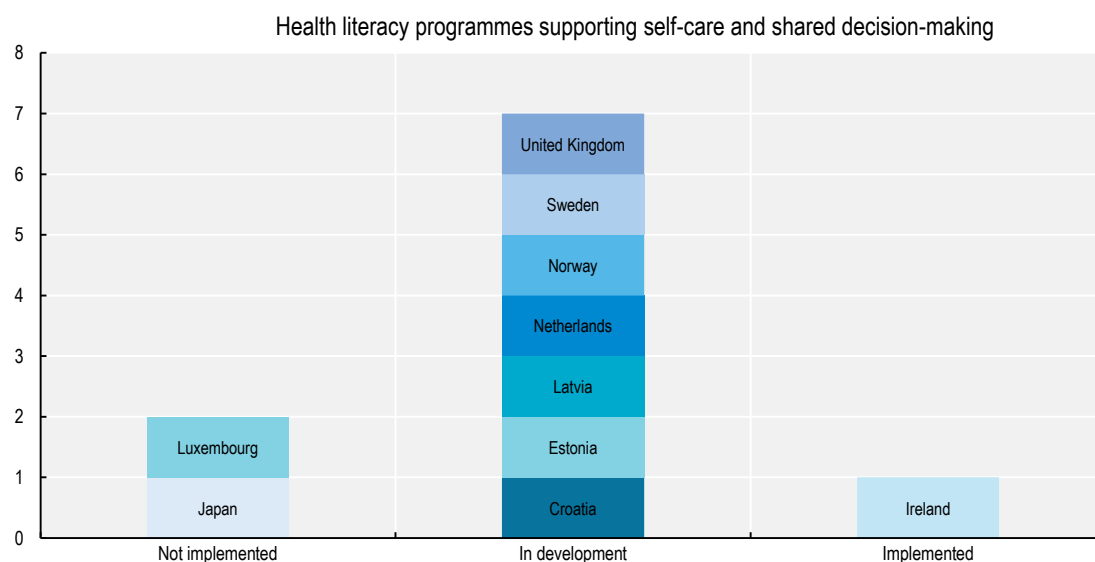
improvements in quality of life and self-efficacy when compared with usual care (Heneghan et al., 2012^[268]). Regarding hypertension, studies also show that self-care monitoring is an effective mean to improve treatment adherence and reduce blood pressure.

Patients diagnosed with HF need to perform lifestyle adjustments to be able to monitor symptom changes, adhere to daily medication and prevent deterioration (ESC, 2011^[225]) and frequently have multiple comorbidities. A literature review assessing the effectiveness of self-management strategies in heart failure patients has shown a significant effect on mortality at half- and one-year follow-up, as well as the cost-effectiveness of these strategies (Koikai and Khan, 2023^[269]).

Some studies have showed the feasibility and cost-effectiveness of innovative methods to increase adherence to self-management, such as home-based interventions, telemonitoring and the use of mobile telephone applications. An intervention including home-based care and support to caregivers was considered feasible and contributing to enhance symptom perception in people with heart failure (Santos et al., 2023^[270]). A Dutch randomised controlled trial assessing the impact of personalised telemonitoring on heart failure patients, found that it was feasible to educate patients and improve their ability to self-care (TEHAF, 2013^[271]).

Only **Ireland** has reported implementing health literacy initiatives aimed at promoting self-care and shared decision making, while five European countries have indicated that such initiatives are under development (Figure 6.15). **Ireland** has established a Decision Support Service to aid individuals in making or sharing health-related decisions, with over 3 000 agreements in place as of March 2025. **France** introduced "*Mon bilan prévention*", a personalised prevention programme encouraging proactive health management in key phases of life, where individuals meet with a healthcare professional to identify risk factors, assess lifestyle habits, and receive tailored advice related to self-care. **The United Kingdom** promotes self-care through NHS initiatives and British Heart Foundation resources available online. In **Latvia**, the Cardiovascular Health Action Plan adopted in mid-2025 (2025-2027) includes incentives to support self-care practices. **Sweden** incorporates self-care into its national, regional, and local strategies on integrated care delivery.

Figure 6.15. Few countries are investing in health literacy programmes to support self-care and shared decision making



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom), only 11 countries provided responses to this item.

Source: 2025 OECD Cardiovascular Policy and Data Survey.

6.8.5. Enhancing patient experiences and quality of life requires strong investments in discharge planning, self-management and rehabilitation

Implementation of early supported discharge and community rehabilitation programmes varies greatly across Europe, though evidence suggests their safety and cost-effectiveness

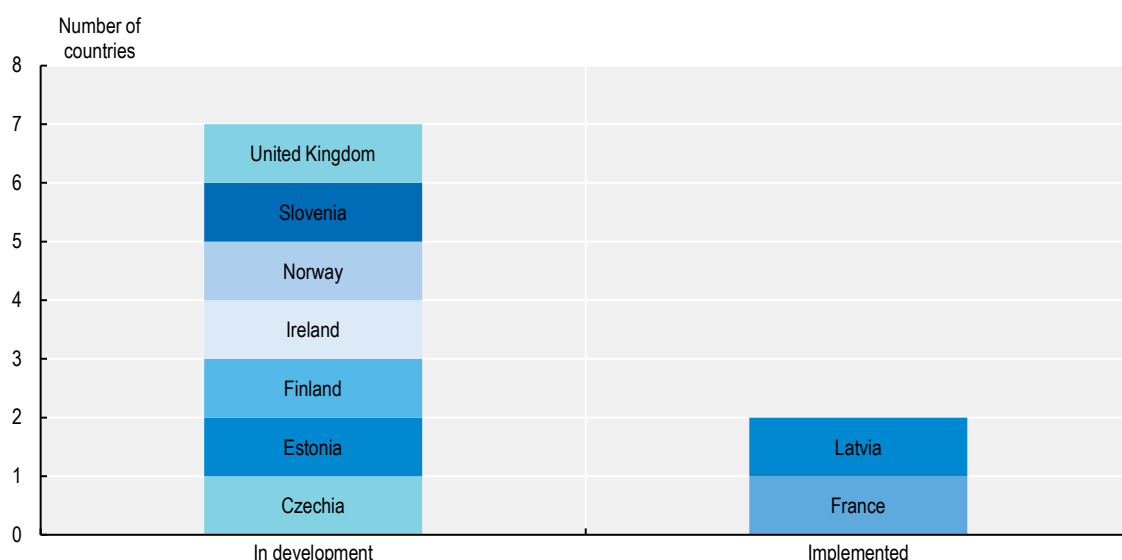
Primary care-oriented systems contribute to improve population health by preventing acute deterioration in people living with three chronic conditions, including congestive heart failure (OECD/The Health Foundation, 2025^[201]). Cardiovascular conditions comprise a relevant burden to primary care patients aged 45 years or older: In the PaRIS survey, cardiovascular conditions were the third most frequent diagnosis among men (27%) and women (17%), followed by diabetes (23% and 15%) (OECD, 2025^[3]).

My healthcare journey has been a rollercoaster. While I am grateful for the expertise of the doctors who treated me, I often felt like a passive participant in my care. There was a lack of communication and shared decision-making, which left me feeling disconnected at times. I believe that involving patients in their care plans and providing tailored education can significantly enhance the healthcare experience.

Caius, artist, researcher, patient advocate, and heart attack survivor.

Early supported discharge aims to accelerate the discharge of stroke patients from hospital by offering specialised rehabilitation and social care at home, with a multidisciplinary team support (Waje-Andreassen et al., 2018^[235]). Several countries are implementing early discharge protocols across Europe (Figure 6.16). For stroke, this practice is established in only a few countries, such as Sweden, Ireland and the United Kingdom, despite local variations (SAFE^[272]). Early discharge after ST-segment-elevation myocardial infarction (STEMI), 24-48 hours after treatment, may offer benefits both for patients and the healthcare system, however it has not yet gained widespread adoption. Various studies showed that an early discharge strategy after STEMI after primary PCI was safe 30 days after discharge among selected low-risk patients (Piris et al., 2024^[273]; Rathod et al., 2021^[274]; Yndigegn et al., 2022^[275]) and cost-effective (Rathod et al., 2025^[276]). Nonetheless, it is crucial to ensure follow-up support from a cardiac rehabilitation team, and ensure that patients or caregivers have clear understanding of treatment and ongoing management.

Figure 6.16. A small number of responding countries reported having fully implemented early discharge protocols after stroke, acute coronary syndrome and/or heart procedures



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom), only 12 countries responded to this item.

Note: In response to the question ‘Since 2020, has your country implemented any of the following policies (...)? *Regulatory frameworks of new models of CV care delivery: (specifically) Early discharge protocols after stroke, acute coronary syndrome, heart procedures*’. The disaggregate data per country, specifying which conditions these protocols apply to is not available.

Source: 2025 OECD Cardiovascular Policy and Data Survey.

Rehabilitation and lifelong management are essential and cost-effective components of tertiary prevention for people with cardiac diseases and stroke (Anderson and Taylor, 2014^[277]). Cardiac rehabilitation is a multidisciplinary supervised programme involving tailored exercise and education focussed on improving lifestyle habits and reducing health risks for individuals with heart conditions (Khadanga et al., 2024^[278]). Cardiac rehabilitation can improve the quality of life of patients diagnosed with HF, relieving symptoms and improving exercise capacity, as well as reducing both all-cause and HF specific hospitalisations (ESC Guidelines, 2021^[220]). While exercise is recommended for all patients who are able to in order to improve their quality of life and reduce HF hospitalisations, the ESC recommend “supervised, exercise-based cardiac rehabilitation programmes should be considered in patients with more severe disease, frailty or other comorbidities” (ESC Guidelines, 2021^[220]).

The availability of cardiac rehabilitation is not widely available across Europe (see Chapter 4) and lack of referral to cardiac rehabilitation has been identified as a key barrier hindering participation of eligible patients (Khadanga et al., 2024^[278]). **Ireland** has implemented a Model of Care for Integrated Cardiac Rehabilitation for people living with CVD (Box 6.15).

Post-stroke disability is a key contributor to long-term healthcare resource use, thereby strengthening rehabilitation services may reduce healthcare costs. Nonetheless, access to rehabilitation services after stroke varies greatly across Europe. Stroke survivors frequently face problems with speech, mobility or speech, and require multi-disciplinary support. Few countries monitor rehabilitation provision at hospital level and even less monitor this service at the community level (SAFE^[272]).

Box 6.15. Development and Approval of an Evidence-Based Cardiac Rehabilitation Model of Care

Ireland's Model of Care for Integrated Cardiac Rehabilitation sets out an evidence-based approach for the delivery of a high-quality, equitable and person-centred cardiac rehabilitation service for those living with CVD (HSE, 2023^[279]).

A person-centred approach

To optimise recruitment and retention and enhance participant experience, the model promotes a person-centred approach (BACPR, 2023^[280]; ESC, 2022^[281]). The model also places a focus on enhancing referral to, and attendance at, cardiac rehabilitation for those who are traditionally under-referred, such as women, older patients and marginalised groups (ESC, 2018^[282]; Castellanos, 2019^[283]; Ruano-Ravina A, 2016^[284]; Resurrección DM, 2017^[285]).

leveraging Ireland's national health policy

The Model of Care aligns with Sláintecare – Ireland's roadmap to deliver a sustainable universal health and social care service – and constitutes a foundational component of the National Framework for the Integrated Prevention and Management of Chronic Disease, which describes a continuum of care from health promotion and disease prevention through to proactive disease management, rehabilitation and palliative care (Department of Health, 2023^[286]; HSE, 2020^[287]). The National Framework aims to shift care from a reactive, hospital-centric approach to a more integrated, population-based approach for the prevention and management of chronic disease (HSE, 2020^[287]).

Implementation

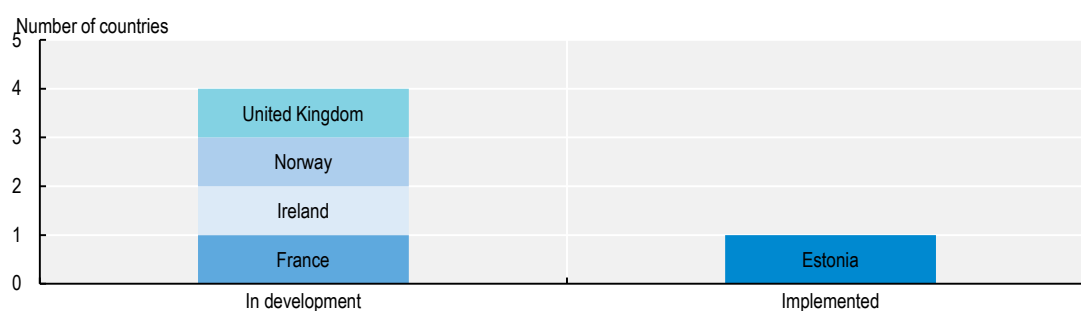
The Model of Care for Integrated Cardiac Rehabilitation was developed by a multi-disciplinary expert group with representation from cardiologists, nurses, health and social care professionals, psychologists and patient groups. To drive implementation, a national needs assessment for cardiac rehabilitation was undertaken to understand the resources required to meet population needs and to identify the barriers and facilitators to implementation. Funding has been provided to implement and evaluate the full end-to-end Model of Care for Integrated Cardiac Rehabilitation in the West of Ireland in 2025 and 2026, with a view to supporting national scale-up of the service thereafter.

Embedding rehabilitation in national guidelines, standardised care pathways and innovative delivery models may foster rehabilitation provision across Europe

Alternative solutions and interventions to enhance cardiac rehabilitation (CR) delivery can enhance attendance, such as hybrid CR (includes in-facility and at-home or community-based CR), home-based CR, automatic referral at time of discharge, patient education and financial incentives (Khadanga et al., 2024^[278]). Home-based cardiac rehabilitation may provide an effective and more affordable alternative to centre-based rehabilitation (Claes et al., 2016^[288]). In a multicentre randomised clinical trial in England, a home-based cardiac rehabilitation intervention tailored to people with HF and their caregivers was evaluated as an alternative to traditional hospital-based programmes (Dalal et al., 2018^[289]). This study showed better outcomes in quality of life and self-management when compared with usual care. The possibility to provide tele-supervised rehabilitation for heart failure patients is also promising, with some studies reporting favourable effects of its implementation (Piotrowicz et al., 2016^[290]). Home-based point-of-care technologies and wearable devices may enhance the quality and accuracy of follow-up data (Norrving et al., 2018^[291]) (see Chapter 5).

Only a handful of countries are systematically developing regulatory frameworks for the systemic use of home-based care (Figure 6.17). **Estonia's** national policy mandates that care homes provide 24/7 support for individuals unable to live independently. Local governments are responsible for assessing care needs and co-financing care home services. The **CardiacCare@Home** project, led by Radboudumc in the **Netherlands**, aims to improve heart failure care at home through technology development and AI-driven monitoring. Its main goals are to reduce hospital admissions by enabling early detection of heart failure worsening, support home-based rehabilitation, and ultimately enhance patients' quality of life, while lowering workload at the hospital (Radboud UMC, 2024^[292]).

Figure 6.17. Home-based care has significant potential for development across Europe as currently only a few countries report developing regulatory frameworks for this model of care delivery



Note: N=19 EU+2 and OECD G20 countries (Austria, Canada, Croatia, Czechia, Estonia, Finland, France, Germany, Iceland, Ireland, Japan, Latvia, Luxembourg, the Netherlands, Norway, Slovenia, Sweden, Türkiye, the United Kingdom), only 10 countries responded to this item.
Source: 2025 OECD Cardiovascular Policy and Data Survey.

In **Denmark**, a national clinical guideline for cardiac rehabilitation was launched in 2013 as a result of a national political agreement, alongside a national clinical quality database for CR (Lindström Egholm et al., 2018^[293]). Improvements in adherence at hospital level were noted, while no general improvement was observed at the community level, suggesting that tailored initiatives to specific settings may be needed to support implementation. In **Ireland**, cardiac rehabilitation is a key component of the *Model of Care for the Integrated Prevention and Management of Chronic Disease*, implemented in Ireland (2020-2025). Specialist ambulatory care hubs have been established since 2020 in Ireland, which includes hospital and community-based staff, collaborating to provide rehabilitation services (HSE, 2023^[279]).

Return-to-work programs can be better integrated into national policies

CVD frequently impact work ability, with return-to-work rates varying across countries and patient groups (Sadeghi et al., 2022^[294]; Rørth et al., 2016^[295]). A study suggested that returning may be harder for people suffering from with heart valve disease or heart failure than for people diagnosed with atrial fibrillation or ischemic heart disease (Bernt Jørgensen et al., 2022^[296]). A Danish nation-wide study reported that among working-age patients, employed before admission, who experience a first-time myocardial infarction, 91% had returned to work within one year (Smedegaard et al., 2017^[297]). However, after their return, 24% were detached from employment and receiving social benefits. Factors associated with detachment from employment included heart failure, diabetes, and depression. Individuals with higher levels of education and income were more likely to remain in the workforce. A multicentre prospective cohort study between 2013 and 2021 reported that, among young individuals who experienced a first ischemic stroke, significant vascular cognitive deficits and slower processing speed during the subacute phase were independently linked to being unemployed. However, these factors did not appear to affect the ability to maintain employment (Schellekens et al., 2025^[298]).

Cardiac rehabilitation has a relevant role in facilitating returning to work (Sadeghi et al., 2022^[294]) and international guidelines recommend including vocational counselling as part of rehabilitation programmes. Nonetheless, research on long-term return-to-work effectiveness remains limited, notably the effectiveness of workplace-focussed interventions. Combined cardiac rehabilitation programmes interventions (including physical and psychological aspects) may improve return to work within six months among individuals diagnosed with coronary heart disease (Hegewald et al., 2019^[299]). A clinical trial assessing the effect of an extended case-management rehabilitation intervention showed a relevant positive impact on the return-to-work of myocardial infarction (MI) patients and in increased probability of maintaining employment at one and two years of follow-up (Zack et al., 2022^[300]).

Most European countries lack clear guidelines (Reibis et al., 2019^[301]) and there is a wide variety of rehabilitation and return-to-work policies, due to heterogeneous legal, institutional, and cultural frameworks (EAPC, 2019^[302]). A comparative review of rehabilitation laws, policies and national action plans in Sweden, Italy, Germany, the Netherlands, and the United Kingdom revealed that disease-specific policies across these countries consistently state rehabilitation as a core component of healthcare. However, a gap between legal entitlements to universal rehabilitation coverage and policy implementation was identified (Garg, Skempes and Bickenbach, 2020^[303]). **Germany's** Operational Integration Management is legally mandated since 2004 and supports employees returning to work after extended illness (more than six weeks) (Box 6.16). In the **Netherlands**, return-to-work programmes are embedded within a structured legal framework that emphasises early intervention and co-ordinated reintegration. Under the Eligibility for Permanent Incapacity Benefit (Restrictions) Act ("*Wet verbetering poortwachter*"), employers are legally required to initiate a reintegration process if an employee is ill for more than six weeks. This includes creating a reintegration dossier, conducting regular progress meetings, and developing a tailored action plan in collaboration with occupational health professionals (RVO^[304]).

Box 6.16. Germany's pathway from treatment to reintegration at the workplace – Country example

In Germany, return-to-work policies are embedded within a comprehensive social insurance framework, primarily managed by the German statutory pension insurance (GPI). Individuals are legally entitled to medical and vocational rehabilitation if certain conditions are met, with rehabilitation being prioritised over early retirement (Hetzl et al., 2023^[305]). Most interventions are delivered through 3- to 4-week inpatient, outpatient or semi-inpatient options. During rehabilitation, employees receive continued wage payments for up to six weeks, after which the GPI provides transitional benefits.

Germany's **Operational Integration Management (OIM)** targets employees absent for more than six weeks within a year. Employers are required to offer OIM, but participation is voluntary. The reintegration process includes a systematic assessment of health-related limitations and corresponding workplace adjustments. It is co-ordinated by the company's case manager and carried out in collaboration with staff and works council representatives, as well as treating physicians, therapists and occupational health service, where appropriate. Its implementation varies, with limited uptake in smaller enterprises (BAuA^[306]).

Germany's **four-phase reintegration model** is a stepwise approach promoting sustainable work reintegration through continuous and tailored support. Initially developed to tackle mental health problems, it has broader applicability, and entails: 1) co-orientation, fostering trust and identifying necessary resources, 2) co-ordination, focussing on organising interventions, 3) co-operation, supporting the actual return to work and 4) renewed co-orientation, to sustain performance and work ability.

Source: (BAuA^[306]; Hetzel et al., 2023^[305]).

Occupational safety and health strategies and systems policies from 32 European countries were analysed in the context of the European Parliament's pilot project "*Safer and healthier work at any age – occupational safety and health in the context of an ageing workforce*", launched in 2012 (EU-OSHA, 2022^[307]). Effective return-to-work policies share several characteristics, according to this analysis, including legal frameworks covering all aspects of the process, effective co-ordination mechanisms, and incentives for employers and workers (Box 6.17).

Box 6.17. Requirements for establishing national return-to-work systems

An analysis across 32 European countries under the European Parliament's pilot project "*Safer and healthier work at any age – occupational safety and health in the context of an ageing workforce*", identified essential prerequisites for establishing an effective national return-to-work system:

- **Holistic systems targeting all workers:** Expanding support to all workers, enabling early, tailored interventions for those returning from medium- or long-term sickness.
- **Embedding within the broader policy framework:** Embedding return-to-work within broader policy frameworks to ensure cross-sectoral co-ordination including employment, health, safety, social protection, and education sectors. Joint budgeting may enhance co-ordination and efficiency.
- **Co-ordinated systems with workplace at core:** Strengthening co-ordination among healthcare providers, rehabilitation services, and the workplace as a central actor.
- **Financial and technical support for workplaces:** Providing financial and technical assistance, especially for small enterprises, to implement effective reintegration strategies.
- **Awareness:** Promoting understanding of return-to-work strategies through company culture and intermediary actors.
- **Research gaps:** Addressing gaps in implementation, small business practices, groups living in vulnerable situations, and EU-level data harmonisation on sickness absence and return-to-work rates.

Source: EU-OSHA (2022^[307]), Rehabilitation and return-to-work policies and systems in European Countries - OSHwiki | European Agency for Safety and Health at Work, https://oshwiki.osha.europa.eu/en/themes/rehabilitation-and-return-work-policies-and-systems-european-countries#_edn1.

6.8.6. Measuring what matters for people with CVD may accelerate people-centred improvements across the care pathway

Condition-specific PROMs for CVD have the potential to improve clinical practice

CVD symptoms frequently have a negative impact on health-related quality of life and are associated with reduced physical competence, as well as emotional stress (de Leon et al., 2009^[308]). Patient-reported outcome measures (PROMs) are a key component of people-centred clinical practice and evaluate health domains such as symptoms, health-related quality of life, and health behaviours, allowing to tailor treatment to patient needs. PROMs are frequently administered longitudinally at different moments in time to monitor outcomes trends. The International Consortium for Health Outcomes Measurement (ICHOM), established in 2012, gathers research, clinical and patients experts from around the world to standardise and promote patient-centred outcomes measurement (Bright et al., 2025^[309]). It has published 46 standards, covering 60% of the global burden of disease (Bright et al., 2025^[309]).

While generic tools allow comparison across clinical conditions, disease-specific tools present greater face validity to guide improvements at the disease level. Various studies recommend using generic and condition-specific instruments simultaneously to assess PROMs (Rumsfeld et al., 2013^[310]; Abdalla et al., 2022^[311]). A literature review aiming to identify heart-disease-specific PROMs, identified several PROMs instruments for various heart diseases, namely coronary artery disease, valvular and structural heart interventions, percutaneous coronary intervention, congestive heart failure, adult congenital heart disease, peripheral vascular and arterial disease, and one related to arrhythmia management, which present a relevant potential to tailor cardiovascular care to each patient needs and expectations (Kornowski, 2021^[312]) (Box 6.18).

Box 6.18. Potential opportunities to integrate condition-specific PROMs in cardiovascular care

Stable coronary heart disease: PROMs may contribute to better define the patients' expectations from the available treatment strategies, to improve physicians reliability to grade PCI appropriateness, and potentially predict long-term cardiac prognosis of patients who underwent PCI. A study that collected PROMs pre-percutaneous coronary intervention and at 30-days after the procedure, showed similar symptom improvements regardless of the appropriateness defined by physician assessments (Yang et al., 2019^[313]), signalling the potential value of PROMs to improve the evaluation of PCI appropriateness made by physicians.

Valvular and structural heart interventions: PROMs may contribute to individualise outcome predictions in high-risk patients. Studies have shown a misalignment between the measured benefits of transcatheter aortic valve implantation (TAVI) and the perceived benefits by the patients who underwent the procedure, underscoring the value of TAVI even for patients to whom the heart team deemed the treatment futile.

Atrial fibrillation: The inclusion of PROMs as endpoints in clinical trials and their routine collection in practice may contribute to enhance care experiences and monitor outcomes. Intervention studies have shown an association between improvement in PROM scores and a decrease in the burden of AF and related symptoms (Steinberg and Piccini, 2019^[314]; RATE-AF, 2020^[315]). AF-specific questionnaires still lack sufficient validation of their measurement properties (Kotecha et al., 2016^[316]; Ogendo et al., 2025^[317]). A recent study has developed and validated the Atrial Fibrillation Patient-Reported Outcome Measures (AF-PROMs) Questionnaire in the United Kingdom, to measure the quality-of-life of AF patients (Kanthasamy et al., 2025^[318]), which may be tested in clinical practice and research.

Congestive heart failure: The NYHA (New York Heart Association) classification, commonly used in heart failure (HF) care, offers a limited clinician-based view of patient health. Researchers have developed the PROMIS-Plus-HF tool, a PROM that captures physical, mental, and social health dimensions and allows customisation based on clinical or research needs (Ahmad et al., 2019^[319]). The first randomised clinical trial assessing the impact of routine PRO evaluation in heart failure care found no impact on patient-reported health status at one year compared with usual care, underscoring the importance of continue evaluating the implementation of PROM in practice to monitor its impact on patient-reported data (Sandhu et al., 2024^[320]).

Adult congenital heart disease: There is lack of disease-specific PROMs for adults with congenital heart disease, due to the population's clinical diversity and complexity. Researchers developed and validated the Adult Congenital Heart Disease – Patient-Reported Outcome (ACHD-PRO), a 33-item tool covering physical, psychological, and quality-of-life domains. Further validation is needed to confirm its broader applicability in this patient group.

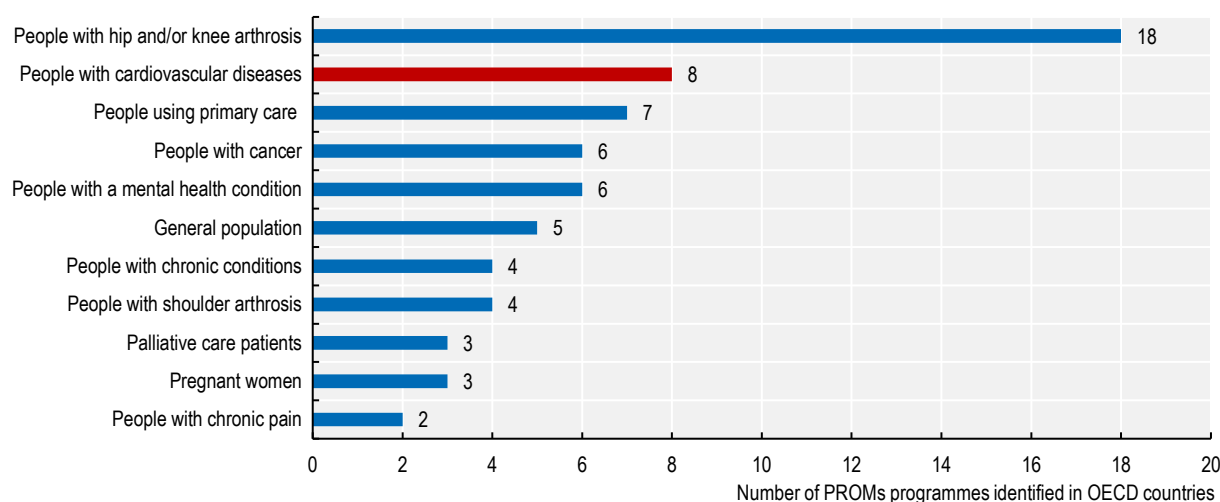
Diabetes: A Delphi study developed an outcome set for routine diabetes care, which was agreed by international key stakeholders and was tested and implemented in Europe in the context of the H2O project (Porth et al., 2023^[321]; Kornowski, 2021^[312]).

Some European countries are implementing PROMs to monitor cardiovascular care, yet challenges persist

The systematic collection and use of PROMs data can be facilitated by the integration of PROMs into data infrastructures such as patient portals and electronic health records, which is being implemented in some countries. This integration provides various advantages, namely the integration into clinical flows and real-time data collection. An OECD survey assessing the systematic collection and use of PROMs among OECD countries showed that about from the 55 programmes of PROMs data collection identified, eight programmes targeted people with CVD (Kendir et al., 2025^[322]) (Figure 6.18). Most of the programmes identified reported using both generic and condition-specific tools to measure patient outcomes. **Estonia** integrates PROMs into the clinical pathway for stroke. **Germany** has introduced a paper-based patient survey under the Federal Joint Committee's directive for quality assurance in percutaneous coronary intervention and coronary angiography, launched in July 2022. In **Canada**, PROMs are used in cardiac rehabilitation to capture the experiences of people living with heart conditions. **England** employs the Long-Term Conditions Questionnaire to assess outcomes across various health conditions, including diabetes and heart disease.

In **Austria**, the “Therapie Aktiv: Diabetes Disease Management” programme collects PROMs electronically to support diabetes care. **Sweden** has developed a condition-specific questionnaire to evaluate PROM and PREM in patients with diabetes, a measure that was lacking in the Swedish National Diabetes Register (Svedbo Engström et al., 2018^[323]). **Denmark** has also developed a national core set of diabetes outcome measures for routine use in clinical practice and has various sets of PROMs implemented to monitor various chronic conditions (Skovlund et al., 2021^[324]; Skovlund et al., 2021^[325]) (Box 6.19).

Figure 6.18. Despite people living with CVD being the second most frequently targeted population in PROMs programmes, their implementation remains low



Note: The category “people with cardiovascular diseases” includes seven reported target populations, including people with valvular diseases, heart failure and coronary artery diseases. The category “people with cancer” includes nine reported target populations: people with breast, lung, colorectal, ovarian, cervical, head and neck, vulvar, uterine, oesophagus, stomach cancers). Some initiatives have multiple target populations.

Note: Programmes targeting individuals with other conditions represented by $n \leq 2$ have been excluded from this figure for clarity. These account for a total of 53 programmes.

Source: Kendir et al. (2025^[322]), “PROMoting quality of care through patient reported outcome measures (PROMs): Systematic collection of PROMs for quality improvement and assurance in 38 countries”, <https://doi.org/10.1787/c17bb968-en>.

Box 6.19. Implementation of PROMS in cardiovascular care through integration in registries and electronic health records – Country examples

Denmark is systematically monitoring condition-specific PROMs and is expanding to other conditions

Danish regions and municipalities collaborate to deliver integrated and preventive care services in a decentralised healthcare system. Denmark has taken a structured and progressive approach to implementing patient-reported outcome measures (PROMs) across its healthcare system. PROMs are currently used nationally in areas such as diabetes and cardiac rehabilitation. The “Interface PRO Diabetes” tool is designed to capture people-centred outcomes that reflect the lived experience of managing diabetes, assessing patients’ daily life experiences, symptom burden, medication management, and blood sugar control. PROMs are also being piloted to monitor heart failure care, indicating a growing interest in expanding their use to other chronic conditions.

In addition to routine care, Denmark is exploring PROMs through research initiatives, such as a project focussed on developing stroke-specific PROMs for patients with cognitive impairments.

Heart failure PROMs are monitored in Wales, as part of the broader “Value in Health” programme

In Wales, the implementation of patient-reported outcome measures (PROMs) for heart failure is a key component of the country’s “Value in Health” programme. The Heart Failure Service captures patients’ perspectives on their symptoms, quality of life, and treatment impact throughout their care journey. PROMs are collected at multiple points, including at referral, during treatment, and at follow-up, using digital platforms that integrate with clinical systems. This enables clinicians to monitor changes over time and tailor care to individual needs, while also generating data for service evaluation and improvement.

The PROMs Standard Operating Model (PSOM) in Wales provides a structured framework for collecting, managing, and using PROMs data across health services. In the heart failure context, this includes validated tools such as the Kansas City Cardiomyopathy Questionnaire (KCCQ) and EQ-5D, which assess both disease-specific and general health outcomes. The data collected supports shared decision making, enhances communication between patients and providers, and informs resource allocation and policy decisions.

Source: Welsh Value in Health Centre (n.d.^[326]), Case Illustration - Heart Failure Service - Value in Health, <https://vbhc.nhs.wales/delivering-value/toolkits/education/patient-reported-outcome-measures-proms/case-illustration-heart-failure-service/?previewid=797FDA09-3623-4F99-8E6B1178E543EACD> (accessed on 15 July 2025); Withers et al. (2020^[327]), “First steps in PROMs and PREMs collection in Wales as part of the prudent and value-based healthcare agenda”, <https://doi.org/10.1007/s11136-020-02711-2>; Welsh Value in Health Centre (n.d.^[328]), PROMs Standard Operating Model (PSOM) - Value in Health, <https://vbhc.nhs.wales/digital-health/data-products/proms-standard-operating-model-psom/> (accessed on 15 July 2025).

The Health Outcomes Observatory (H2O), co-funded by the European Commission, was conducted from October 2020 until September 2025. It aims to enhance the standardised collection of health outcomes and support their integration into healthcare decision making processes (Stamm et al., 2021^[329]). This initiative established the first European scale network for health outcomes data, and the first H2O Observatories were Austria, Germany, the Netherlands, and Spain (H2O^[330]). Likewise, the OECD PaRIS survey is being used to examine the outcomes and experiences of patients with CVD who attend primary care (See Chapters 2, 3 and 4) (OECD, 2025^[31]).

Improved patient experience has been associated with better cardiovascular health outcomes

Optimal patient experience has been associated with better health outcomes among patients with CVD. Among patients with atherosclerotic CVD, an American study showed an association between optimal patient-centred care and various health outcomes, including quality of care processes and patient-reported outcomes (Okunrintemi et al., 2017^[331]). Four key patient-centred domains to optimise patient-reported experiences among patients with CVD were identified in a previous review: 1) overall patient satisfaction, 2) access to a healthcare provider, 4) patient-provider communication, and 4) shared decision making (Okunrintemi and Nasir, 2020^[332]). An Australian cross-sectional survey of patients who underwent elective cardiac catheterisation within the past six months found that fewer than 80% of those who rated certain aspects of care as “very important” or “essential” felt they actually received that level of care (Fakes et al., 2023^[333]). The identified gaps were related to the referral process, decision making process and prognosis information.

Patient-reported experience measures (PREMs) are collected through standardised instruments allowing to provide the patient’s perspective on care delivery, such as assessing information support, emotional support and patient involvement (Scholl et al., 2014^[334]). A scoping review conducted to obtain an overview of PREMs used to capture patients’ experiences with digitally supported care processes in people suffering from heart failure (HF) (iCARE4CVD consortium, 2024^[335]) showed that, in most cases, PREMs were assessed with self-developed and study-specific questionnaires which lacked standardisation and validity. To fill this gap in the field of catheterisation laboratory-based procedures, the European Association of Percutaneous Cardiovascular Interventions Patient Initiatives Committee from the ESC developed the “European Patient Experience in the Catheterisation Laboratory” PATCATH, a patient Reported Experience Measurements (PREM) questionnaire available in ten languages, aiming to characterise and improve these patients’ experience (ESC, 2024^[336]). Further efforts are necessary to improve standardisation of questionnaires within and across countries to improve international comparability.

PREMs are being increasingly used to compare care providers and support accreditation, although standardising instruments could enhance comparability

In **Sweden**, the National Diabetes Register developed a diabetes-specific questionnaire to capture patient-reported outcomes and experiences – such as well-being, abilities, and perceptions of diabetes care (Borg et al., 2019^[337]). Studies using registry data have shown that demographic characteristics have a significant influence on diabetic patients experiences and outcomes, which highlights the value of monitoring PROMs and PREMs to tailor care to specific populations (Sághy et al., 2025^[338]). In **France**, since 2016, the e-Satis survey by France’s “Haute Autorité de Santé” collects patient-reported experience measures across major hospital care pathways, including acute in-patient medicine, rehabilitation services, with some modules in development, such as home-based care (HAS, 2025^[339]). It generates a global satisfaction score out of 100 for each hospital and makes these results publicly available. These insights feed into national quality and safety indicators to help hospitals identify and address areas for improvement.

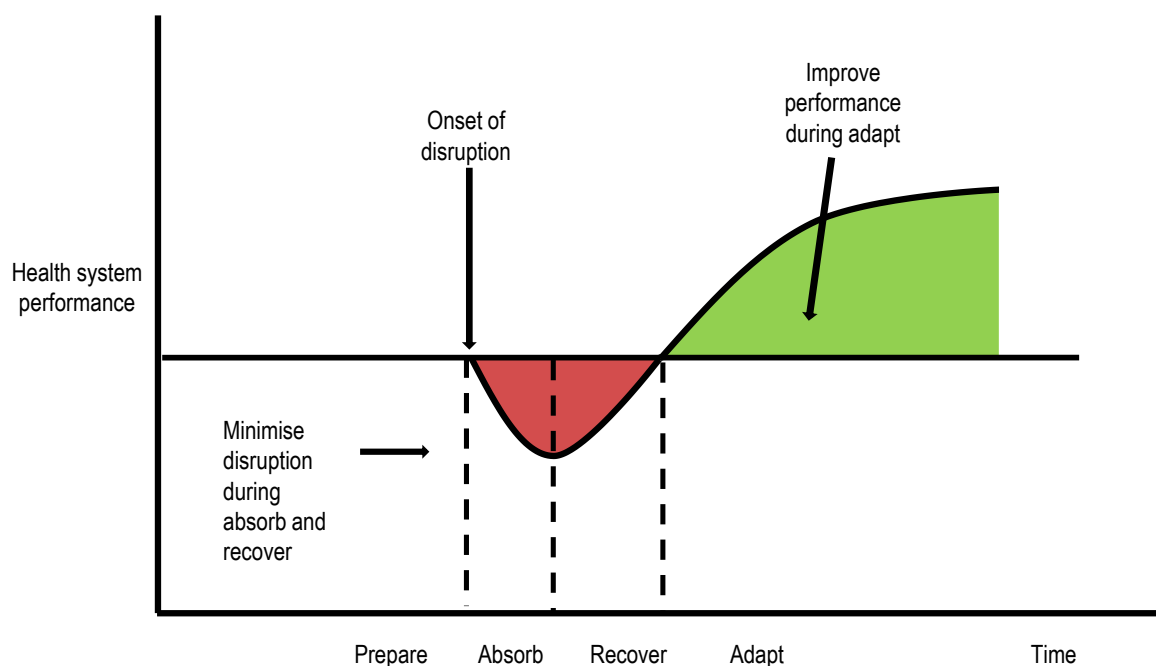
In **Belgium**, two large initiatives in the Flemish and French-speaking communities support hospitals in using PREMs (Desomer et al., 2018^[340]). The French-speaking program, “Project ASPE: Attentes et Satisfaction des Patients et de leur Entourage”, has voluntary participation of hospitals and uses generic and domain-specific PREMs. It includes day hospitalisation and surgery and emergency department, among others. The programme provides several services to participants, such as regular benchmarking for some domains, an online platform closed to participant organisations to exchange experiences, board tables and scientific updates. These components promote cross-learning between participants and foster improvements in the quality of healthcare services. The Flemish initiative, “The Vlaamse Patiëntenpeiling”, covers the cardiology and stroke domains, besides other clinical areas. Feedback and benchmarking reports are provided to organisations and healthcare providers, while a selection of aggregate results is made public.

6.8.7. Resilience as a cross-cutting domain: Cardiovascular health services design need to be resilient to care for an ageing and diverse population

The COVID-19 pandemic caused major disruptions in care delivery for people suffering from CVD, notably with delays in access to diagnosis and treatment, leading to worsening outcomes (de Lange et al., 2022^[341]; CVD-COVID-UK Consortium, 2023^[342]; Khan et al., 2023^[343]). Geographical and socio-economic variations in the detection and management of some conditions were reported in some studies (Castanon et al., 2023^[344]), underscoring the importance of monitoring and tackling inequalities during crises. Considering the high burden of CVDs across Europe (see Chapter 2) and their life-threatening, time-sensitive nature, maintaining cardiovascular care priority during shocks that disrupt health systems is critical.

Resilience refers to the capacity of a health system to maintain its performance under extreme stress (OECD, 2023^[345]). A resilience approach recognises that some shocks may overwhelm the entire health system, making it essential to prepare and absorb impacts, to recover and adapt for future challenges (Figure 6.19). In recent years, resilience has become a central concept in how countries assess and strengthen their health systems and several countries are integrating resilience into their health system performance assessment frameworks. **Belgium** has formally embedded resilience as a key dimension in its Health System Performance Assessment (KCE, 2024^[346]; KCE, 2023^[347]). **Ireland** is updating its Healthy Ireland framework to strengthen integrated care and adaptability (see Section 0).

Figure 6.19. Strengthening health systems resilience entails preparation, absorption, recovery, and adaptation throughout a crisis period



Source: OECD (2023^[345]), *Ready for the Next Crisis? Investing in Health System Resilience*, <https://doi.org/10.1787/1e53cf80-en>.

Several European initiatives are actively working to enhance health systems resilience (Table 6.7). The EU4Health Programme (2021-2027) addresses cross-border health threats and overall system resilience. The Health Emergency Preparedness and Response Authority supports co-ordinated EU responses to health emergencies. The RESIL-Card project (2023-2026) is developing a resilience assessment toolkit to strengthen European cardiovascular care pathways to face future crises.

Table 6.7. Selected European initiatives focussing on strengthening health systems resilience

Project/Initiative	Coordinator	Focus Area	Timeframe
Health Emergency Preparedness and Response (HERA) Authority	European Commission	Ensure that the EU and Member States are prepared for cross-border health threats, focussing on both advance preparedness and implementation of rapid crisis response.	Launched in 2021
EU4Health Programme	European Commission	Launched in response to COVID-19; focus on strengthening crisis preparedness and support long-term health challenges by building more resilient and accessible health systems. The programme supports a healthier Europe by funding national authorities, health organisations, and other bodies through grants and public procurement.	2021-2027
RESIL-Card, Action Grant co-funded by EU4Health Programme	We CARE (France)	Development of a resilience assessment toolkit to strengthen cardiovascular care resilience during crises	2023-2026

Source: European Commission (n.d.^[348]), EU4Health programme 2021-2027 – a vision for a healthier European Union, https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union_en. We CARE (2025^[349]), RESIL-Card marks major milestone with first cardiovascular resilience assessment tool - We CARE, <https://www.wecareabouthearts.org/resil-card-marks-major-milestone-with-first-cardiovascular-resilience-assessment-tool/>.

Key themes emerge as priorities for enhancing health systems resilience and cardiovascular care pathways in particular, enabling a comprehensive approach to support readiness for future crises (Box 6.20). These include strengthening workforce, clear governance, adaptable infrastructure, digital innovation, and supply chain resilience.

Box 6.20. Key themes for enhancing the resilience of cardiovascular care pathways

Strengthening cardiovascular care resilience requires focus on several key areas:

- Promoting workforce recruitment, retention, flexibility and well-being,
- Promoting infrastructure's flexibility to accommodate more intensive care and to separate clean and dirty pathways during crises,
- Prioritising the development of triage scales and prioritisation criteria for CVD patients to be applied during crises, ideally integrated into regularly tested simulation protocols, and as part of a broader, harmonised framework for minimum service provision,
- Investing in the uptake of telemedicine and home-based care,
- Strengthening communication and co-operation between primary and secondary care professionals and with patients and carers,
- Harnessing data collection and use,
- Investing on the resilience of the supply chain.

Source OECD (2023^[345]), *Ready for the Next Crisis? Investing in Health System Resilience*, <https://doi.org/10.1787/1e53cf80-en>; We CARE (2025^[349]), RESIL-Card marks major milestone with first cardiovascular resilience assessment tool - We CARE, <https://www.wecareabouthearts.org/resil-card-marks-major-milestone-with-first-cardiovascular-resilience-assessment-tool/>; European Commission (2020^[350]), "Assessing the resilience of health systems in Europe – An overview of the theory, current practice and strategies for improvement", <https://doi.org/10.2875/191483>.

6.8.8. Sustainability as a cross-cutting dimension to enhance health system performance and improve population health

Improvements in fiscal sustainability could be achieved by harnessing prevention policies

Sustainability is most commonly referred in relation to fiscal sustainability of health systems, i.e. governments' ability to "manage public finances credibly" (OECD, 2015^[351]). Fiscal sustainability can be attained by policymakers through three broad pillars: 1) improving the efficiency of health spending, 2) reevaluating the boundaries between private and public spending, and 3) raising more money for health (OECD, 2024^[352]). While the three ways are applicable to cardiovascular care delivery, the first measure relates closely to prevention spending, which entails a cost-effective approach to foster financial sustainability of cardiovascular care delivery (see Section 6.4).

The economic pressure on healthcare systems by the cardiovascular system is considerable, and continues to stress already strained systems (see Chapter 2) (ESC-Oxford Burden of Disease, 2023, 2023^[353]). The return on investment in preventing and managing CVD disease is large, and cross-sectoral action can reduce substantially the societal economic burden, particularly around tobacco, physical activity and diet (Masters et al., 2017^[354]). Recent evidence suggests that financial incentives may contribute to positively change relevant lifestyle behaviours, such as smoking and diet improvements. Incentives like vouchers and cash payments, often linked to measurable outcomes, may support improvements in healthcare systems' sustainability (Petracca et al., 2025^[355]). Furthermore, CV risk is socially patterned, with worst cardiovascular health in the more deprived segments of the population. They also tend to have more risk factors at higher levels, often resulting in differential outcomes, such as strong social gradients in CVD mortality. Higher levels of social protection and access to healthcare seems not to explain all the disparities, so the social patterning of risk requires intervention. (Bugiardini, 2023^[356]).

Tailored goals and regulations are lacking to enhance healthcare environmental sustainability

Health systems and the environment are deeply interconnected, however often neglected in policymaking. On one hand, health systems contribute to approximately 4.4% of global net emissions, on the other hand, citizen are exposed to climate-related health risks driven by heatwaves or air pollution (see Chapter 3). Improving population health, driven by socio-economic, environmental, and healthcare aspects, not only fosters resilience to environmental threats but also reduces the environmental footprint of health systems. Many countries currently lack mechanisms to monitor these impacts, and sector-specific decarbonisation policies are limited, with most efforts focussed on broad public and industrial strategies for reducing emissions (Gocke et al., 2023^[357]).

A literature review aiming to identify services and care pathways assessing their carbon footprint identified six studies related to cardiac care, assessing atrial fibrillation catheter ablation, cardioversion care pathway, cardiac surgery, decompensated heart failure care pathway and elective coronary artery bypass graft surgery (Kouwenberg et al., 2024^[358]). The carbon footprint ranged between 76.9 kg of Co₂e in the AF ablation procedure and 505 kg Co₂e per elective coronary artery bypass grafting (CABG). The main contributor to the impact of AF ablation were related to electrophysiology catheters and patches, which could be reduced, reused and recycled (Ditac et al., 2022^[359]). In uncomplicated CABG surgery, emissions were mainly related to manufacturing and disposal of medical waste, which represented 436.7 kg of CO₂-e per surgery (Hubert et al., 2022^[360]).

Studies assessing waste reduction and enhanced circularity in healthcare organisations provided promising results, some of which are applicable or could be tested in cardiovascular care. For instance, the possibility to reprocess face masks with minimal reduction of filtration efficiency (van Straten et al., 2021^[361]), recycle polypropylene wrapping paper, used to wrap sterile surgical instruments, into new

medical devices (van Straten et al., 2021^[362]), and recycle discarded stainless steel surgical instruments, while saving costs through a circular approach (van Straten et al., 2021^[362]). A study in the **Netherlands** showed that heart surgeries and intensive care admissions may be performed more sustainably, by identifying opportunities to reduce the environmental footprint of coronary artery bypass surgeries (van Bree et al., 2025^[363]). Potential gains can be achieved in the healthcare pathway through using washable drapes,⁴ optimising air handling units and using renewable energy – when balanced with infection prevention priorities, operational constraints, and environmental impacts (Doerstling et al., 2025^[364]). Further research is warranted, for instance to reduce the heavy environmental burden of plastic materials contained in a disposable set for the heart-lung machine.

The European Society of Cardiology (ESC) has established the ESC Environmental Sustainability Task Force (2024-2026), aiming to raise awareness, expand research and advocacy, contributing to the implementation of sustainable practices (ESC Task Force Environmental Sustainability, 2025^[365]). The subsequent Task Force (2026-2028) is envisioned to sustain and expand on these efforts. Some countries have introduced national strategies which include health sector responsibilities, particularly for large hospitals, however comprehensive policies are rare (Gocke et al., 2023^[357]). In the **Netherlands**, some advanced healthcare sustainability policies have been implemented through a series of Green Deals. The third Green Deal was signed in 2022, setting out specific goals addressing a broad spectrum of environmental issues, including CO₂ emissions and pharmaceutical pollution in water. In **Belgium**, the Flemish Government established 13 climate commitments for healthcare facilities in 2017, targeting reductions in energy use and CO₂ emissions by 2030. Further embedding of climate resilience into health policy design may drive system-level adaptations, fostering greener and more sustainable health systems.

References

- Abdalla, R. et al. (2022), “Quality measurement for cardiovascular diseases and cancer in hospital value-based healthcare: a systematic review of the literature”, *BMC Health Services Research*, Vol. 22/1, <https://doi.org/10.1186/s12913-022-08347-x>. [311]
- Abdeldayem, T. and A. Gunarathne (2022), “45 Outcome of stemi patients admitted through inter-hospital transfer vs direct admission to ppci centre”, *Acute coronary syndromes & interventional cardiology*, pp. A33.2-A34, <https://doi.org/10.1136/heartjnl-2022-bcs.45>. [167]
- Action on Sugar (2025), *Soft Drinks Industry Levy - Action on Sugar*, <https://www.actiononsugar.org/reformulation-soft-drinks-industry-levy/> (accessed on 6 July 2025). [66]
- AFFECT-EU (2020), *Digital, risk-based screening for atrial fibrillation in the European Community*, <http://affect-eu.eu/> (accessed on 6 July 2025). [376]
- AFFIRMO (n.d.), *AFFIRMO*, <https://affirmo.eu/the-project/> (accessed on 6 July 2025). [379]
- AHA (2023), “Shared Decision-Making and Cardiovascular Health: A Scientific Statement From the American Heart Association”, *Circulation*, Vol. 148/11, pp. 912-931, <https://doi.org/10.1161/cir.0000000000001162>. [263]
- AHA (2019), “Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association”, *Stroke*, Vol. 50/12, <https://doi.org/10.1161/str.0000000000000211>. [164]

- AHA (2018), "Health Literacy and Cardiovascular Disease: Fundamental Relevance to Primary and Secondary Prevention: A Scientific Statement From the American Heart Association", *Circulation*, Vol. 138/2, <https://doi.org/10.1161/cir.0000000000000579>. [138]
- AHA (2017), "Self-Care for the Prevention and Management of Cardiovascular Disease and Stroke", *Journal of the American Heart Association*, Vol. 6/9, <https://doi.org/10.1161/jaha.117.006997>. [267]
- AHA/ASA (n.d.), "Acute ischemic stroke: Current Treatment Approaches for Acute Ischemic Stroke". [139]
- Ahmad, F. et al. (2019), "Development and Initial Validation of the PROMIS®-Plus-HF Profile Measure", *Circulation: Heart Failure*, Vol. 12/6, <https://doi.org/10.1161/circheartfailure.118.005751>. [319]
- Akter, S. et al. (2023), "Evaluation of Population-Level Tobacco Control Interventions and Health Outcomes", *JAMA Network Open*, Vol. 6/7, p. e2322341, <https://doi.org/10.1001/jamanetworkopen.2023.22341>. [42]
- Akter, S. et al. (2024), "A systematic review and network meta-analysis of population-level interventions to tackle smoking behaviour", *Nature Human Behaviour*, Vol. 8/12, pp. 2367-2391, <https://doi.org/10.1038/s41562-024-02002-7>. [82]
- Aladeokin, A. and C. Haighton (2019), "Is adolescent e-cigarette use associated with smoking in the United Kingdom?: A systematic review with meta-analysis", *Tobacco Prevention & Cessation*, Vol. 5/April, <https://doi.org/10.18332/tpc/108553>. [99]
- Almanfi, A. (2018), "The Key Elements That are Fundamental for Initiating a Structural Heart Program", *Structural Heart*, Vol. 2/3, pp. 197-198, <https://doi.org/10.1080/24748706.2018.1446110>. [213]
- Amgen (2025), *CVD Dashboard*, https://public.tableau.com/app/profile/gabriel.lopez3427/viz/CVDDashboard_17277167502310/0_Cover (accessed on 18 July 2025). [7]
- Anderson, L. and R. Taylor (2014), "Cardiac rehabilitation for people with heart disease: an overview of Cochrane systematic reviews", *Cochrane Database of Systematic Reviews*, Vol. 2021/12, <https://doi.org/10.1002/14651858.cd011273.pub2>. [277]
- Azaïs-Braesco, V. et al. (2017), "A review of total & added sugar intakes and dietary sources in Europe", *Nutrition Journal*, Vol. 16/1, <https://doi.org/10.1186/s12937-016-0225-2>. [56]
- B Armocida, T. (2024), "Cross-cutting integration of equity and diversity lens in public health: a novel approach of JACARDI", *European Journal of Public Health*, Vol. 34/3, <https://doi.org/10.1093/eurpub/ckae144.116>. [171]
- BACPR (2023), *The BACPR Standards and Core Components for Cardiovascular Disease Prevention and Rehabilitation*, British Cardiovascular Society, <https://www.cardiacrehabilitation.org.uk/site/docs/BACPR-Standards-and-Core-Components-2023.pdf>. [280]
- Barrenho, E. et al. (2022), "International comparisons of the quality and outcomes of integrated care: Findings of the OECD pilot on stroke and chronic heart failure", *OECD Health Working Papers*, No. 142, OECD Publishing, Paris, <https://doi.org/10.1787/480cf8a0-en>. [203]

- Basu, S. (ed.) (2017), “Reducing US cardiovascular disease burden and disparities through national and targeted dietary policies: A modelling study”, *PLOS Medicine*, Vol. 14/6, p. e1002311, <https://doi.org/10.1371/journal.pmed.1002311>. [61]
- Batchelor, W. et al. (2023), “The Multidisciplinary Heart Team in Cardiovascular Medicine”, *JACC: Advances*, Vol. 2/1, p. 100160, <https://doi.org/10.1016/j.jacadv.2022.100160>. [232]
- BAuA (n.d.), *BAuA - Return to work (RTW) and operational integration management (OIM) - Federal Institute for Occupational Safety and Health*, <https://www.baua.de/EN/Topics/Prevention/Workplace-prevention/Operational-integration-management> (accessed on 14 July 2025). [306]
- Bayes-Genis, A. et al. (2024), “Awareness, access, and adoption of natriuretic peptides for diagnosis of heart failure”, *ESC Heart Failure*, Vol. 12/1, pp. 54-59, <https://doi.org/10.1002/ehf2.14825>. [221]
- BeatHF (n.d.), *Let's BEAT Heart Failure Together*, <https://beathf.org.uk/> (accessed on 14 July 2025). [222]
- Berdzuli, N. et al. (2020), “Alcohol Control Policy in Europe: Overview and Exemplary Countries”, *International Journal of Environmental Research and Public Health*, Vol. 17/21, p. 8162, <https://doi.org/10.3390/ijerph17218162>. [111]
- Bernt Jørgensen, S. et al. (2022), “Perceived return-to-work pressure following cardiovascular disease is associated with age, sex, and diagnosis: a nationwide combined survey- and register-based cohort study”, *BMC Public Health*, Vol. 22/1, <https://doi.org/10.1186/s12889-022-13494-1>. [296]
- Berrick, J. (2025), “Guidance for Introducing the Tobacco-Free Generation Policy”, *The International Journal of Health Planning and Management*, Vol. 40/3, pp. 776-782, <https://doi.org/10.1002/hpm.3896>. [91]
- Berta, P., V. Vinciotti and F. Moscone (2022), “The association between hospital cooperation and the quality of healthcare”, *Regional Studies*, Vol. 56/11, pp. 1858-1873, <https://doi.org/10.1080/00343404.2021.2009792>. [168]
- Bhat, A. et al. (2021), “Integrated Care in Atrial Fibrillation”, *Circulation: Cardiovascular Quality and Outcomes*, Vol. 14/3, <https://doi.org/10.1161/circoutcomes.120.007411>. [206]
- Bhat, M. (ed.) (2024), “Innovative population-based strategies for primary prevention of cardiovascular disease: A 2-year randomised control trial evaluating behavioral change led by community champions versus brief advice”, *PLOS ONE*, Vol. 19/12, p. e0314748, <https://doi.org/10.1371/journal.pone.0314748>. [135]
- Birkun, A. (2023), “Global prevalence of resuscitation training among the general public: current evidence and future directions”, *Clinical and Experimental Emergency Medicine*, Vol. 10/3, pp. 345-346, <https://doi.org/10.15441/ceem.23.043>. [153]
- Blanchard, L. et al. (2023), “Where is the evidence supporting voluntary and public-private partnership policies for promoting healthy food environments? Findings from four evidence syntheses”, *Population Medicine*, Vol. 5/Supplement, <https://doi.org/10.18332/popmed/165468>. [40]

- Bodenheimer, T., E. Wagner and K. Grumbach (2002), "Improving Primary Care for Patients With Chronic Illness", *JAMA*, Vol. 288/15, p. 1909, <https://doi.org/10.1001/jama.288.15.1909>. [196]
- Borg, S. et al. (2019), "Patient-reported outcome and experience measures for diabetes: development of scale models, differences between patient groups and relationships with cardiovascular and diabetes complication risk factors, in a combined registry and survey study in Sweden", *BMJ Open*, Vol. 9/1, p. e025033, <https://doi.org/10.1136/bmjopen-2018-025033>. [337]
- Boyland, E. et al. (2022), "Systematic review of the effect of policies to restrict the marketing of foods and non-alcoholic beverages to which children are exposed", *Obesity Reviews*, Vol. 23/8, <https://doi.org/10.1111/obr.13447>. [47]
- Bright, J. et al. (2025), "Outcomes That Matter to Patients: ICHOM as a Catalyst for Value-Based Care", *NEJM Catalyst*, Vol. 6/4, <https://doi.org/10.1056/cat.24.0483>. [309]
- Britten, N. et al. (2020), "Learning from Gothenburg model of person centred healthcare", *BMJ*, p. m2738, <https://doi.org/10.1136/bmj.m2738>. [255]
- Broughan, J. et al. (2024), "Preventing cardiovascular disease in at-risk patients: Results of a pilot behavioural health programme in general practice", *European Journal of General Practice*, Vol. 30/1, <https://doi.org/10.1080/13814788.2024.2413106>. [134]
- Bryant, M. et al. (2023), "Understanding school food systems to support the development and implementation of food based policies and interventions", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 20/1, <https://doi.org/10.1186/s12966-023-01432-2>. [77]
- Bueno, H. et al. (2025), "Development and rollout of a national plan on cardiovascular health. Spain's cardiovascular health strategy (ESCAV)", *Revista Española de Cardiología (English Edition)*, Vol. 78/7, pp. 628-636, <https://doi.org/10.1016/j.rec.2024.11.009>. [20]
- Bugiardini, R. (2023), *Tackling cardiovascular health inequalities in European countries*, The Lancet Regional Health – Europe, Volume 33, 100730, [https://www.thelancet.com/journals/lanep/article/PIIS2666-7762\(23\)00149-7/fulltext](https://www.thelancet.com/journals/lanep/article/PIIS2666-7762(23)00149-7/fulltext). [356]
- Bulgarian Ministry of Health (2021), *National Programme for the Prevention of Chronic Non-communicable Diseases 2021-2025*, <https://ncpha.government.bg/index/3189-nacionalna-programa-za-prevenция-na-hronichnite-nezarazni-bolesti-2021-2025-g.html>. [12]
- Busse, R. and J. Stahl (2014), "Integrated Care Experiences And Outcomes In Germany, The Netherlands, And England", *Health Affairs*, Vol. 33/9, pp. 1549-1558, <https://doi.org/10.1377/hlthaff.2014.0419>. [193]
- C4D (n.d.), , <https://c4djointaction.eu/documents/>. [367]
- Camacho, E. and G. Lip (2023), "Estimating the impact of implementing an integrated care management approach with Atrial fibrillation Better Care (ABC) pathway for patients with atrial fibrillation in England from 2020 to 2040", *European Heart Journal - Quality of Care and Clinical Outcomes*, Vol. 10/4, pp. 326-333, <https://doi.org/10.1093/ehjqcco/qcad055>. [205]
- Capewell, S. and M. O'Flaherty (2011), "Rapid mortality falls after risk-factor changes in populations", *The Lancet*, Vol. 378/9793, pp. 752-753, [https://doi.org/10.1016/s0140-6736\(10\)62302-1](https://doi.org/10.1016/s0140-6736(10)62302-1). [38]

- Cardiologico Monzino (n.d.), *Operation Unit Women's Heart Center - Cardiologico Monzino*, [184]
<https://www.cardiologicomonzino.it/en/operation-units/womens-heart-center/38/> (accessed on 14 July 2025).
- Castanon, A. et al. (2023), "The impact of the COVID-19 pandemic on cardiovascular disease prevention and corresponding geographical inequalities in England: interrupted time series analysis", *BMC Public Health*, Vol. 23/1, <https://doi.org/10.1186/s12889-023-17282-3>. [344]
- Castellanos, L. (2019), "Disparities in Cardiac Rehabilitation Among Individuals from Racial and Ethnic Groups and Rural Communities-A Systematic Review", *Journal of Racial and Ethnic Health Disparities*, Vol. 6/1, pp. 1-11, <https://doi.org/10.1007/s40615-018-0478-x>. [283]
- Chamberlain, R. et al. (2023), "Health effects of low emission and congestion charging zones: a systematic review", *The Lancet Public Health*, Vol. 8/7, pp. e559-e574, [https://doi.org/10.1016/s2468-2667\(23\)00120-2](https://doi.org/10.1016/s2468-2667(23)00120-2). [120]
- Ciliberti, G. et al. (2023), "Coronary Artery Dissection and Myocardial Infarction With Nonobstructed Coronary Arteries: Insights From a UK Nationwide Autopsy-Based Registry—Brief Report", *Arteriosclerosis, Thrombosis, and Vascular Biology*, Vol. 43/5, pp. 787-792, <https://doi.org/10.1161/atvbaha.122.318401>. [177]
- Claes, J. et al. (2016), "Longer-term effects of home-based exercise interventions on exercise capacity and physical activity in coronary artery disease patients: A systematic review and meta-analysis", *European Journal of Preventive Cardiology*, Vol. 24/3, pp. 244-256, <https://doi.org/10.1177/2047487316675823>. [288]
- Claeys, M. et al. (2012), "STEMI mortality in community hospitals versus PCI-capable hospitals: results from a nationwide STEMI network programme", *European Heart Journal: Acute Cardiovascular Care*, Vol. 1/1, pp. 40-47, <https://doi.org/10.1177/2048872612441579>. [190]
- Cobiac, L. et al. (2024), "Impact of the UK soft drinks industry levy on health and health inequalities in children and adolescents in England: An interrupted time series analysis and population health modelling study", *PLOS Medicine*, Vol. 21/3, p. e1004371, <https://doi.org/10.1371/journal.pmed.1004371>. [67]
- Council of Europe (2025), *New European project tackles risks associated with youth online gambling and gaming: conference in Rome*, [https://search.coe.int/directorate_of_communications#/%22CoEIdentifier%22:\[%220900001680b3cfc7%22\],%22sort%22:\[%22CoEValidationDate%20Descending%22\]}](https://search.coe.int/directorate_of_communications#/%22CoEIdentifier%22:[%220900001680b3cfc7%22],%22sort%22:[%22CoEValidationDate%20Descending%22]}) (accessed on 8 December 2025). [112]
- CVD-COVID-UK Consortium (2023), "The impact of the COVID-19 pandemic on cardiovascular disease prevention and management", *Nature Medicine*, Vol. 29/1, pp. 219-225, <https://doi.org/10.1038/s41591-022-02158-7>. [342]
- CVDPREVENT (2025), "Cardiovascular Disease Prevention (CVDP) CVDPREVENT Healthcare Quality Improvement (QI) Plan". [172]
- Dalal, H. et al. (2018), "The effects and costs of home-based rehabilitation for heart failure with reduced ejection fraction: The REACH-HF multicentre randomized controlled trial", *European Journal of Preventive Cardiology*, Vol. 26/3, pp. 262-272, <https://doi.org/10.1177/2047487318806358>. [289]

- Dalby, M. et al. (2003), “Transfer for Primary Angioplasty Versus Immediate Thrombolysis in Acute Myocardial Infarction”, *Circulation*, Vol. 108/15, pp. 1809-1814, <https://doi.org/10.1161/01.cir.0000091088.63921.8c>. [189]
- de Boer RA, M. (2019), “Cancer and heart disease: associations and relations”, *Eur J Heart Fail*, Vol. 21/12, pp. 1515-1525, <https://doi.org/10.1002/ehf.1539>. [29]
- de Lange, M. et al. (2022), “The Impact of the COVID-19 Pandemic on Hospital Services for Patients with Cardiac Diseases: A Scoping Review”, *International Journal of Environmental Research and Public Health*, Vol. 19/6, p. 3172, <https://doi.org/10.3390/ijerph19063172>. [341]
- de Leon, C. et al. (2009), “Quality of Life in a Diverse Population of Patients With Heart Failure”, *Journal of Cardiopulmonary Rehabilitation and Prevention*, Vol. 29/3, pp. 171-178, <https://doi.org/10.1097/hcr.0b013e31819a0266>. [308]
- De Rosa, S. (ed.) (2024), “Call to action for acute myocardial infarction in women: international multi-disciplinary practical roadmap”, *European Heart Journal Open*, Vol. 4/6, <https://doi.org/10.1093/ehjopen/oeae087>. [186]
- Department of Health (2023), *Sláintecare Implementation Strategy & Action Plan 2021–2023*, <https://assets.gov.ie/static/documents/slaintecare-action-plan-2023.pdf>. [286]
- Desomer, A. et al. (2018), *Use of patient-reported outcome and experience measures in patient care and policy*, Belgian Health Care Knowledge Centre (KCE), <https://doi.org/10.57598/r303c>. [340]
- Dhaka, M. (ed.) (2021), “Can sterilization of disposable face masks be an alternative for imported face masks? A nationwide field study including 19 sterilization departments and 471 imported brand types during COVID-19 shortages”, *PLOS ONE*, Vol. 16/9, p. e0257468, <https://doi.org/10.1371/journal.pone.0257468>. [361]
- DHSC (2023), *Major conditions strategy: case for change and our strategic framework - GOV.UK*, <https://www.gov.uk/government/publications/major-conditions-strategy-case-for-change-and-our-strategic-framework/major-conditions-strategy-case-for-change-and-our-strategic-framework--2> (accessed on 13 July 2025). [26]
- Ditac, G. et al. (2022), “Carbon footprint of atrial fibrillation catheter ablation”, *EP Europace*, Vol. 25/2, pp. 331-340, <https://doi.org/10.1093/europace/euac160>. [359]
- Doerstling, S. et al. (2025), “Striking a balance: strategies for addressing single-use surgical equipment in infection prevention”, *Antimicrobial Stewardship & Healthcare Epidemiology*, Vol. 5/1, <https://doi.org/10.1017/ash.2025.186>. [364]
- EAPC (2019), “The importance of return to work: How to achieve optimal reintegration in ACS patients”, *European Journal of Preventive Cardiology*, Vol. 26/13, pp. 1358-1369, <https://doi.org/10.1177/2047487319839263>. [302]
- Ekman, I. et al. (2011), “Person-Centered Care — Ready for Prime Time”, *European Journal of Cardiovascular Nursing*, Vol. 10/4, pp. 248-251, <https://doi.org/10.1016/j.ejcnurse.2011.06.008>. [251]
- Ekman, I. et al. (2011), “Effects of person-centred care in patients with chronic heart failure: the PCC-HF study”, *European Heart Journal*, Vol. 33/9, pp. 1112-1119, <https://doi.org/10.1093/eurheartj/ehr306>. [256]

- EPRS (2022), “Implementation of the EU school scheme for fruit, vegetables and milk products: A mid-term review European implementation assessment”, [https://www.europarl.europa.eu/RegData/etudes/STUD/2022/730339/EPRS_STU\(2022\)730339_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2022/730339/EPRS_STU(2022)730339_EN.pdf) (accessed on 3 July 2025). [72]
- ESC (2025), *Resuscitation in out-of-hospital cardiac arrest – it’s how quickly it is done, rather than who does it*, <https://www.escardio.org/The-ESC/Press-Office/Press-releases/resuscitation-in-out-of-hospital-cardiac-arrest-it-s-how-quickly-it-is-done-r> (accessed on 7 July 2025). [151]
- ESC (2024), *EAPCI Patient Engagement*, [https://www.escardio.org/Sub-specialty-communities/European-Association-of-Percutaneous-Cardiovascular-Interventions-\(EAPCI\)/About/eapci-patient-engagement](https://www.escardio.org/Sub-specialty-communities/European-Association-of-Percutaneous-Cardiovascular-Interventions-(EAPCI)/About/eapci-patient-engagement) (accessed on 14 July 2025). [336]
- ESC (2023), “2023 ESC Guidelines for the management of acute coronary syndromes: Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC)”, *European Heart Journal*, Vol. 44/38, pp. 3720–3826, <https://doi.org/10.1093/eurheartj/ehad191>. [150]
- ESC (2023), “Do we practice what we preach? Implementation of cardiovascular prevention strategies in 13 European countries between 2011 and 2021: a statement of the European Association of Preventive Cardiology of the ESC”, *European Journal of Preventive Cardiology*, Vol. 31/8, pp. e65–e70, <https://doi.org/10.1093/eurjpc/zwad312>. [125]
- ESC (2022), “ESC Guidelines on cardiovascular disease prevention in clinical practice”, *European Journal of Preventive Cardiology*, Vol. 29/1, pp. 5–115, <https://doi.org/10.1093/eurjpc/zwab154>. [281]
- ESC (2018), “Determinants of participation and risk factor control according to attendance in cardiac rehabilitation programmes in coronary patients in Europe: EUROASPIRE IV survey”, *European Journal of Preventive Cardiology*, Vol. 25/12, pp. 1242–1251, <https://doi.org/10.1177/2047487318781359>. [282]
- ESC (2017), *Treatment goals for patients with ischaemic heart disease*, <https://www.escardio.org/Education/ESC-Prevention-of-CVD-Programme/Treatment-goals/treatment-goals-for-patients-with-ischaemic-heart-disease#> (accessed on 23 July 2025). [212]
- ESC (2011), “European Society of Cardiology Heart Failure Association Standards for delivering heart failure care”, *European Journal of Heart Failure*, Vol. 13/3, pp. 235–241, <https://doi.org/10.1093/eurjhf/hfq221>. [225]
- ESC Cardiovascular risk collaboration (2021), “SCORE2 risk prediction algorithms: new models to estimate 10-year risk of cardiovascular disease in Europe”, *European Heart Journal*, Vol. 42/25, pp. 2439–2454, <https://doi.org/10.1093/eurheartj/ehab309>. [130]
- ESC Guidelines (2023), “2023 ESC Guidelines for the management of acute coronary syndromes”, *European Heart Journal*, Vol. 44/38, pp. 3720–3826, <https://doi.org/10.1093/eurheartj/ehad191>. [163]
- ESC Guidelines (2023), “2023 ESC Guidelines for the management of cardiomyopathies”, *European Heart Journal*, Vol. 44/37, pp. 3503–3626, <https://doi.org/10.1093/eurheartj/ehad194>. [208]

- ESC Guidelines (2021), “2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure”, *European Heart Journal*, Vol. 42/36, pp. 3599-3726, [220]
<https://doi.org/10.1093/eurheartj/ehab368>.
- ESC Guidelines (2021), “2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure”, *European Heart Journal*, Vol. 42/36, pp. 3599-3726, [224]
<https://doi.org/10.1093/eurheartj/ehab368>.
- ESC Guidelines (2020), “2020 ESC Guidelines for the management of adult congenital heart disease”, *European Heart Journal*, Vol. 42/6, pp. 563-645, [217]
<https://doi.org/10.1093/eurheartj/ehaa554>.
- ESC Task Force Environmental Sustainability (2025), “Championing environmental sustainability in cardiology: the ESC Task Force’s vision for a healthier future. A Task Force with a mission”, *European Heart Journal*, <https://doi.org/10.1093/eurheartj/ehaf261>. [365]
- ESC-Oxford Burden of Disease, 2023 (2023), “Economic burden of cardiovascular diseases in the European Union: a population-based cost study”, *European Heart Journal*, Vol. 44/45, pp. 4752-4767, <https://doi.org/10.1093/eurheartj/ehad583>. [353]
- ESO (2023), *KPI 1 – European Stroke Organisation (ESO)*, <https://actionplan.eso-stroke.org/kpi/kpi-1> (accessed on 13 July 2025). [5]
- EU (2021), *Europe’s Beating Cancer Plan. Communication from the Commission to the European Parliament and the Council*, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:44:FIN> (accessed on 3 July 2025). [89]
- EU Policy Lab (2016), *Unlocking the full potential of behavioural insights for policy*, <https://op.europa.eu/en/publication-detail/-/publication/36c073b3-e765-11ef-b5e9-01aa75ed71a1>. [41]
- EU-OSHA (2022), *Rehabilitation and return-to-work policies and systems in European Countries - OSHwiki | European Agency for Safety and Health at Work*, https://oshwiki.osha.europa.eu/en/themes/rehabilitation-and-return-work-policies-and-systems-european-countries#_edn1 (accessed on 14 July 2025). [307]
- EuroHeartPath (2025), *EuroHeartPath: Leading Innovation in Cardiovascular Pathways for Improved Patient Outcomes*, Publications Office of the European Union, <https://doi.org/10.3030/101194785>. [378]
- European Commission (2025), *EU School scheme explained - European Commission*, https://agriculture.ec.europa.eu/common-agricultural-policy/market-measures/school-scheme-explained_en (accessed on 3 July 2025). [76]
- European Commission (2025), *European Commission modernises Tobacco Taxation Directive - European Commission*, https://taxation-customs.ec.europa.eu/news/european-commission-modernises-tobacco-taxation-directive-2025-07-16_en (accessed on 7 August 2025). [84]
- European Commission (2025), *Health taxes from an EU perspective*, European Commission, <https://op.europa.eu/en/publication-detail/-/publication/93844ea8-3133-11f0-8a44-01aa75ed71a1/language-en> (accessed on 30 November 2025). [59]

- European Commission (2025), *Zero Pollution Action Plan - European Commission*, https://environment.ec.europa.eu/strategy/zero-pollution-action-plan_en (accessed on 3 July 2025). [119]
- European Commission (2024), *Cardiovascular health: Council calls for more robust efforts to help prevent cardiovascular diseases*, <https://www.consilium.europa.eu/en/press/press-releases/2024/12/03/cardiovascular-health-council-calls-for-more-robust-efforts-to-help-prevent-cardiovascular-diseases/>. [370]
- European Commission (2024), *JA PreventNCD*, https://health.ec.europa.eu/non-communicable-diseases/cancer/europes-beating-cancer-plan-eu4health-financed-projects/projects/ja-preventncd_en. [368]
- European Commission (2024), *Updated Recommendation on smoke-free environments*, European Commission, https://ec.europa.eu/commission/presscorner/detail/en/ip_24_4682 (accessed on 30 November 2025). [85]
- European Commission (2022), *Commission Decision of 7.12.2022*, https://health.ec.europa.eu/document/download/e4d7a33c-ea35-4a08-8e0d-c1cb8ac04172_en?filename=c_2022_8816_en.pdf. [366]
- European Commission (2021), *Best Practice Portal - ENSP actions to support WHO FCTC Article 14 implementation in Europe*, <https://webgate.ec.europa.eu/dyna/bp-portal/best-practice/379> (accessed on 15 July 2025). [86]
- European Commission (2020), *Assessing the resilience of health systems in Europe – An overview of the theory, current practice and strategies for improvement*, European Commission: Directorate-General for Health and Food Safety, <https://doi.org/10.2875/191483>. [350]
- European Commission (2017), *Blocks – Tools and methodologies to assess integrated care in Europe – Report by the Expert Group on Health Systems Performance Assessment*, European Commission: Directorate-General for Health and Food Safety, <https://doi.org/10.2875/69305>. [191]
- European Commission (2014), *Product regulation - European Commission*, https://health.ec.europa.eu/tobacco/product-regulation_en (accessed on 4 July 2025). [374]
- European Commission (2011), *Council Directive 2011/64/EU of 21 June 2011 on the structure and rates of excise duty applied to manufactured tobacco (codification)*, <https://eur-lex.europa.eu/eli/dir/2011/64/oj/eng> (accessed on 6 August 2025). [373]
- European Commission (2003), *Directive 2003/33/CE du Parlement européen et du Conseil du 26 mai 2003 concernant le rapprochement des dispositions législatives, réglementaires et administratives des États membres en matière de publicité² et de parrainage en faveur des produits du tabac (Texte présentant de l'intérêt pour l'EEE)*, <https://eur-lex.europa.eu/legal-content/fr/ALL/?uri=CELEX:32003L0033> (accessed on 6 August 2025). [371]
- European Commission (n.d.), *Best practices Portal*, <https://webgate.ec.europa.eu/dyna/bp-portal/> (accessed on 12 July 2025). [88]
- European Commission (n.d.), *EU4Health programme 2021-2027 – a vision for a healthier European Union -*, https://health.ec.europa.eu/funding/eu4health-programme-2021-2027-vision-healthier-european-union_en (accessed on 18 July 2025). [348]

- European Commission (n.d.), *Food 2030 - Research and innovation*, https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy/food-systems/food-2030_en (accessed on 8 December 2025). [74]
- European Commission (n.d.), *School scheme explained - Agriculture and rural development*, https://agriculture.ec.europa.eu/common-agricultural-policy/market-measures/school-scheme-explained_en (accessed on 8 December 2025). [75]
- European Commission (n.d.), *The Agri-Food Code - Internal Market, Industry, Entrepreneurship and SMEs*, https://single-market-economy.ec.europa.eu/sectors/agri-food-industrial-ecosystem/agri-food-code_en (accessed on 8 December 2025). [73]
- European Commission (n.d.), *Trans fat in food - European Commission*, https://food.ec.europa.eu/food-safety/labelling-and-nutrition/trans-fat-food_en (accessed on 14 July 2025). [62]
- European Council (2024), *Cardiovascular health: Council calls for more robust efforts to help prevent cardiovascular diseases - Consilium*, <https://www.consilium.europa.eu/en/press/press-releases/2024/12/03/cardiovascular-health-council-calls-for-more-robust-efforts-to-help-prevent-cardiovascular-diseases/> (accessed on 4 July 2025). [124]
- European Council (2024), *Council recommends increased protection against second-hand smoke and aerosols - Consilium*, <https://www.consilium.europa.eu/en/press/press-releases/2024/12/03/council-recommends-increased-protection-against-second-hand-smoke-and-aerosols/> (accessed on 4 July 2025). [375]
- European Observatory on Health Systems and Policies & Beger, B. (2022), "Towards a beating cardiovascular disease plan for Europe", , Vol. 27/2, pp. 37-40, <https://iris.who.int/handle/1066> (accessed on 6 July 2025). [34]
- European Parliament (2014), "DIRECTIVE 2014/40/EU", *Official Journal of the European Union*, https://health.ec.europa.eu/system/files/2016-11/dir_201440_en_0.pdf (accessed on 3 July 2025). [93]
- Eustace, I. et al. (2025), "Integrated care management for patients following acute stroke: a systematic review", *QJM: An International Journal of Medicine*, <https://doi.org/10.1093/qjmed/hcaf029>. [247]
- Fakes, K. et al. (2023), "Preparation for cardiac procedures: a cross-sectional study identifying gaps between outpatients' views and experiences of patient-centred care", *European Heart Journal - Quality of Care and Clinical Outcomes*, Vol. 10/3, pp. 235-245, <https://doi.org/10.1093/ehjqcco/qcad042>. [333]
- FAO (2023), *School Food Global Hub: Finland*, <https://www.fao.org/platforms/school-food/around-the-world/europe-and-central-asia/finland/en> (accessed on 3 July 2025). [79]
- FCTC (2013), *Guidelines for implementation of Article 14*, <https://fctc.who.int/resources/publications/m/item/guidelines-for-implementation-of-article-14> (accessed on 15 July 2025). [87]

- Flodgren, G. et al. (2011), “An overview of reviews evaluating the effectiveness of financial incentives in changing healthcare professional behaviours and patient outcomes”, *Cochrane Database of Systematic Reviews*, Vol. 2011/7, <https://doi.org/10.1002/14651858.cd009255>. [199]
- Florido R, D. (2022), “Cardiovascular Disease Risk Among Cancer Survivors: The Atherosclerosis Risk In Communities (ARIC) Study”, *J Am Coll Cardiol*, Vol. 5/80, pp. 22-32, <https://doi.org/10.1016/j.jacc.2022.04.042>. [30]
- Fors, A. et al. (2017), “Effects of person-centred care after an event of acute coronary syndrome: Two-year follow-up of a randomised controlled trial”, *International Journal of Cardiology*, Vol. 249, pp. 42-47, <https://doi.org/10.1016/j.ijcard.2017.08.069>. [257]
- French Ministry of Solidarity and Health (2018), *National Health Strategy 2018-2022*, https://sante.gouv.fr/IMG/pdf/dossier_sns_2017_synthesev6-10p_anglaisv2.pdf. [13]
- Fridberg, H., L. Wallin and M. Tistad (2021), “The innovation characteristics of person-centred care as perceived by healthcare professionals: an interview study employing a deductive-inductive content analysis guided by the consolidated framework for implementation research”, *BMC Health Services Research*, Vol. 21/1, <https://doi.org/10.1186/s12913-021-06942-y>. [259]
- Frisch, S. et al. (2019), “Prevalence and Predictors of Delay in Seeking Emergency Care in Patients Who Call 9-1-1 for Chest Pain”, *The Journal of Emergency Medicine*, Vol. 57/5, pp. 603-610, <https://doi.org/10.1016/j.jemermed.2019.07.012>. [170]
- Galea G, E. (2025), “Quick buys for prevention and control of noncommunicable diseases”, *Lancet Reg Health Eur*, <https://doi.org/10.1016/j.lanepe.2025.10128>. [128]
- Garcia, M. et al. (2016), “Focused Cardiovascular Care for Women”, *Mayo Clinic Proceedings*, Vol. 91/2, pp. 226-240, <https://doi.org/10.1016/j.mayocp.2015.11.001>. [174]
- Garg, A., D. Skempes and J. Bickenbach (2020), “Legal and Regulatory Approaches to Rehabilitation Planning: A Concise Overview of Current Laws and Policies Addressing Access to Rehabilitation in Five European Countries”, *International Journal of Environmental Research and Public Health*, Vol. 17/12, p. 4363, <https://doi.org/10.3390/ijerph17124363>. [303]
- Global Heart Hub (2020), “Working together to create a better patient journey”, https://globalhearthub.org/wp-content/uploads/2021/11/HVD_report-final-2021.pdf (accessed on 23 July 2025). [214]
- Gocke, D. et al. (2023), “Building Sustainable and Resilient Health Systems KEY FINDINGS FROM COUNTRY REPORTS”, <http://www.phssr.org> (accessed on 15 July 2025). [357]
- Gov.UK (2025), *Single-use vapes: why it's time to ditch them for good – Environment*, <https://defraenvironment.blog.gov.uk/2025/05/01/single-use-vapes-why-its-time-to-ditch-them-for-good/> (accessed on 16 July 2025). [101]
- GPCC (2024), *Standard for patient participation in person-centred care | Centre for Person-centred Care - GPCC, University of Gothenburg*, <https://www.gu.se/en/gpcc/standard-for-patient-participation-in-person-centred-care> (accessed on 14 July 2025). [253]
- GPCC (n.d.), *Practice tools for person-centred care | Centre for Person-centred Care - GPCC, University of Gothenburg*, <https://www.gu.se/en/gpcc/practice-tools-for-person-centred-care> (accessed on 14 July 2025). [261]

- Graffe, M. et al. (2019), “Dietary sources of free sugars in the diet of European children: the IDEFICS Study”, *European Journal of Nutrition*, Vol. 59/3, pp. 979-989, <https://doi.org/10.1007/s00394-019-01957-y>. [57]
- Gräsner, J. et al. (2021), “European Resuscitation Council Guidelines 2021: Epidemiology of cardiac arrest in Europe”, *Resuscitation*, Vol. 161, pp. 61-79, <https://doi.org/10.1016/j.resuscitation.2021.02.007>. [154]
- Gräsner, J. et al. (2016), “EuReCa ONE – 27 Nations, ONE Europe, ONE Registry”, *Resuscitation*, Vol. 105, pp. 188-195, <https://doi.org/10.1016/j.resuscitation.2016.06.004>. [146]
- Gräsner, J. et al. (2020), “Survival after out-of-hospital cardiac arrest in Europe - Results of the EuReCa TWO study”, *Resuscitation*, Vol. 148, pp. 218-226, <https://doi.org/10.1016/j.resuscitation.2019.12.042>. [147]
- Gräsner, J. et al. (2025), “European registry of cardiac arrest study THREE (EuReCa- THREE) – EMS response time influence on outcome in Europe”, *Resuscitation*, p. 110704, <https://doi.org/10.1016/j.resuscitation.2025.110704>. [148]
- Green, L. et al. (2021), “‘Health in All Policies’—A Key Driver for Health and Well-Being in a Post-COVID-19 Pandemic World”, *International Journal of Environmental Research and Public Health*, Vol. 18/18, p. 9468, <https://doi.org/10.3390/ijerph18189468>. [33]
- Groenewegen, A. et al. (2024), “Diagnostic yield of a proactive strategy for early detection of cardiovascular disease versus usual care in adults with type 2 diabetes or chronic obstructive pulmonary disease in primary care in the Netherlands (RED-CVD): a multicentre, pragmatic, cluster-randomised, controlled trial”, *The Lancet Public Health*, Vol. 9/2, pp. e88-e99, [https://doi.org/10.1016/s2468-2667\(23\)00269-4](https://doi.org/10.1016/s2468-2667(23)00269-4). [126]
- Gulati, M. et al. (2021), “Why We Need Specialised Centres for Women’s Hearts: Changing the Face of Cardiovascular Care for Women”, *European Cardiology Review*, Vol. 16, <https://doi.org/10.15420/ecr.2021.49>. [181]
- Gulati, M. et al. (2021), “Why We Need Specialised Centres for Women’s Hearts: Changing the Face of Cardiovascular Care for Women”, *European Cardiology Review*, Vol. 16, <https://doi.org/10.15420/ecr.2021.49>. [180]
- H20 (n.d.), “The health outcomes observatory: the power of patient-reported outcomes The health outcomes observatory: The power outcomes of patient-reported”, <https://health-outcomes-observatory.eu/wp-content/uploads/2023/10/The-Health-Outcomes-Observatory-The-Power-of-Patient-Reported-Outcomes.pdf> (accessed on 15 July 2025). [330]
- Halladay, J. et al. (2017), “The association of health literacy and blood pressure reduction in a cohort of patients with hypertension: The heart healthy lenoir trial”, *Patient Education and Counseling*, Vol. 100/3, pp. 542-549, <https://doi.org/10.1016/j.pec.2016.10.015>. [137]
- Halvorsrud, K. et al. (2018), “A Delphi study and ranking exercise to support commissioning services: future delivery of Thrombectomy services in England”, *BMC Health Services Research*, Vol. 18/1, <https://doi.org/10.1186/s12913-018-2922-3>. [239]
- Hamoud, J. et al. (2024), “A Systematic Review Investigating the Impact of Dual Use of E-Cigarettes and Conventional Cigarettes on Smoking Cessation”, *ERJ Open Research*, pp. 00902-2024, <https://doi.org/10.1183/23120541.00902-2024>. [97]

- Handelsman, Y. et al. (2023), “Early intervention and intensive management of patients with diabetes, cardiorenal, and metabolic diseases”, *Journal of Diabetes and its Complications*, Vol. 37/2, p. 108389, <https://doi.org/10.1016/j.jdiacomp.2022.108389>. [127]
- HAS (2025), *Haute Autorité de Santé - IQSS - e-Satis : mesure de la satisfaction et de l'expérience des patients hospitalisés*, https://www.has-sante.fr/jcms/c_2030354/fr/iqss-e-satis-mesure-de-la-satisfaction-et-de-l-experience-des-patients-hospitalises (accessed on 16 July 2025). [339]
- Haupt, S., C. Carcel and R. Norton (2024), “Neglecting sex and gender in research is a public-health risk”, *Nature*, Vol. 629/8012, pp. 527-530, <https://doi.org/10.1038/d41586-024-01372-2>. [173]
- Hayhoe, B. et al. (2018), “Adherence to guidelines in management of symptoms suggestive of heart failure in primary care”, *Heart*, Vol. 105/9, pp. 678-685, <https://doi.org/10.1136/heartjnl-2018-313971>. [218]
- Healthcare Denmark (n.d.), “Chronic diseases and multimorbidity in Denmark”, <http://www.healthcaredenmark.dk> (accessed on 13 July 2025). [25]
- Healthy Stadia (2024), *Advocacy and guidance - Healthy Stadia*, <https://healthystadia.eu/advocacy-and-guidance/> (accessed on 14 July 2025). [70]
- Heart Failure Policy Network (2020), “Heart failure policy and practice in Europe: France”, <http://www.hfpolicynetwork.org/> (accessed on 7 July 2025). [227]
- Hedberg, B. et al. (2022), “Shared decision-making and person-centred care in Sweden: Exploring coproduction of health and social care services”, *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, Vol. 171, pp. 129-134, <https://doi.org/10.1016/j.zefq.2022.04.016>. [260]
- Hegewald, J. et al. (2019), “Interventions to support return to work for people with coronary heart disease”, *Cochrane Database of Systematic Reviews*, Vol. 2019/3, <https://doi.org/10.1002/14651858.cd010748.pub2>. [299]
- Heider, A. and H. Mang (2020), “Effects of Monetary Incentives in Physician Groups: A Systematic Review of Reviews”, *Applied Health Economics and Health Policy*, Vol. 18/5, pp. 655-667, <https://doi.org/10.1007/s40258-020-00572-x>. [200]
- Heneghan, C. et al. (2012), “Self-monitoring of oral anticoagulation: systematic review and meta-analysis of individual patient data”, *The Lancet*, Vol. 379/9813, pp. 322-334, [https://doi.org/10.1016/s0140-6736\(11\)61294-4](https://doi.org/10.1016/s0140-6736(11)61294-4). [268]
- Hetzel, C. et al. (2023), “Return to work after medical rehabilitation in Germany: influence of individual factors and regional labour market based on administrative data”, *Journal for Labour Market Research*, Vol. 57/1, <https://doi.org/10.1186/s12651-023-00330-1>. [305]
- Hildebrandt, H., T. Schulte and B. Stunder (2012), “Triple Aim in Kinzigtal, Germany”, *Journal of Integrated Care*, Vol. 20/4, pp. 205-222, <https://doi.org/10.1108/14769011211255249>. [194]
- HM Revenue & Customs (2016), *Soft Drinks Industry Levy - GOV.UK*, <https://www.gov.uk/government/publications/soft-drinks-industry-levy/soft-drinks-industry-levy> (accessed on 6 July 2025). [64]

- HMRC (2025), *HMT-HMRC Soft Drinks Industry Levy Review - GOV.UK*, [69]
<https://www.gov.uk/government/publications/soft-drinks-industry-levy-review/hmt-hmrc-soft-drinks-industry-levy-review> (accessed on 6 July 2025).
- Hodder, R. et al. (2022), “Interventions to prevent obesity in school-aged children 6-18 years: An update of a Cochrane systematic review and meta-analysis including studies from 2015–2021”, *eClinicalMedicine*, Vol. 54, p. 101635, <https://doi.org/10.1016/j.eclinm.2022.101635>. [71]
- Hospital Professional News (2023), *Irish Heart Foundation patient support services..* [22]
- HSE (2025), *HSE launches new Stroke public awareness campaign, highlighting the importance of timely intervention to improve survival and outcomes.* [145]
- HSE (2023), *Model of care for integrated cardiac rehabilitation*, Health Service Executive, [279]
<https://www.hse.ie/eng/services/publications/model-of-care-for-integrated-cardiac-rehabilitation.pdf>.
- HSE (2020), *National framework for the integrated prevention and management of chronic disease in Ireland*, Health Service Executive, [287]
<https://www.hse.ie/eng/about/who/cspd/icp/chronic-disease/documents/>.
- HSPM (2017), *Portugal limits advertising of unhealthy food products for children*, [49]
<https://eurohealthobservatory.who.int/monitors/health-systems-monitor/updates/hspm/portugal-2017/portugal-limits-advertising-of-unhealthy-food-products-for-children>.
- Hubert, G. et al. (2018), “Recommendations on telestroke in Europe”, *European Stroke Journal*, Vol. 4/2, pp. 101-109, <https://doi.org/10.1177/2396987318806718>. [242]
- Hubert, J. et al. (2022), “Carbon emissions during elective coronary artery bypass surgery, a single center experience”, *Journal of Clinical Anesthesia*, Vol. 80, p. 110850, <https://doi.org/10.1016/j.jclinane.2022.110850>. [360]
- Hujala, A. et al. (n.d.), “Innovating care for people with multiple chronic conditions in Europe Caring for people with multiple chronic conditions in Finland: policy and practices”, <http://www.icare4eu.org>. (accessed on 13 July 2025). [27]
- iCARE4CVD consortium (2024), “Patient-Reported Experience Measures to Evaluate Digitally Supported Care Processes for Heart Failure: A Scoping Review”, in *Studies in Health Technology and Informatics, German Medical Data Sciences 2024*, IOS Press, [335]
<https://doi.org/10.3233/shti240872>.
- IDF Europe (n.d.), *Country Profiles – Insulin at 100 – IDF Europe*, [6]
<https://www.insulin100.eu/country-profiles/> (accessed on 13 July 2025).
- Imran Hamid, U. et al. (2023), “Structure of multidisciplinary heart teams, a survey-based heart team study”, *Interdisciplinary CardioVascular and Thoracic Surgery*, Vol. 37/2, <https://doi.org/10.1093/icvts/ivad134>. [233]
- Indenrigs- og Sundhedsministeriet (n.d.), *Regeringen vil flytte sundhedsvæsenet tættere på med ny reform | Indenrigs- og Sundhedsministeriet*, [14]
<https://www.ism.dk/nyheder/2024/september/regeringen-vil-flytte-sundhedsvaesenet-taettere-paa-med-ny-reform> (accessed on 13 July 2025).

- Institute of Public Health (2024), *Vaping among children – how are governments in Ireland and Northern Ireland responding to the challenge?* |, <https://www.publichealth.ie/blog/vaping-among-children-how-are-governments-ireland-and-northern-ireland-responding-challenge> (accessed on 16 July 2025). [103]
- Ioffe D, B. (2024), “Cardiovascular Concerns, Cancer Treatment, and Biological and Chronological Aging in Cancer: JACC Family Series”, *JACC CardioOncol.*, Vol. 8/6, pp. 143-158, <https://doi.org/10.1016/j.jaccao.2024.02.00>. [32]
- Irish Heart Foundation (2025), *Irish Heart Foundation Stroke Connect Service*. [21]
- Italian Ministry of Health (2025), *National Plan for Chronicity*, <https://www.salute.gov.it/new/it/pubblicazione/piano-nazionale-della-cronicita/> (accessed on September 2025). [17]
- Italian Ministry of Health (2025), *National prevention plan*, <https://www.salute.gov.it/new/it/tema/il-piano-nazionale-della-prevenzione/> (accessed on September 2025). [10]
- Italian Ministry of Health (2025), *Plan for Diabetic Disease*, <https://www.salute.gov.it/new/it/tema/114-piano-la-malattia-diabetica/>. [18]
- JA-CHRODIS (2017), *The European Joint Action on Chronic Diseases and Promoting Healthy Ageing (JA-CHRODIS)(2014-2017)* | EuroHealthNet, <https://eurohealthnet.eu/publication/the-european-joint-action-on-chronic-diseases-and-promoting-healthy-ageing-ja-chrodis2014-2017/> (accessed on 13 July 2025). [369]
- Jakobsen LK, B. (2025), “Semi-autonomous drone delivering automated external defibrillators for real out-of-hospital cardiac arrest: A Danish feasibility study”, *Resuscitation*, <https://doi.org/10.1016/j.resuscitation.2025.110544>. [161]
- Kanthasamy, V. et al. (2025), “Development and validation of a new disease-specific quality-of-life measure for atrial fibrillation derived from patient perspectives: The Atrial Fibrillation Patient-Reported Outcome Measures (AF-PROMs) Questionnaire”, *Heart Rhythm*, <https://doi.org/10.1016/j.hrthm.2025.02.007>. [318]
- Kazi, D. et al. (2024), “Climate Change and Cardiovascular Health”, *JAMA Cardiology*, Vol. 9/8, p. 748, <https://doi.org/10.1001/jamacardio.2024.1321>. [122]
- KCE (2024), *Performance of the Belgian health system*, <https://doi.org/10.57598/R376C>. [346]
- KCE (2023), *Performance of the Belgian health system: Revision of the conceptual framework and indicators set*, <https://doi.org/10.57598/R370C>. [347]
- Kendir, C. et al. (2025), “PROMoting quality of care through patient reported outcome measures (PROMs): Systematic collection of PROMs for quality improvement and assurance in 38 countries”, *OECD Health Working Papers*, No. 183, OECD Publishing, Paris, <https://doi.org/10.1787/c17bb968-en>. [322]
- Khadanga, S. et al. (2024), “Cardiac rehabilitation: the gateway for secondary prevention”, *Heart*, Vol. 110/24, pp. 1427-1436, <https://doi.org/10.1136/heartjnl-2023-323152>. [278]

- Khan, Y. et al. (2023), "The impact of the COVID-19 pandemic on delayed care of cardiovascular diseases in Europe: a systematic review", *European Heart Journal - Quality of Care and Clinical Outcomes*, Vol. 9/7, pp. 647-661, <https://doi.org/10.1093/ehjqcco/qcad051>. [343]
- Kiguchi, T. et al. (2020), "Out-of-hospital cardiac arrest across the World: First report from the International Liaison Committee on Resuscitation (ILCOR)", *Resuscitation*, Vol. 152, pp. 39-49, <https://doi.org/10.1016/j.resuscitation.2020.02.044>. [152]
- Kilian, C. et al. (2022), "Changes in alcohol use during the COVID-19 pandemic in Europe: A meta-analysis of observational studies", *Drug and Alcohol Review*, Vol. 41/4, pp. 918-931, <https://doi.org/10.1111/dar.13446>. [110]
- Kleja, M. (2024), *Danish government rolls out plan addressing tomorrow's health challenges - Euractiv*, EURACTIV, <https://www.euractiv.com/section/health-consumers/news/danish-government-rolls-out-plan-addressing-tomorrows-health-challenges/> (accessed on 13 July 2025). [15]
- Koikari, J. and Z. Khan (2023), "The Effectiveness of Self-Management Strategies in Patients With Heart Failure: A Narrative Review", *Cureus*, <https://doi.org/10.7759/cureus.41863>. [269]
- Kornowski, R. (2021), "Patient-reported outcome measures in cardiovascular disease", *European Heart Journal - Quality of Care and Clinical Outcomes*, Vol. 9/2, pp. 119-127, <https://doi.org/10.1093/ehjqcco/qcab051>. [312]
- Kothari, R. et al. (1999), "Cincinnati Prehospital Stroke Scale: Reproducibility and Validity", *Annals of Emergency Medicine*, Vol. 33/4, pp. 373-378, [https://doi.org/10.1016/s0196-0644\(99\)70299-4](https://doi.org/10.1016/s0196-0644(99)70299-4). [143]
- Kouwenberg, L. et al. (2024), "The Carbon Footprint of Hospital Services and Care Pathways: A State-of-the-Science Review", *Environmental Health Perspectives*, Vol. 132/12, <https://doi.org/10.1289/ehp14754>. [358]
- Kromann Reumert (2024), *Life Science Update: September 2024*, <https://kromannreumert.com/en/news/life-science-update-september-2024> (accessed on 13 July 2025). [16]
- Kuwabara, M. (2025), "The interplay between cancer and cardiovascular disease", *Hypertens Res*, Vol. 48, pp. 1192–1194, <https://doi.org/10.1038/s41440-024-02015-9>. [24]
- Kwong, E. et al. (2022), "Population-level salt intake in the WHO European Region in 2022: a systematic review", *Public Health Nutrition*, Vol. 26/S1, pp. s6-s19, <https://doi.org/10.1017/s136898002200218x>. [53]
- Lachkhem, Y., S. Rican and É. Minvielle (2018), "Understanding delays in acute stroke care: a systematic review of reviews", *European Journal of Public Health*, Vol. 28/3, pp. 426-433, <https://doi.org/10.1093/eurpub/cky066>. [141]
- Lane, M. et al. (2024), "Ultra-processed food exposure and adverse health outcomes: umbrella review of epidemiological meta-analyses", *BMJ*, p. e077310, <https://doi.org/10.1136/bmj-2023-077310>. [381]
- Law, C. et al. (2020), "The impact of UK soft drinks industry levy on manufacturers' domestic turnover", *Economics & Human Biology*, Vol. 37, p. 100866, <https://doi.org/10.1016/j.ehb.2020.100866>. [68]

- Lindström Egholm, C. et al. (2018), "Implementation of a politically initiated national clinical guideline for cardiac rehabilitation in hospitals and municipalities in Denmark", *Health Policy*, Vol. 122/9, pp. 1043-1051, <https://doi.org/10.1016/j.healthpol.2018.07.015>. [293]
- LINNC (2023), *Transfer to the Closest Local Stroke Center vs. Direct Transfer to Endovascular Stroke Center of Acute Stroke Patients With Suspected LVO. RACECAT*, <https://www.linnc.com/LINNC-INR-Trials-Book-Table-of-content/RACECAT> (accessed on 15 July 2025). [237]
- Lip, G. (2017), "The ABC pathway: an integrated approach to improve AF management", *Nature Reviews Cardiology*, Vol. 14/11, pp. 627-628, <https://doi.org/10.1038/nrcardio.2017.153>. [204]
- Liu, A. et al. (2022), "Changing epidemiology of congenital heart disease: effect on outcomes and quality of care in adults", *Nature Reviews Cardiology*, Vol. 20/2, pp. 126-137, <https://doi.org/10.1038/s41569-022-00749-y>. [215]
- Li, Y. et al. (2020), "Healthy lifestyle and life expectancy free of cancer, cardiovascular disease, and type 2 diabetes: prospective cohort study", *BMJ*, p. l6669, <https://doi.org/10.1136/bmj.l6669>. [2]
- Lomi, A. et al. (2014), "Quality of Care and Interhospital Collaboration", *Medical Care*, Vol. 52/5, pp. 407-414, <https://doi.org/10.1097/mlr.000000000000107>. [166]
- Longo, D. (ed.) (2021), "Pollution and the Heart", *New England Journal of Medicine*, Vol. 385/20, pp. 1881-1892, <https://doi.org/10.1056/nejmra2030281>. [118]
- LSHTM/SMC (2023), *School Meals Case Study: Finland*, [https://www.schoolmealscoalition.org/sites/default/files/2024-05/Kuusipalo Manninen 2023 Food Meals Case Study Finland.pdf](https://www.schoolmealscoalition.org/sites/default/files/2024-05/Kuusipalo_Manninen_2023_Food_Meals_Case_Study_Finland.pdf) (accessed on 3 July 2025). [80]
- Luedike, P. et al. (2022), "Structural components for the development of a heart failure network", *ESC Heart Failure*, Vol. 10/3, pp. 1545-1554, <https://doi.org/10.1002/ehf2.14266>. [226]
- Lundberg, G. et al. (2018), "Heart Centers for Women", *Circulation*, Vol. 138/11, pp. 1155-1165, <https://doi.org/10.1161/circulationaha.118.035351>. [179]
- Lyzwinski, L. (2014), "Public health perspectives on noise and cardiovascular disease", *World Journal of Cardiovascular Diseases*, Vol. 04/01, pp. 23-34, <https://doi.org/10.4236/wjcd.2014.41005>. [123]
- Machado, A., F. Leite and M. Pereira (2025), "Integrated Care in Atrial Fibrillation: A Multidisciplinary Approach to Improve Clinical Outcomes and Quality of Life", *Healthcare*, Vol. 13/3, p. 325, <https://doi.org/10.3390/healthcare13030325>. [207]
- Markhorst, B. et al. (2025), "Optimizing mobile stroke unit deployment: A strategic case study in the greater Oslo area", *European Stroke Journal*, <https://doi.org/10.1177/23969873251329862>. [246]
- Marklund, M. et al. (2024), "Estimated health effect, cost, and cost-effectiveness of mandating sodium benchmarks in Australia's packaged foods: a modelling study", *The Lancet Public Health*, Vol. 9/11, pp. e861-e870, [https://doi.org/10.1016/S2468-2667\(24\)00219-6](https://doi.org/10.1016/S2468-2667(24)00219-6). [54]

- Marshall V., W. et al. (2025), "Paving the Way for Integrated Advanced Heart Failure and Adult Congenital Heart Disease Training", *JACC: Advances*, Vol. 4/3, p. 101586, <https://doi.org/10.1016/j.jacadv.2025.101586>. [216]
- Masters, R. et al. (2017), "Return on investment of public health interventions: a systematic review", *Journal of Epidemiology and Community Health*, Vol. 71/8, pp. 827-834, <https://doi.org/10.1136/jech-2016-208141>. [354]
- Mertens, E., C. Colizzi and J. Peñalvo (2021), "Ultra-processed food consumption in adults across Europe", *European Journal of Nutrition*, Vol. 61/3, pp. 1521-1539, <https://doi.org/10.1007/s00394-021-02733-7>. [43]
- Mesana, M. et al. (2016), "Dietary sources of sugars in adolescents' diet: the HELENA study", *European Journal of Nutrition*, Vol. 57/2, pp. 629-641, <https://doi.org/10.1007/s00394-016-1349-z>. [58]
- Monteiro, C. et al. (2017), "The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing", *Public Health Nutrition*, Vol. 21/1, pp. 5-17, <https://doi.org/10.1017/s1368980017000234>. [380]
- Mortimer, A. et al. (2021), "To support safe provision of mechanical thrombectomy services for patients with acute ischaemic stroke: 2021 consensus guidance from BASP, BSNR, ICSWP, NACCS, and UKNG", *Clinical Radiology*, Vol. 76/11, pp. 862.e1-862.e17, <https://doi.org/10.1016/j.crad.2021.08.002>. [240]
- Moser, D. et al. (2006), "Reducing Delay in Seeking Treatment by Patients With Acute Coronary Syndrome and Stroke", *Circulation*, Vol. 114/2, pp. 168-182, <https://doi.org/10.1161/circulationaha.106.176040>. [140]
- Müller-Barna, P. et al. (2014), "TeleStroke Units Serving as a Model of Care in Rural Areas", *Stroke*, Vol. 45/9, pp. 2739-2744, <https://doi.org/10.1161/strokeaha.114.006141>. [243]
- Ndlovu, N. and B. Nkeh-Chungag (2024), "Impact of Indoor Air Pollutants on the Cardiovascular Health Outcomes of Older Adults: Systematic Review", *Clinical Interventions in Aging*, Vol. Volume 19, pp. 1629-1639, <https://doi.org/10.2147/cia.s480054>. [121]
- NEMJ (2017), *What Is Patient-Centered Care?* | *NEJM Catalyst*, <https://catalyst.nejm.org/doi/full/10.1056/CAT.17.0559> (accessed on 14 July 2025). [252]
- Neumar, R. et al. (2015), "Part 1: Executive Summary", *Circulation*, Vol. 132/18_suppl_2, <https://doi.org/10.1161/cir.0000000000000252>. [169]
- Ngo, A. et al. (2017), "The effect of MPOWER scores on cigarette smoking prevalence and consumption", *Preventive Medicine*, Vol. 105, pp. S10-S14, <https://doi.org/10.1016/j.ypmed.2017.05.006>. [83]
- NICE (2023), "Overview | Chronic heart failure in adults | Quality standards | NICE". [223]
- Nisha I. Parikh, M. (2021), "Adverse Pregnancy Outcomes and Cardiovascular Disease Risk: Unique Opportunities for Cardiovascular Disease Prevention in Women: A Scientific Statement From the American Heart Association", *Circulation*, Vol. 143/18, <https://doi.org/10.1161/CIR.0000000000000961>. [176]

- Norrving, B. et al. (2018), "Action Plan for Stroke in Europe 2018–2030", *European Stroke Journal*, Vol. 3/4, pp. 309-336, <https://doi.org/10.1177/2396987318808719>. [291]
- Norwegian Ministry of Health and Care Services (2025), *Norway bans marketing of unhealthy food and drinks to children*, <https://www.regjeringen.no/en/aktuelt/norway-bans-marketing-of-unhealthy-food-and-drinks-to-children/id3098225>. [48]
- Nutbeam, D. and J. Lloyd (2021), "Understanding and Responding to Health Literacy as a Social Determinant of Health", *Annual Review of Public Health*, Vol. 42/1, pp. 159-173, <https://doi.org/10.1146/annurev-publhealth-090419-102529>. [142]
- O'Flaherty, M. et al. (2021), "Using the workHORSE model to explore and compare the effectiveness, cost-effectiveness and equity impact of different implementations of the NHS Health Check programme", <https://www.ncbi.nlm.nih.gov/books/NBK570866/> (accessed on 4 July 2025). [132]
- OECD (2025), *Does Healthcare Deliver?: Results from the Patient-Reported Indicator Surveys (PaRIS)*, OECD Publishing, Paris, <https://doi.org/10.1787/c8af05a5-en>. [3]
- OECD (2024), *Fiscal Sustainability of Health Systems: How to Finance More Resilient Health Systems When Money Is Tight?*, OECD Publishing, Paris, <https://doi.org/10.1787/880f3195-en>. [352]
- OECD (2024), *Rethinking Health System Performance Assessment: A Renewed Framework*, OECD Publishing, Paris, <https://doi.org/10.1787/107182c8-en>. [1]
- OECD (2023), *Integrating Care to Prevent and Manage Chronic Diseases: Best Practices in Public Health*, OECD Publishing, Paris, <https://doi.org/10.1787/9acc1b1d-en>. [202]
- OECD (2023), *Ready for the Next Crisis? Investing in Health System Resilience*, OECD Health Policy Studies, OECD Publishing, Paris, <https://doi.org/10.1787/1e53cf80-en>. [345]
- OECD (2015), *Fiscal Sustainability of Health Systems: Bridging Health and Finance Perspectives*, OECD Publishing, Paris, <https://doi.org/10.1787/9789264233386-en>. [351]
- OECD/The Health Foundation (2025), *How Do Health System Features Influence Health System Performance?*, OECD Publishing, Paris, <https://doi.org/10.1787/7b877762-en>. [201]
- Office for Health Improvement & Disparities (2021), *Preventing illness and improving health for all: a review of the NHS Health Check programme and recommendations - GOV.UK*, <https://www.gov.uk/government/publications/nhs-health-check-programme-review/preventing-illness-and-improving-health-for-all-a-review-of-the-nhs-health-check-programme-and-recommendations> (accessed on 4 July 2025). [131]
- Ogendo, J. et al. (2025), "Patient-reported outcome measures for atrial fibrillation: systematic review and evaluation of psychometric properties of symptom severity measures", *Europace*, Vol. 27/Supplement_1, <https://doi.org/10.1093/europace/euaf085.521>. [317]
- Okunrintemi, V. and K. Nasir (2020), "Optimizing Patient-Reported Experiences for Cardiovascular Disease: Current Landscape and Future Opportunities", *Methodist DeBakey Cardiovascular Journal*, Vol. 16/3, p. 220, <https://doi.org/10.14797/mdcj-16-3-220>. [332]

- Okunrintemi, V. et al. (2017), "Patient–Provider Communication and Health Outcomes Among Individuals With Atherosclerotic Cardiovascular Disease in the United States", *Circulation: Cardiovascular Quality and Outcomes*, Vol. 10/4, <https://doi.org/10.1161/circoutcomes.117.003635>. [331]
- Olive-Gadea, M. et al. (2024), "Evaluating Transport Strategies and Local Hospital Impact on Stroke Outcomes: A RACECAT Trial Substudy", *Stroke: Vascular and Interventional Neurology*, Vol. 4/3, <https://doi.org/10.1161/SVIN.123.001213>. [238]
- Oliveira Gonçalves, A. et al. (2023), "Economic Evaluation of a Mobile Stroke Unit Service in Germany", *Annals of Neurology*, Vol. 93/5, pp. 942-951, <https://doi.org/10.1002/ana.26602>. [245]
- Ollila, H. et al. (2024), "Tobacco endgame goals and measures in Europe: current status and future directions", *Tobacco Control*, pp. tc-2024-058606, <https://doi.org/10.1136/tc-2024-058606>. [90]
- Ollila, H. et al. (2023), "Exclusive and dual use of electronic cigarettes among European youth in 32 countries with different regulatory landscapes", *Tobacco Control*, Vol. 33/5, pp. 622-627, <https://doi.org/10.1136/tc-2022-057749>. [96]
- Onder, G. et al. (2015), "Time to face the challenge of multimorbidity. A European perspective from the joint action on chronic diseases and promoting healthy ageing across the life cycle (JA-CHRODIS)", *European Journal of Internal Medicine*, Vol. 26/3, pp. 157-159, <https://doi.org/10.1016/j.ejim.2015.02.020>. [23]
- Parnham, J. et al. (2024), "Multistate transition modelling of e-cigarette use and cigarette smoking among youth in the UK", *Tobacco Control*, Vol. 33/4, pp. 489-496, <https://doi.org/10.1136/TC-2022-057777>. [100]
- Parvand, M. et al. (2022), "One-Year Prospective Follow-up of Women With INOCA and MINOCA at a Canadian Women's Heart Centre", *Canadian Journal of Cardiology*, Vol. 38/10, pp. 1600-1610, <https://doi.org/10.1016/j.cjca.2022.07.005>. [182]
- Parvand, M. et al. (2024), "Sex, Gender, and Women's Heart Health: How Women's Heart Programs Address the Knowledge Gap", *CJC Open*, Vol. 6/2, pp. 442-453, <https://doi.org/10.1016/j.cjco.2023.10.012>. [183]
- Pell, D. et al. (2019), "Support for, and perceived effectiveness of, the UK soft drinks industry levy among UK adults: cross-sectional analysis of the International Food Policy Study", *BMJ Open*, Vol. 9/3, p. e026698, <https://doi.org/10.1136/bmjopen-2018-026698>. [65]
- Perry, A. et al. (2023), "Physical Activity Over the Lifecourse and Cardiovascular Disease", *Circulation Research*, Vol. 132/12, pp. 1725-1740, <https://doi.org/10.1161/circresaha.123.322121>. [116]
- Petracca, F. et al. (2025), "Harnessing financial incentives for health promotion: A scoping review of prevention programs implemented in upper-middle and high-income countries", *Social Science & Medicine*, Vol. 383, p. 118499, <https://doi.org/10.1016/j.socscimed.2025.118499>. [355]
- Piotrowicz, E. et al. (2016), "Telerehabilitation in heart failure patients: The evidence and the pitfalls", *International Journal of Cardiology*, Vol. 220, pp. 408-413, <https://doi.org/10.1016/j.ijcard.2016.06.277>. [290]

- Piris, A. et al. (2024), "Safety of an Early Discharge Strategy (≤ 48 h) after ST-Elevation Myocardial Infarction", *Journal of Clinical Medicine*, Vol. 13/13, p. 3827, <https://doi.org/10.3390/jcm13133827>. [273]
- Popkin, B. et al. (2021), "Towards unified and impactful policies to reduce ultra-processed food consumption and promote healthier eating", *The Lancet Diabetes & Endocrinology*, Vol. 9/7, pp. 462-470, [https://doi.org/10.1016/s2213-8587\(21\)00078-4](https://doi.org/10.1016/s2213-8587(21)00078-4). [39]
- Popkin, B. and S. Ng (2021), "The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable", *Obesity Reviews*, Vol. 23/1, <https://doi.org/10.1111/obr.13366>. [44]
- Porth, A. et al. (2023), "Standardising personalised diabetes care across European health settings: A person-centred outcome set agreed in a multinational Delphi study", *Diabetic Medicine*, Vol. 41/5, <https://doi.org/10.1111/dme.15259>. [321]
- Portugal Ministry of Health (2025), *PNS 2030*, <https://pns.dgs.pt/pns-2021-2030/>. [19]
- PROFID EHRA (2025), *Profid EHRA Trial - PROFID PROJECT*, <https://profid-project.eu/profid-ehra-trial/> (accessed on 6 July 2025). [377]
- Public, S. (2025), *Vaping - The sale of disposable e-cigarettes is now banned in France* | Service-Public.fr, <https://www.service-public.fr/particuliers/actualites/A18103?lang=en> (accessed on 16 July 2025). [102]
- PWC (2025), "Towards better cardiovascular health in Poland", https://www.pwc.ch/en/publications/2025/PwC_better-cardiovascular-health-in-Poland_EN_web.pdf (accessed on 18 July 2025). [9]
- Quinn, T. (ed.) (2016), "Patient-Reported Outcomes for Quality of Life Assessment in Atrial Fibrillation: A Systematic Review of Measurement Properties", *PLOS ONE*, Vol. 11/11, p. e0165790, <https://doi.org/10.1371/journal.pone.0165790>. [316]
- Raat, W. et al. (2021), "Impact of primary care involvement and setting on multidisciplinary heart failure management: a systematic review and meta-analysis", *ESC Heart Failure*, Vol. 8/2, pp. 802-818, <https://doi.org/10.1002/ehf2.13152>. [229]
- Radbound UMC (2024), *Millions of funding for tackling heart failure at home - Project cardiac care at home provides better monitoring and rehabilitation - Radboudumc*, <https://www.radboudumc.nl/en/news-items/2024/miljoenen subsidie-voor-aanpak-van-hartfalen-in-de-thuissituatie> (accessed on 14 July 2025). [292]
- Rakisheva, A. et al. (2024), "Multidisciplinary care of peripartum heart failure: A scientific statement of the Heart Failure Association of the <sc>ESC</sc>", *European Journal of Heart Failure*, Vol. 26/4, pp. 742-753, <https://doi.org/10.1002/ehf.3246>. [188]
- RATE-AF (2020), "Effect of Digoxin vs Bisoprolol for Heart Rate Control in Atrial Fibrillation on Patient-Reported Quality of Life", *JAMA*, Vol. 324/24, p. 2497, <https://doi.org/10.1001/jama.2020.23138>. [315]
- Rathod, K. et al. (2025), "Cost-Effectiveness of Early Discharge (≤ 48 Hours) for Low-Risk Patients Following PPCI for STEMI", *JACC: Cardiovascular Interventions*, Vol. 18/12, pp. 1499-1509, <https://doi.org/10.1016/j.jcin.2025.04.045>. [276]

- Rathod, K. et al. (2021), “Early Hospital Discharge Following PCI for Patients With STEMI”, *Journal of the American College of Cardiology*, Vol. 78/25, pp. 2550-2560, <https://doi.org/10.1016/j.jacc.2021.09.1379>. [274]
- Rehm, J. et al. (2023), “Impact of the WHO “best buys” for alcohol policy on consumption and health in the Baltic countries and Poland 2000–2020”, *The Lancet Regional Health - Europe*, Vol. 33, p. 100704, <https://doi.org/10.1016/j.lanepe.2023.100704>. [107]
- Reibis, R. et al. (2019), “The importance of return to work: How to achieve optimal reintegration in ACS patients”, *European Journal of Preventive Cardiology*, Vol. 26/13, pp. 1358-1369, <https://doi.org/10.1177/2047487319839263>. [301]
- Resurrección DM, M. (2017), “Barriers for Nonparticipation and Dropout of Women in Cardiac Rehabilitation Programs: A Systematic Review”, *Journal of Women’s Health*, Vol. 26/8, pp. 849-859, <https://doi.org/10.1089/jwh.2016.6249>. [285]
- Riegel, B., T. Jaarsma and A. Strömberg (2012), “A Middle-Range Theory of Self-Care of Chronic Illness”, *Advances in Nursing Science*, Vol. 35/3, pp. 194-204, <https://doi.org/10.1097/ans.0b013e318261b1ba>. [266]
- Rodriguez-Blazquez, C. et al. (2020), “Assessing the Pilot Implementation of the Integrated Multimorbidity Care Model in Five European Settings: Results from the Joint Action CHRODIS-PLUS”, *International Journal of Environmental Research and Public Health*, Vol. 17/15, p. 5268, <https://doi.org/10.3390/ijerph17155268>. [195]
- Roeters van Lennep, J. et al. (2023), “Women, lipids, and atherosclerotic cardiovascular disease: a call to action from the European Atherosclerosis Society”, *European Heart Journal*, Vol. 44/39, pp. 4157-4173, <https://doi.org/10.1093/eurheartj/ehad472>. [187]
- Romanian Ministry of Health (2025), *Romania launches first national strategy to combat cardiovascular and cerebrovascular diseases 2025-2030*, <https://www.ms.ro/ro/centrul-de-presa/rom%C3%A2nia-are-%C3%AEn-premier%C4%83-o-strategie>. [8]
- Rørth, R. et al. (2016), “Return to the Workforce After First Hospitalization for Heart Failure”, *Circulation*, Vol. 134/14, pp. 999-1009, <https://doi.org/10.1161/circulationaha.116.021859>. [295]
- Ruano-Ravina A, P. (2016), “Participation and adherence to cardiac rehabilitation programs. A systematic review”, *International Journal of Cardiology*, Vol. 223, pp. 436-443, <https://doi.org/10.1016/j.ijcard.2016.08.120>. [284]
- Rumsfeld, J. et al. (2013), “Cardiovascular Health: The Importance of Measuring Patient-Reported Health Status”, *Circulation*, Vol. 127/22, pp. 2233-2249, <https://doi.org/10.1161/cir.0b013e3182949a2e>. [310]
- RVO (n.d.), *Reintegration obligations for employers* | *Business.gov.nl*, <https://business.gov.nl/regulation/reintegration-obligations/> (accessed on 14 July 2025). [304]
- Sadeghi, M. et al. (2022), “Prevalence of Return to Work in Cardiovascular Patients After Cardiac Rehabilitation: A Systematic Review and Meta-analysis”, *Current Problems in Cardiology*, Vol. 47/7, p. 100876, <https://doi.org/10.1016/j.cpcardi.2021.100876>. [294]
- SAFE (n.d.), “The Burden of Stroke in Europe”. [272]

- Sághy, E. et al. (2025), “Patient-Reported Experience and Outcome Measures of Patients Living With Diabetes: Associations Among Different Factors”, *Value in Health Regional Issues*, Vol. 47, p. 101082, <https://doi.org/10.1016/j.vhri.2025.101082>. [338]
- Sagris, D. et al. (2024), “Adherence to an integrated care pathway for stroke is associated with lower risk of major cardiovascular events: A report from the Athens Stroke Registry”, *European Journal of Internal Medicine*, Vol. 122, pp. 61-67, <https://doi.org/10.1016/j.ejim.2023.12.010>. [248]
- Sandhu, A. et al. (2024), “Clinical Impact of Routine Assessment of Patient-Reported Health Status in Heart Failure Clinic: The PRO-HF Trial”, *Circulation*, Vol. 149/22, pp. 1717-1728, <https://doi.org/10.1161/circulationaha.124.069624>. [320]
- Santos, G. et al. (2023), “Feasibility, acceptability, and outcome responsiveness of the SYMPERHEART intervention to support symptom perception in persons with heart failure and their informal caregivers: a feasibility quasi-experimental study”, *Pilot and Feasibility Studies*, Vol. 9/1, <https://doi.org/10.1186/s40814-023-01390-3>. [270]
- Sardari Nia, P. et al. (2021), “Effect of a dedicated mitral heart team compared to a general heart team on survival: a retrospective, comparative, non-randomized interventional cohort study based on prospectively registered data”, *European Journal of Cardio-Thoracic Surgery*, Vol. 60/2, pp. 263-273, <https://doi.org/10.1093/ejcts/ezab065>. [231]
- Scheibler, F. et al. (2023), “Patient-reported effects of hospital-wide implementation of shared decision-making at a university medical centre in Germany: a pre–post trial”, *BMJ Evidence-Based Medicine*, Vol. 29/2, pp. 87-95, <https://doi.org/10.1136/bmjebm-2023-112462>. [265]
- Schellekens, M. et al. (2025), “Cognitive performance is associated with return to work after ischemic stroke in young adults: The ODYSSEY study”, *European Stroke Journal*, <https://doi.org/10.1177/23969873251324400>. [298]
- Schierbeck, S. et al. (2021), “National coverage of out-of-hospital cardiac arrests using automated external defibrillator-equipped drones — A geographical information system analysis”, *Resuscitation*, Vol. 163, pp. 136-145, <https://doi.org/10.1016/j.resuscitation.2021.02.040>. [160]
- Schierbeck, S. et al. (2023), “Drone delivery of automated external defibrillators compared with ambulance arrival in real-life suspected out-of-hospital cardiac arrests: a prospective observational study in Sweden”, *The Lancet Digital Health*, Vol. 5/12, pp. e862-e871, [https://doi.org/10.1016/s2589-7500\(23\)00161-9](https://doi.org/10.1016/s2589-7500(23)00161-9). [162]
- Schiøtz, M. et al. (2011), “Something is amiss in Denmark: A comparison of preventable hospitalisations and readmissions for chronic medical conditions in the Danish Healthcare system and Kaiser Permanente”, *BMC Health Services Research*, Vol. 11/1, <https://doi.org/10.1186/1472-6963-11-347>. [198]
- Schoenfelder, J. et al. (2021), “Stroke care networks and the impact on quality of care”, *Health Care Management Science*, Vol. 25/1, pp. 24-41, <https://doi.org/10.1007/s10729-021-09582-0>. [241]

- SchoolFood4Change (2023), "SF4C Project number Work package 5: Innovative, sustainable and healthy food procurement Deliverable D5.1: Report 'Innovative Criteria and Models for Procurement of Sustainable and Healthy School Meals' ICLEI Europe Deliverable Quality Review", <https://schoolfood4change.eu/wp-content/uploads/2023/06/D5.1-Innovative-CriteriaModels-for-Proc-of-SustHealthy-School-Meals.pdf> (accessed on 3 July 2025). [78]
- Schooling, C. (ed.) (2014), "A Time Series Evaluation of the FAST National Stroke Awareness Campaign in England", *PLoS ONE*, Vol. 9/8, p. e104289, <https://doi.org/10.1371/journal.pone.0104289>. [144]
- Scott-Herridge, J. et al. (2022), "Does a Heart Team Improve Clinical Outcomes?", *The American Journal of Cardiology*, Vol. 169, pp. 120-126, <https://doi.org/10.1016/j.amjcard.2022.01.006>. [230]
- SF4C (2022), *Mapping the School Food System*, <https://schoolfood4change.eu/wp-content/uploads/2023/06/D2.2-Mapping-School-Food-System.pdf> (accessed on 3 July 2025). [81]
- Shankar, B. (ed.) (2017), "Systematic review of dietary salt reduction policies: Evidence for an effectiveness hierarchy?", *PLOS ONE*, Vol. 12/5, p. e0177535, <https://doi.org/10.1371/journal.pone.0177535>. [37]
- SHARE TO CARE (n.d.), *Was ist SHARE TO CARE?*, <https://share-to-care.de/programm> (accessed on 14 July 2025). [264]
- Sheikh, A. (ed.) (2018), "Future cost-effectiveness and equity of the NHS Health Check cardiovascular disease prevention programme: Microsimulation modelling using data from Liverpool, UK", *PLOS Medicine*, Vol. 15/5, p. e1002573, <https://doi.org/10.1371/journal.pmed.1002573>. [133]
- Siaw, M. and J. Lee (2018), "Multidisciplinary collaborative care in the management of patients with uncontrolled diabetes: A systematic review and meta-analysis", *International Journal of Clinical Practice*, Vol. 73/2, p. e13288, <https://doi.org/10.1111/ijcp.13288>. [210]
- Simmons, K., S. Mclsaac and R. Ohle (2023), "Impact of community-based interventions on out-of-hospital cardiac arrest outcomes: a systematic review and meta-analysis", *Scientific Reports*, Vol. 13/1, <https://doi.org/10.1038/s41598-023-35735-y>. [155]
- Singh, B. et al. (2024), "A systematic umbrella review and meta-meta-analysis of eHealth and mHealth interventions for improving lifestyle behaviours", *npj Digital Medicine*, Vol. 7/1, <https://doi.org/10.1038/s41746-024-01172-y>. [113]
- Skovlund, S. et al. (2021), "Perceived Benefits, Barriers, and Facilitators of a Digital Patient-Reported Outcomes Tool for Routine Diabetes Care: Protocol for a National, Multicenter, Mixed Methods Implementation Study", *JMIR Research Protocols*, Vol. 10/9, p. e28391, <https://doi.org/10.2196/28391>. [324]
- Skovlund, S. et al. (2021), "The participatory development of a national core set of person-centred diabetes outcome constructs for use in routine diabetes care across healthcare sectors", *Research Involvement and Engagement*, Vol. 7/1, <https://doi.org/10.1186/s40900-021-00309-7>. [325]

- Smedegaard, L. et al. (2017), “Return to Work and Risk of Subsequent Detachment From Employment After Myocardial Infarction: Insights From Danish Nationwide Registries”, *Journal of the American Heart Association*, Vol. 6/10, <https://doi.org/10.1161/jaha.117.006486>. [297]
- Smeets, R. et al. (2023), “Supporting professionals to implement integrated, person-centered care for people with chronic conditions: the TARGET pilot study”, *Scandinavian Journal of Primary Health Care*, Vol. 41/4, pp. 377-391, <https://doi.org/10.1080/02813432.2023.2250392>. [262]
- Smoke Free Partnership (2009), *What is the current status of the draft Council Recommendation on smoke-free environments? - SmokeFree Partnership*, <https://smokefreepartnership.eu/news/sfp-news/what-is-the-current-status-of-the-draft-council-recommendation-on-smoke-free-environments> (accessed on 4 July 2025). [372]
- Sochalski, J. et al. (2009), “What Works In Chronic Care Management: The Case Of Heart Failure”, *Health Affairs*, Vol. 28/1, pp. 179-189, <https://doi.org/10.1377/hlthaff.28.1.179>. [4]
- Spanish Ministry of Health (2022), *Joint Action to Prevent Non Communicable Diseases and Cancer*, https://www.sanidad.gob.es/en/areas/promocionPrevencion/jornadas_OtrasActuaciones/otrasActuaciones/JA_preventNCD.htm. [11]
- Stamm, T. et al. (2021), “Building a Value-Based Care Outcomes Observatory”, *NEJM Catalyst*, <https://doi.org/10.1056/CAT.21.0146>. [329]
- Steenstrup, S., J. Kramer-Johansen and H. Berge (2025), “Saving lives together in sport: – A pilot study attempting to increase the number and availability of automated external defibrillators and to initiate voluntary training in cardiopulmonary resuscitation with the use of automated external defibrillators in Norwegian amateur football clubs”, *Resuscitation*, Vol. 209, p. 110586, <https://doi.org/10.1016/j.resuscitation.2025.110586>. [158]
- Steinberg, B. and J. Piccini (2019), “Tackling Patient-Reported Outcomes in Atrial Fibrillation and Heart Failure”, *Cardiology Clinics*, Vol. 37/2, pp. 139-146, <https://doi.org/10.1016/j.ccl.2019.01.013>. [314]
- Stjernswärd, S. and S. Glasdam (2022), “The European Standard EN 17398:2020 on Patient Involvement in Health Care – a Fairclough-Inspired Critical Discourse Analysis”, *Policy, Politics, & Nursing Practice*, Vol. 23/2, pp. 130-141, <https://doi.org/10.1177/15271544221088250>. [254]
- Stratton, K., L. Kwan and D. Eaton (eds.) (2018), *Public Health Consequences of E-Cigarettes*, National Academies Press, Washington, D.C., <https://doi.org/10.17226/24952>. [94]
- Stroke Unit Trialists’ Collaboration (2013), “Organised inpatient (stroke unit) care for stroke”, *Cochrane Database of Systematic Reviews*, <https://doi.org/10.1002/14651858.cd000197.pub3>. [234]
- Struckmann, V., W. Boerma and E. Van Ginneken (n.d.), “Innovating care for people with multiple chronic conditions in Europe The Gesundes Kinzigtal programme, Germany 1. Care for people with multimorbidity in Germany”. [192]

- Stuart-Shor, E. et al. (2012), “Behavioral Strategies for Cardiovascular Risk Reduction in Diverse and Underserved Racial/Ethnic Groups”, *Circulation*, Vol. 125/1, pp. 171-184, <https://doi.org/10.1161/circulationaha.110.968495>. [136]
- Sturgeon KM, D. (2019), “A population-based study of cardiovascular disease mortality risk in US cancer patients”, *Eur Heart J.*, Vol. 40/48, pp. 3889-3897, <https://doi.org/10.1093/eurheartj/ehz766>. [31]
- Svedbo Engström, M. et al. (2018), “A disease-specific questionnaire for measuring patient-reported outcomes and experiences in the Swedish National Diabetes Register: Development and evaluation of content validity, face validity, and test-retest reliability”, *Patient Education and Counseling*, Vol. 101/1, pp. 139-146, <https://doi.org/10.1016/j.pec.2017.07.016>. [323]
- TackSHS Project Investigators (2023), “Electronic Cigarette Use in 12 European Countries: Results From the TackSHS Survey”, *Journal of Epidemiology*, Vol. 33/6, pp. 276-284, <https://doi.org/10.2188/jea.je20210329>. [95]
- Taillie, L. et al. (2019), “Governmental policies to reduce unhealthy food marketing to children”, *Nutrition Reviews*, Vol. 77/11, pp. 787-816, <https://doi.org/10.1093/nutrit/nuz021>. [51]
- Taylor, C. et al. (2017), “From breathless to failure: symptom onset and diagnostic meaning in patients with heart failure—a qualitative study”, *BMJ Open*, Vol. 7/3, p. e013648, <https://doi.org/10.1136/bmjopen-2016-013648>. [219]
- TEHAF (2013), “Effects of tailored telemonitoring on heart failure patients’ knowledge, self-care, self-efficacy and adherence: A randomized controlled trial”, *European Journal of Cardiovascular Nursing*, Vol. 13/3, pp. 243-252, <https://doi.org/10.1177/1474515113487464>. [271]
- The Health Policy Partnership (2021), “Secondary prevention of heart attack and stroke: country profile for Italy.”. [250]
- the PEN Consortium (2022), “Strength of EU-level food environment policies and priority recommendations to create healthy food environments”, *European Journal of Public Health*, Vol. 32/3, pp. 504-511, <https://doi.org/10.1093/eurpub/ckac010>. [45]
- Tjelmeland, I. et al. (2024), “Norsk hjertestansregister Årsrapport for 2023”. [159]
- Tokle, R., G. Brunborg and T. Vedøy (2021), “Adolescents’ Use of Nicotine-Free and Nicotine E-Cigarettes: A Longitudinal Study of Vaping Transitions and Vaper Characteristics”, *Nicotine & Tobacco Research*, Vol. 24/3, pp. 400-407, <https://doi.org/10.1093/ntr/ntab192>. [98]
- Tsang, C. et al. (2024), “Integrated care using the ABC-stroke pathway improves cardiovascular outcomes and survival in patients with recent ischaemic stroke: a population-based cohort study”, *European Heart Journal*, Vol. 45/Supplement_1, <https://doi.org/10.1093/eurheartj/ehae666.2791>. [249]
- Turc, G. et al. (2019), “European Stroke Organisation (ESO)- European Society for Minimally Invasive Neurological Therapy (ESMINT) guidelines on mechanical thrombectomy in acute ischemic stroke”, *Journal of NeuroInterventional Surgery*, Vol. 11/6, pp. 535-538, <https://doi.org/10.1136/neurintsurg-2018-014568>. [165]
- UK Parliament (2025), *Advertising of HFSS food and drink to children*, <https://commonslibrary.parliament.uk/research-briefings/cbp-10061>. [50]

- van Bree, E. et al. (2025), “Assessing the environmental impact of coronary artery bypass grafting to decrease its footprint”, *European Journal of Cardio-Thoracic Surgery*, Vol. 67/2, <https://doi.org/10.1093/ejcts/ezaf054>. [363]
- Van Spall, H. et al. (2017), “Comparative effectiveness of transitional care services in patients discharged from the hospital with heart failure: a systematic review and network meta-analysis”, *European Journal of Heart Failure*, Vol. 19/11, pp. 1427-1443, <https://doi.org/10.1002/ehf.765>. [228]
- van Straten, B. et al. (2021), “Surgical waste reprocessing: Injection molding using recycled blue wrapping paper from the operating room”, *Journal of Cleaner Production*, Vol. 322, p. 129121, <https://doi.org/10.1016/j.jclepro.2021.129121>. [362]
- Vat, L. et al. (2016), “The Development of Integrated Stroke Care in the Netherlands a Benchmark Study”, *International Journal of Integrated Care*, Vol. 16/4, <https://doi.org/10.5334/ijic.2444>. [197]
- Venema E, G. (2019), “Effect of Interhospital Transfer on Endovascular Treatment for Acute Ischemic Stroke”, *Stroke*, Vol. 50/4, pp. 923-930, <https://doi.org/10.1161/strokeaha.118.024091>. [236]
- Vervoort, D. et al. (2024), “Addressing the Global Burden of Cardiovascular Disease in Women”, *Journal of the American College of Cardiology*, Vol. 83/25, pp. 2690-2707, <https://doi.org/10.1016/j.jacc.2024.04.028>. [185]
- Vogel, B. et al. (2021), “The Lancet women and cardiovascular disease Commission: reducing the global burden by 2030”, *The Lancet*, Vol. 397/10292, pp. 2385-2438, [https://doi.org/10.1016/s0140-6736\(21\)00684-x](https://doi.org/10.1016/s0140-6736(21)00684-x). [175]
- Vranckx, P., M. Valgimigli and M. Aleksic (2024), “Shaping the future of acute coronary syndrome management: a look back at 2024”, *European Heart Journal: Acute Cardiovascular Care*, Vol. 14/1, pp. 40-43, <https://doi.org/10.1093/ehjacc/zuae143>. [178]
- Waje-Andreassen, U. et al. (2018), “European Stroke Organisation certification of stroke units and stroke centres”, *European Stroke Journal*, Vol. 3/3, pp. 220-226, <https://doi.org/10.1177/2396987318778971>. [235]
- Walter, S. et al. (2022), “European Stroke Organisation (ESO) guidelines on mobile stroke units for prehospital stroke management”, *European Stroke Journal*, Vol. 7/1, pp. XXVII-LIX, <https://doi.org/10.1177/23969873221079413>. [244]
- WCRFI (2025), *MOVING physical activity policy benchmarking tool*, World Cancer Research Fund, <https://www.wcrf.org/research-policy/policy/physical-activity-policy/moving-physical-activity-policy-benchmarking-tool/> (accessed on 15 July 2025). [114]
- WCRFI (2023), *NOURISHING nutrition policy index brief*, World Cancer Research Fund, <https://www.wcrf.org/research-policy/library/nourishing-nutrition-policy-index-brief/> (accessed on 3 July 2025). [52]
- WCRFI (n.d.), *MOVING physical activity policy index*, World Cancer Research Fund, <https://www.wcrf.org/research-policy/policy/physical-activity-policy/moving-physical-activity-policy-index/> (accessed on 15 July 2025). [115]

- We CARE (2025), *RESIL-Card marks major milestone with first cardiovascular resilience assessment tool - We CARE*, <https://www.wecareabouthearts.org/resil-card-marks-major-milestone-with-first-cardiovascular-resilience-assessment-tool/> (accessed on 14 July 2025). [349]
- Wein, T. et al. (2000), "Activation of Emergency Medical Services for Acute Stroke in a Nonurban Population", *Stroke*, Vol. 31/8, pp. 1925-1928, <https://doi.org/10.1161/01.str.31.8.1925>. [156]
- Welsh Value in Health Centre (n.d.), *Case Illustration - Heart Failure Service - Value in Health*, <https://vbhc.nhs.wales/delivering-value/toolkits/education/patient-reported-outcome-measures-proms/case-illustration-heart-failure-service/?previewid=797FDA09-3623-4F99-8E6B1178E543EACD> (accessed on 15 July 2025). [326]
- Welsh Value in Health Centre (n.d.), *PROMs Standard Operating Model (PSOM) - Value in Health*, <https://vbhc.nhs.wales/digital-health/data-products/proms-standard-operating-model-psom/> (accessed on 15 July 2025). [328]
- WHO (2025), *Avoidable mortality, risk factors and policies for tackling noncommunicable diseases – leveraging data for impact: monitoring commitments in the WHO European Region ahead of the Fourth United Nations High-Level Meeting*, <https://iris.who.int/handle/10665/381744> (accessed on 13 July 2025). [36]
- WHO (2025), *European Salt Action Network (ESAN)*. [55]
- WHO (2025), *Safer Partners*. [35]
- WHO (2025), *The SAFER initiative*. [105]
- WHO (2024), *A focus on adolescent substance use in Europe, central Asia and Canada. Health Behaviour in School-aged Children international report from the 2021/2022 survey. Volume 3*, <https://www.who.int/europe/publications/i/item/9789289060936> (accessed on 6 July 2025). [92]
- WHO (2024), "Alcohol health and policy response in the WHO European Region". [106]
- WHO (2024), *Global alcohol action plan 2022-2030*, <https://www.who.int/publications/i/item/9789240090101> (accessed on 3 July 2025). [108]
- WHO (2024), *Health-enhancing physical activity in the European Union, 2024*, World Health Organization, <https://iris.who.int/handle/10665/379360> (accessed on 6 July 2025). [117]
- WHO (2023), *WHO recommends stronger policies to protect children from the harmful impact of food marketing*, <https://www.who.int/news/item/03-07-2023-who-recommends-stronger-policies-to-protect-children-from-the-harmful-impact-of-food-marketing> (accessed on 8 December 2025). [46]
- WHO (2022), *European framework for action on alcohol, 2022–2025*, https://cdn.who.int/media/docs/librariesprovider2/regional-committee-meeting-reports/rc72/european-framework-for-action-on-alcohol-2022-2025-cheat-sheet-en.pdf?sfvrsn=8e63aef4_6&download=true. [104]
- WHO (2022), "European framework for action on alcohol, 2022-2025 Vision: A SAFER European Region free from harm due to alcohol A call to action Priorities for action on alcohol", <http://www.who.int/europe> (accessed on 3 July 2025). [109]

- WHO (n.d.), *REPLACE Trans fat-free*, <https://www.who.int/teams/nutrition-and-food-safety/replace-trans-fat> (accessed on 14 July 2025). [63]
- WHO (n.d.), “WHO cardiovascular disease risk laboratory-based charts”. [129]
- Wilcox, N. (2024), “Cardiovascular disease and cancer: shared risk factors and mechanisms”, *Nat Rev Cardiol*, Vol. 21, pp. 617–631, <https://doi.org/10.1038/s41569-024-01017-x>. [28]
- Wissenberg, M. et al. (2013), “Association of National Initiatives to Improve Cardiac Arrest Management With Rates of Bystander Intervention and Patient Survival After Out-of-Hospital Cardiac Arrest”, *JAMA*, Vol. 310/13, p. 1377, <https://doi.org/10.1001/jama.2013.278483>. [157]
- Withers, K. et al. (2020), “First steps in PROMs and PREMs collection in Wales as part of the prudent and value-based healthcare agenda”, *Quality of Life Research*, Vol. 30/11, pp. 3157–3170, <https://doi.org/10.1007/s11136-020-02711-2>. [327]
- Wolf, A., R. Vella and A. Fors (2019), “The impact of person-centred care on patients’ care experiences in relation to educational level after acute coronary syndrome: secondary outcome analysis of a randomised controlled trial”, *European Journal of Cardiovascular Nursing*, Vol. 18/4, pp. 299–308, <https://doi.org/10.1177/1474515118821242>. [258]
- Wolfenden, L. et al. (2021), “Consolidating evidence on the effectiveness of interventions promoting fruit and vegetable consumption: an umbrella review”, *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 18/1, <https://doi.org/10.1186/s12966-020-01046-y>. [60]
- Wu, W. (ed.) (2014), “An Integrative Model of Patient-Centeredness – A Systematic Review and Concept Analysis”, *PLoS ONE*, Vol. 9/9, p. e107828, <https://doi.org/10.1371/journal.pone.0107828>. [334]
- Yang, J. et al. (2019), “Association between procedure appropriateness and patient-reported outcomes after percutaneous coronary intervention”, *Heart*, Vol. 106/6, pp. 441–446, <https://doi.org/10.1136/heartjnl-2019-315835>. [313]
- Yeung J, M. (2019), “Does care at a cardiac arrest centre improve outcome after out-of-hospital cardiac arrest? - A systematic review”, *Resuscitation*, <https://doi.org/10.1016/j.resuscitation.2019.02.006>. [149]
- Yndigegn, T. et al. (2022), “Safety of early hospital discharge following admission with ST-elevation myocardial infarction treated with percutaneous coronary intervention: a nationwide cohort study”, *EuroIntervention*, Vol. 17/13, pp. 1091–1099, <https://doi.org/10.4244/eij-d-21-00501>. [275]
- Zack, O. et al. (2022), “The Effectiveness of Case-management Rehabilitation Intervention in Facilitating Return to Work and Maintenance of Employment After Myocardial Infarction: Results of a Randomized Controlled Trial”, *Clinical Rehabilitation*, Vol. 36/6, pp. 753–766, <https://doi.org/10.1177/02692155221076826>. [300]
- Zaman, S. et al. (2025), “The Lancet Commission on rethinking coronary artery disease: moving from ischaemia to atheroma”, *The Lancet*, Vol. 405/10486, pp. 1264–1312, [https://doi.org/10.1016/s0140-6736\(25\)00055-8](https://doi.org/10.1016/s0140-6736(25)00055-8). [211]

Zarora, R. et al. (2022), "Effectiveness of Integrated Diabetes Care Interventions Involving Diabetes Specialists Working in Primary and Community Care Settings: A Systematic Review and Meta-Analysis", *International Journal of Integrated Care*, Vol. 22/0, p. 11, [209]
<https://doi.org/10.5334/ijic.6025>.

Annex 6.A. EU policies and directives related to cardiovascular diseases and related risk factors

Annex Table 6.A.1. Recent EU policies related to cardiovascular diseases

Year	Policy development / Initiative	Description and aims
2017	Article 108 of Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices	The article requires the EC and Member States to encourage the establishment of registers and databanks for specific types of devices. This data collection will contribute to enhance the evaluation of the long-term safety and performance of implantable cardiovascular devices and improve the quality of CVD treatment. A revision of the regulation is being discussed for adoption as of December 2025.
2018	Council conclusions on Healthy Nutrition for Children: The Healthy Future of Europe (2018)	Invite Member States to implement policies targeted to NCDs, notably focussing on unhealth nutrition as a key driver of NCDs.
Dec 2021	Healthier together – EU non-communicable diseases (NCD) initiative Covers the period 2022-2027	Launched by the European Commission “to support EU countries in identifying and implementing effective policies and actions to reduce the burden of major NCDs and improve citizens’ health and well-being”.
Dec-2022	Expert group on public health and subgroup on the prevention of non-communicable diseases	The EC set up the Commission expert group “Steering Group on Health Promotion, Disease Prevention and Management of Non-Communicable Diseases” (European Commission, 2022 ^[366])
Feb-2023 until Jan 2026	Care4Diabetes Joint Action (C4DJA)	Joint Action cofounded by the European Health and Digital Executive Agency (HADEA) in the framework of the EU4Health Program, targeting people affected by type 2 diabetes across 12 EU MS. C4DJA aims to support the transferability and implementation of the REVERSE DIABETES2NOW programme through pilot actions in 12 EU MS. This is an evidence-based lifestyle treatment and training programme aiming to implement effective lifestyle treatment and training programmes to improve the quality of life in people with T2D, potentially lowering medication consumption. (C4D ^[367])
Nov 2023	Joint Action on CARdiovascular diseases and Diabetes in Europe (JACARDI), funded by the EU4Health programme	JACARDI aims to support countries to reduce the burden of cardiovascular diseases and diabetes, specifically focussing on secondary and tertiary prevention. The initiative deploys 142 pilot projects across European countries, covering the complete care pathway, from health literacy to self-management and labour participation. JACARDI also aims to address transversal and intersectional topics, namely promoting equity and the data availability. In addition, nine action grants were financed in the field of CVD.
Jan 2024 – Dec 2027	Joint Action Prevent Non-Communicable Diseases (JA PreventNCD), funded from the EU4Health programme	The JA PreventNCD project brings together 22 EU Member States plus Norway, Iceland and Ukraine and it aims to reduce the burden of NCD, by supporting the prioritisation of effective prevention policies to address individual and societal risk factors. The project intends to develop an European infrastructure to monitor risk factors of NCDs. (European Commission, 2024 ^[368]) and focussing on primary prevention of NCDs.
June 2024	Council conclusions on the Future of the European Health Union	These conclusions address the relevance of addressing NCDs through an integrated approach from prevention to rehabilitation.
2014-2017 and 2017-2020	The European Joint Action on Chronic Diseases and Promoting Healthy Ageing (JA-CHRODIS),	The Joint Action CHRODIS+ (2017-2020) expanded on the achievements of the earlier CHRODIS-JA, serving as a co-ordinated, high-level effort by EU countries to collectively address the growing burden of chronic diseases. Bringing together 42 institutions across 18 EU member states, along with partners from Norway, Serbia, and Iceland, CHRODIS+ aimed to promote the exchange and implementation of good practices to advance shared goals in chronic disease prevention and management. (JA-CHRODIS, 2017 ^[369])
Nov 2024	Conclusions on the improvement of cardiovascular health in the European Union	The Council calls to strengthened efforts to prevent and treat CVDs. (European Commission, 2024 ^[370])

Annex Table 6.A.2. European policies related to tobacco

Year	Policy development / Initiative	Description and aims
May 2003	Tobacco Advertising Directive (2003/33/EC)	(European Commission, 2003 ^[371])
June 2009	Council Recommendation on smoke-free environments	European Commission adopted a proposal for a Council Recommendation on smoke-free environments (Smoke Free Partnership, 2009 ^[372]).
June 2011	Tobacco Taxation Directive (2011/64/EU)	(European Commission, 2011 ^[373])
May 2014	Tobacco Products Directive (2014/40/EU)	The Tobacco Products Directive (2014/40/EU), effective from May 2016, regulates the manufacture, sale, and presentation of tobacco and related products in the EU. It includes measures such as banning characterising flavours, mandating large health warnings, setting safety rules for e-cigarettes, and introducing EU-wide tracking to combat illicit trade (European Commission, 2014 ^[374]).
Dec 2024	Council recommendation to reduce exposure to second-hand smoke and aerosols and to achieve a tobacco-free generation in Europe by 2040 (as defined in Europe's Beating Cancer Plan).	(European Council, 2024 ^[375])

Annex Box 6.A.1. EU co-funded projects to improve early detection and integrated care of heart rhythm disorders and sudden cardiac death

- AFFECT-EU (Apr 2021 to Mar 2024) (AFFECT-EU, 2020^[376]) intends to develop and evaluate a risk-based screening approach to detect atrial fibrillation in the community
- PROFID (PROFID EHRA, 2025^[377]) (Jan 2020 to 31 March 2026) aims to develop a clinical decision support tool to identify which patients with history of coronary heart syndrome would benefit from an implantable cardioverter defibrillator (ICD). The project includes the PROFID EHRA trial, which aims to provide contemporary data on sudden cardiac death prevention after myocardial infarction, assessing the role of ICD under contemporary optimal medical therapy (OMT), <https://profid-project.eu/profid-ehra-trial/>.

Both projects are co-funded by Horizon 2020.

- EuroHeartPath (EuroHeartPath, 2025^[378]) “will simultaneously conduct 18 pathfinder studies to optimize the personalized early detection, diagnosis, monitoring, and treatment of heart failure, atrial fibrillation, ventricular fibrillation, and coronary disease, with a particular emphasis on prevention. These studies are categorized into four key areas: 1) novel artificial intelligence (AI) and machine learning applications, such as automated AI analysis of ECGs and Holters, and AI for predicting cardiomyopathies and cardiovascular events; 2) digital health integration, aimed at improving the diagnosis of aortic stenosis and enhancing secondary prevention measures; 3) point-of-care testing, including the use of point-of-care diagnostics in primary practice and ambulances to exclude heart failure; and 4) technology and robotics, encompassing robotic echocardiography and invasive diagnostics in obstructive epicardial coronary artery disease.”
- AFFIRMO (AFFIRMO^[379]): The AFFIRMO project is dedicated to enhancing the management of atrial fibrillation (AF) among Europe's ageing population by addressing multimorbidity through a holistic, patient-centred approach. Recognising that AF often coexists with other chronic conditions, the project aims to transition from fragmented care to an integrated strategy based on the “Atrial Fibrillation Better Care” (ABC) model. This model emphasises three key components: Avoiding stroke through appropriate anticoagulation, Better symptom management by involving patients in their treatment plans, and Cardiovascular and comorbidity risk optimisation by addressing associated health issues. AFFIRMO seeks to identify clusters of multimorbidity in older AF patients, assess the needs of patients, caregivers, and healthcare professionals, and develop a digital platform to facilitate personalised care pathways and shared decision making.

Notes

¹ There is currently not a global consensus on the definition of ultra-processed foods (UPFs), with most studies relying on the NOVA classification (Monteiro et al., 2017^[380]). Growing evidence links high UPF consumption to increased risk of cardiovascular disease and related factors such as obesity, hypertension, and systemic inflammation (Lane et al., 2024^[381]).

² 56 risk assessment tools have been compiled by JACARDI, https://risktoolapp.shinyapps.io/Risk_Tool/.

³ Relative risk (RR) 0.78, 95% confidence intervals (CI) 0.62-0.98 for nurse home visits and RR 0.80, 95% CI 0.67-0.97 for disease management clinics.

⁴ APIC/WHO guidelines indicate that current evidence – rated moderate to very low quality – shows no clear advantage or disadvantage of disposable drapes and gowns compared to reusable ones in preventing surgical site infections (p.133). Further research is needed to confirm these findings and assess implications for patient safety.

Glossary

Atherosclerosis is the process by which fatty substances, such as cholesterol, clog the arteries and reduce the flow of blood to the heart. These substances are called plaques or atheromas.

Cerebrovascular disease refers to conditions that develop as a result of problems with the brain's blood vessels. Stroke is a common type of cerebrovascular disease. A stroke occurs when the blood supply to part of the brain is interrupted, causing brain cells to become damaged or to die.

Coronary heart disease (CHD), also known as ischaemic heart disease (IHD), occurs when the blood supply to the heart is blocked or interrupted by a slow build-up of fatty substances in the coronary arteries (the blood vessels that supply the heart muscle with blood).

Heart attack or acute myocardial infarction (AMI) occurs when the supply of blood to the heart muscle is suddenly blocked, usually by a blood clot.

Cardiac arrest occurs when the heart stops pumping blood around the body. It is most commonly caused by an abnormal heart rhythm called ventricular fibrillation. Many cardiac arrests happen to people who are already having a heart attack.

Heart failure occurs when the heart is unable to pump blood around the body as well as it used to. It usually occurs when the heart muscle becomes too weak to work properly.

The State of Cardiovascular Health in the European Union

Cardiovascular disease (CVD) remains the leading cause of death and disability in the European Union, with significant geographic, gender and socio-economic disparities in outcomes and care. Despite progress in prevention and treatment, the COVID-19 pandemic reversed some gains, and most countries still face challenges in ensuring effective prevention, early detection, access to acute care and long-term management. The economic and social burden of CVD is immense, driven by premature mortality, lost productivity, and high healthcare costs. While digital health tools, AI and remote monitoring offer promising innovations, their integration into national systems remains limited. Cross-sectoral prevention policies implemented across the life course and a growing emphasis on people-centred care and rehabilitation are critical levers to reduce the burden of CVD and improve long-term outcomes in Europe.



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