Chronic respiratory diseases and health equity by 2050

a spotlight on chronic obstructive pulmonary disease and asthma in the WHO European Region

World Health Organization
European Region

ERS EUROPEAN RESPIRATORY SOCIETY
every breath counts

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Abstract

This report on chronic respiratory diseases (CRDs) in the WHO European Region, developed by WHO and the European Respiratory Society (ERS), highlights that despite progress in reducing CRD mortality, their burden and related inequities remain high. Chronic obstructive pulmonary disease (COPD) and asthma are the most prevalent CRDs, with nearly 80% of CRD deaths caused by COPD. With an ageing population and multiple intertwined crises, COPD cases are projected to increase by 23% globally by 2050, with woman and those living in low- and middle-income countries more greatly affected. Regional productivity loss between 30 and 74 years due to CRDs is estimated at US$20.7 billion. With the Region, disparities are evident, with high CRD prevalence in the western part, but high hospitalization and mortality rates in the eastern part.

This report emphasizes the need for integrated health system responses and prioritization of resources to address these disparities and advance CRD surveillance, research and innovation agendas. It provides a set of essential interventions, policy options and country examples, emphasizing the importance of tobacco and air quality control, addressing social determinants of health and ensuring continuum of care. By leveraging this report, countries can prioritize essential CRD interventions, enhance their health systems, reduce inequities and improve the quality of life for those living with CRDs.

Keywords

RESPIRATORY TRACT DISEASES, ASTHMA, PULMONARY DISEASE, CHRONIC OBSTRUCTIVE, HEALTH POLICY, HEALTH SERVICES RESEARCH

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Foreword

Dr Hans Henri P. Kluge

Regional Director, WHO Regional Office for Europe

In 2025, the year of the fourth High-Level Meeting of the United Nations General Assembly on the prevention and control of noncommunicable diseases (NCDs) in September and of the formulation of our WHO European Programme of Work 2.0 for 2026-2030, the urgency to address CRDs as one of the priority NCDs, has never been greater.

The respiratory system is not just a biological function – it is the breath of life. Yet for millions living with asthma, COPD or other CRDs each breath is a struggle, a reminder of the daily burden of disease. Behind every statistic is a person – often unheard – whose quality of life is diminished, whose suffering is real.

This first WHO European regional report "Chronic respiratory diseases and health equity by 2050: a spotlight on chronic obstructive pulmonary disease and asthma in the WHO European Region" developed in close collaboration with the ERS, shines a light on a long-standing challenge. CRDs affect over half a billion people globally with 81.7 million people in the WHO European Region alone, which contribute significantly to disability, premature death and economic loss – estimated at approximately US$ 21 billion annually for the Region.

The burden is uneven between and within the countries in the Region. Vulnerable populations bear the heaviest weight with limited access to essential treatment. The magnitude of CRD has been overlooked, with the disease receiving limited policy attention and underfunding over the past decades, CRD magnitude is overlooked by limited policy attention and underfunding over the last decades leading to under- and misdiagnosis, fragmented data and limited research in the region.

To change course, we must act decisively, by:

- Strengthen health systems: integrating CRD care into broader NCD strategies with stronger primary health services connected to transformed specialized care, ensuring sustainable financing and ensuring a life-course approach;
- Enforce prevention and health equity: tackling root causes - tobacco, air pollution, occupational risks – while prioritizing underserved communities and reducing disparities; and
- Foster research and innovation: setting measurable targets, investing in data, science and cross-border collaboration to drive solutions and close knowledge gaps.

This report is not just a document – it is a call to action. It is a testament to the power of innovation, solidarity and shared learning across our diverse Region. From the United Kingdom in the west, Portugal in the south, Finland in the north, Hungary in the centre, with Georgia and Kyrgyzstan in the east and with patient voices across the Region – countries are rising to the challenge of CRDs.

This report brings forward these and other country cases as inspiring possibilities and opportunities for changes. It shows us what is achievable with joint efforts, with people at the centre and with clear vision and courage.

Let this report inspire us all to act, to adapt and to accelerate progress – so that by 2050, every person, in every corner of our Region, can breathe freely and live fully.

Professor Silke Ryan

President, European Respiratory Society (ERS)

Breathing is one of the essential functions of life. We take approximately 22 000 breaths each day and yet, collectively, we place little importance on respiratory health.

In today's rapidly evolving world, we face enormous challenges. Chronic diseases, which are now the leading cause of death worldwide, represent a major global health crisis. As one of the leading NCDs, CRDs are often an underappreciated cause of death and disability that hinder progress towards United Nations guided NCD goals.

Alarmingly, the burden of CRDs is affecting populations disproportionately, with middle-and lower-income groups most impacted.

We have the power to change this; many of the risk factors driving the burden of disease are avoidable harms. Evidence-based and cost-effective interventions exist that can tackle the threats and inequities that are so prevalent. To achieve this change, we must take innovative, collaborative and strategic approaches to building resilient health systems.

The ERS urges a collective effort to address CRDs in the WHO European Region in this ambitious way and strongly supports collaboration with all stakeholders to focus on health promotion and disease prevention. We need to change the mindset. We need to devote our attention to improving respiratory health.

The ERS is playing a leading role in driving this change and to further pursue this goal, we have worked side by side with WHO, putting resources behind our collaboration, to allow this report to be produced.

This report – the first ever in the WHO European Region – is an essential step forward in accelerating progress. Although the spotlight is on asthma and chronic obstructive pulmonary disease, it provides us with a springboard to tackle the full spectrum of CRDs. We want to build on this, bringing together all available data, outlining gaps and challenges, and sharing promising strategies that can be adapted by countries across the Region to address respiratory health as a whole and to strive towards true equity.

Now, more than ever, it is important that we combine our efforts to support every individual living with a CRD and to prevent as many people as possible from becoming ill in the first place.

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Abbreviations

AI	artificial intelligence
BMI	body mass index
CF	cystic fibrosis
CIS	Commonwealth of Independent States
COPD	chronic obstructive pulmonary disease
COVID-19	coronavirus disease
CRD	chronic respiratory disease
CT	computed tomography
CVD	cardiovascular diseases
DALYs	disability-adjusted life years
EMA	European Medicines Agency
ENDS	electronic nicotine delivery systems
ERN-LUNG	European Reference Network on Rare Respiratory Diseases
ERS	European Respiratory Society
EU	European Union
GBD	Global Burden of Disease
GHO	Global Health Observatory
GOLD	Global Initiative for Chronic Obstructive Lung Disease
GP	general practitioner
GYTS	Global Youth Tobacco Survey
HIS	health information system
ICS	inhaled corticosteroid
ILD	interstitial lung disease
LABA	long-acting beta-agonists
LAMA	long-acting muscarinic antagonists
NHS	National Health Service
NCD	noncommunicable disease
NRT	nicotine-replacement therapy
OECD	Organisation for Economic Co-operation and Development
OMI	Oslo Medicines Initiative
OOP	out-of-pocket
PHC	primary health care
PM	particulate matter
QI	quality improvement
RSV	respiratory syncytial virus
SABA	short-acting beta-agonists
SDG	Sustainable Development Goal
STEPS	STEPwise approach to NCD risk factor surveillance
TB	tuberculosis
TPE	therapeutic patient education
UHC	universal health coverage
WHO FCTC	WHO Framework Convention on Tobacco Control
YLD	years lived with a disability

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From the first breath to the last, maintaining strong lung capacity ensures a lifetime of vital capacity and resilience.

Why this report matters

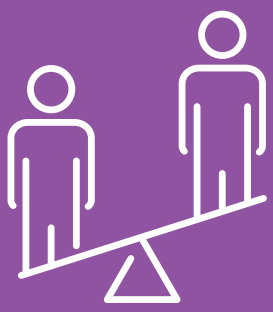
Chronic respiratory diseases (CRDs) like chronic obstructive pulmonary disease (COPD) and asthma are often preventable and manageable – yet they remain one of the leading causes of death, disability and inequality across the WHO European Region. This first-of-its-kind regional report on CRDs reveals the urgent need for action.

Three chapters that drive change

1.

The burden and inequities

Understand the trends, disparities, and economic toll of CRDs across the Region



2.

Health system transformation

Explore policy options, integrated care models, and country case studies

3.

Research and innovation

Discover how data, AI, and digital health can revolutionize CRD prevention and care if wisely implemented

Six powerful questions every country must answer

1.

How can we reduce COPD-driven CRD mortality (80% of cases) and achieve zero preventable asthma deaths in children?

2.

What will it take to close the East–West gap in CRD mortality and care in the Region?

3.

Are we doing well in managing CRDs now?

4.

Are our health systems ready to manage the 23% projected rise in COPD by 2050?

5.

How can we better integrate tobacco control, air quality with CRD prevention and control into joined-up strategies?

6.

Are we investing enough in CRD research, innovation, and equitable access to care?

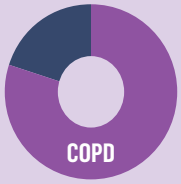
CRDs in the WHO European Region

CRDs are the **sixth leading cause of death** in the Region

81.7 million people were living with CRDs in 2021

6.8 million people are newly diagnosed with CRDs each year

Almost **400 000 deaths** are due to CRD every year



Nearly 80% of all CRD deaths are caused by COPD

The productivity loss between ages 30 and 64 years due to CRDs is **US$ 20.7 billion**

Key messages for action

1. **CRDs are largely preventable and manageable, yet they remain a major contributor to the NCD burden in the WHO European Region**. Many deaths result from complications and co-morbidities – making their true impact on all-cause mortality easy to overlook but critical to address.

2. **Progress in CRDs is being undermined by growing in-country and regional inequalities, placing a heavy – yet under-measured – economic burden on individuals, societies, and governments,** with the most vulnerable communities hit hardest and fastest.

3. **Embedding CRD care into universal health coverage** will close equity gaps, expand access, and improve outcomes.

4. **Stronger governance and integrated NCD strategies – backed by streamlined funding and collaboration** – are essential to prevent CRDs and meet the needs of people living with CRDs.

5. **High-quality health systems – built on equity, timeliness, and integration** – can deliver better CRD outcomes and build trust.

6. **Integrated, people-centered care is the only way forward** – across prevention, diagnosis, treatment, rehabilitation and palliative care

7. CRD prevention is here but still overlooked – **investing in primary care and its CRD diagnostic capacity supported by well-trained teams and smart tools** can make a difference.

8. Unlike other major NCDs, **CRDs lack robust global targets** – hindering national prioritization and slowing progress.

9. **Sustained funding can boost research and innovation, enabling faster, evidence-based decisions** in usual times and in crisis.

10. **Cross-regional collaboration and investment in research tools** will drive public health innovation and CRD prevention and control.

11. **Digital health and AI offer transformative potential** – but must be studied, validated and equitably implemented.

Join the movement

Let's build CRD-resilient health systems and ensure that by 2050, everyone in the WHO European Region can breathe freely.

Introduction

The human respiratory system is a cornerstone of our health and well-being, intricately connected to other vital systems, enabling each person to live vibrant and active lives. From the first breath to the last, maintaining strong lung capacity ensures a lifetime of vital capacity and resilience. However, CRDs, though often preventable and manageable, continue to pose a significant challenge as they contribute to the rising burden of NCDs worldwide, including in the WHO European Region, where they exacerbate issues of morbidity, disability and mortality – especially in relation to cardiovascular diseases (CVD) and cancer, the leading causes of death globally.

CRDs, along with CVD, diabetes and cancers, are the NCDs that account for 90% of deaths and 85% of years lived with disability in the WHO European Region *(1)*. To address the NCD burden, these four NCDs along with mental health conditions and five common risk factors, were prioritized as the "5 by 5" NCD agenda globally. This first report in the WHO European Region dedicated to CRDs provides an overview of the current situation as well as trends, challenges and opportunities to support political commitments, accelerate health systems response and promote research and innovation trajectories.

In the hierarchy of diseases used in the WHO Global Health Estimates and in this publication, CRDs include several respiratory conditions that affect the lower airways and other structures of the lungs. This group includes asthma, COPD, bronchiectasis, cystic fibrosis (CF), interstitial lung disease (ILD) and pulmonary sarcoidosis, pneumoconiosis and other chronic upper respiratory tract conditions *(2)*. The professional respiratory community uses the term CRD across a wider spectrum, including similarly important respiratory conditions that are highly prevalent or rare conditions that carry a higher disease burden to the population and health systems. These include lung cancer, sleep-related breathing disorders, pulmonary arterial hypertension and others which can have a high prevalence and high burden on the population and health systems. The second chapter of this report highlights the interconnectedness of health system responses to common and rare conditions and provides several country examples on how countries address such a complex agenda.

COPD and asthma are the most prevalent CRDs in the WHO International Classification of Diseases grouping, with 80% of CRD deaths caused by COPD. Future projections indicate that globally COPD cases will increase by 23% from 2020 to 2050 with the largest effect on women and in low- and middle-income regions *(3)*. As indicated in the *Global Asthma Report 2022 (4)*, deaths due to asthma are of serious concern because there is evidence to suggest that many of these cases are manageable, especially in the younger age groups. However, high hospitalization and mortality rates in some countries in the Region demonstrate the gaps in effective asthma management.

From the public health perspective, COPD and asthma conditions should be addressed by all countries in the Region regardless of income level. Consequently, this report places a spotlight on COPD and asthma, and throughout the document the term CRD is used for all noncommunicable chronic respiratory conditions.

Worldwide, it has been estimated that 545 million people have a CRD *(5)*. According to the Global Burden of Disease, millions of children and adult population were living with CRDs in the WHO European Region in 2021, with 6.8 million people newly diagnosed each year *(6)*. The productivity loss between the ages of 30 and

74 years due to CRDs cost the Region US$ 20.7 billion. The frequency of acute exacerbations and severity of many CRDs are considered major drivers of ill health, with the burden expected to increase considerably in the 21st century due to population growth and ageing. Moreover, this burden of disease is unequally spread across the Region.

The risk factors for CRDs are widespread and include harmful environmental, occupational and behavioural inhalational influences. Tobacco stands out as the primary avoidable risk factor for a range of respiratory and non-respiratory conditions, with damage starting as soon as the first cigarette is smoked. Additionally, the rise of electronic nicotine delivery systems (e-cigarettes) and heated tobacco products adds complexity to this issue, posing new risks that affect both individuals and the broader population.

Indoor and outdoor air pollution, which refers to harmful substances present in the air we breathe both inside homes and in the environment, is the second most significant risk factor for CRDs overall and the leading risk factor for children. Other major contributors to CRD include occupational exposures, extreme temperatures and metabolic factors such as high or low body mass index, developmental problems in childhood and respiratory infections.

Within the past decades, as a result of effective prevention measures and new treatment approaches, CRD mortality rates have been declining globally and in the Region. However, their contribution to cardiovascular, cancer and all-cause mortality, to the NCD burden, to a diminished quality of life, and to inequities and inequalities across the Region and within each country requires high attention and strong actions supported by adequate investments. Very often, comorbidities and complications of CRDs combined with other underlying factors, described in this report, can lead to an underestimation of the burden attributed to CRDs in health statistics, suggesting that their impact on public health is greater than is currently recognized. Personal accounts are included throughout the report to give voice to lived experiences and illustrate the individual burden (see Vignettes 1–5).

Unfortunately, due to complexity with their definitions and absence of unanimously agreed targets, CRD surveillance and monitoring systems are not well designed. Determining the real magnitude of the CRD burden is fundamental to identifying unmet needs at population level. There has been a reduction in investment for CRD research, compared with other NCDs, where epidemiological studies have defined their global burden and priority actions; there are only a handful of population-based studies on CRDs.

The United Nations 2011 *Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases* recognized that the incidence and impacts of NCDs, including CRDs, can be largely prevented or reduced through evidence-based, affordable, cost-effective, population-wide and multisectoral interventions *(7)*. This commitment is echoed in the 2030 Sustainable Development Goals (SDGs), particularly Goal 3 *(8)*, which aims to ensure healthy lives and promote well-being for all at all ages, SDG 3.4 on the reduction of premature mortality from NCDs by one third by 2030, and nine global NCD voluntary targets *(9)*. WHO estimated in 2018, that if all countries put in place the most cost-effective interventions, the so called, NCD “best buys”, by 2030 they will not only save millions of lives, but would also see a return of US$ 7 per person for every dollar invested.

Achieving these goals requires integrated approaches that address both prevention and treatment measures at policy level, in health system strengthening, health equity and social determinants of health. Having policies is not enough. There is a need to prioritize resources and implementation. Accountability of the government implementing these policies and action plans is equally crucial.

WHO advocates for a dual-track approach for NCDs: one – to accelerate progress in countries with unfinished agendas by 2030 – the race to the finish; and two – to contribute to the design of the Vision 2050 at the upcoming United Nations Fourth High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs and Mental Health, in New York, United States of America, in September 2025.

This regional report offers a comprehensive overview of the burden of CRDs and the inequalities that persist in our communities. This report can serve as a platform for countries, the NCD and respiratory health community, civil society and people with lived experience. It can provide a strong argument for addressing challenges, gaps and the needs of people living with CRDs. It showcases potential health system solutions for reducing inequities, harnessing research and innovation to drive meaningful changes across the WHO European Region and at a global scale.

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Methods

To compile comprehensive data and evidence for this report, a rigorous methodology was employed, encompassing several approaches:

A desk literature review was conducted to identify relevant studies published in peer-reviewed journals, grey literature, interviews with country representatives and other sources. Electronic databases such as WHO Global Health Observatory (GHO), Global Burden of Disease (GBD), the Organisation for Economic Co-operation and Development (OECD), and Eurostat were also reviewed; further repositories including PubMed, Embase and the Cochrane Library were searched using predefined search terms and criteria. In addition, personal suggestions of key references to global and regional reports on CRDs, WHO country capacity surveys and others were considered by the authors and external experts. The review largely focused on recent publications (within the last 5 years) to capture the latest evidence on CRD epidemiology, risk factors, burden and interventions, plus landmark and classical studies and their references. However, due to scarcity of research in the CRD area, big publications for previous years were also included.

Expert consultation was sought from a multidisciplinary panel of researchers, clinicians, public health experts and policymakers with expertise in CRDs from all over Europe and beyond. Expert input was solicited through stakeholder meetings and virtual discussions, allowing for the integration of diverse perspectives and insights into the technical report. Expert evidence informed the interpretation of data, identification of research gaps and the formulation of recommended actions for CRD prevention and control strategies.

Two-round Delphi methodology was followed to identify and rank selected country case examples to showcase for good practice and their demonstrated effectiveness.

By employing the above-mentioned methodological approaches, this technical report aims to provide a robust, evidence-based assessment of the regional burden, epidemiology and determinants of CRDs, while also offering actionable insights for policy development, resource allocation, public health interventions and country experience.

The **CRD definition** used in this report follows the WHO reporting system based on coding driven by the International Classification of Diseases**.**

There have been many initiatives to define the burden of respiratory diseases in the countries of the WHO European Region. Most of the initiatives are dedicated to respiratory health, including acute and chronic, communicable and noncommunicable respiratory conditions, with only a few specifically dedicated to CRDs *(1–4)*.

Due to variability in the definitions of CRDs and the inclusion of different conditions in the analyses, as well as differences in country coverage, comparing the burden of CRDs across various initiatives is nearly impossible. Additionally, unlike other major NCDs, such as cancer, CVD and diabetes, which are well-documented through extensive studies and registries, CRDs are significantly underrepresented in population-based research. This underrepresentation leads to a scarcity of data and variability.

The grouping of CRDs was driven by the International Classification of Diseases used by the Member States' reporting system to WHO. For clearer epidemiological analysis and to avoid duplication in representation of various conditions in different sources, the respiratory conditions such as lung cancers (included in all cancers), sleep-related disorders (included in neurological conditions) and pulmonary hypertension (included in diseases of circulatory system) are not included in the burden estimations.

However, there is an understanding that all respiratory conditions have commonalities in prevention, detections, treatment and managements, therefore in the chapters on health systems response, and research and innovation, there are several examples of how different approaches can be integrated within a wider range of respiratory conditions.

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1 All references were accessed 5 June 2025.

The human respiratory system is a cornerstone of our health and well-being, intricately connected to other vital systems, enabling each person to live vibrant and active lives.

Chapter 1

Health disparities in focus: the impact of chronic respiratory diseases in the WHO European Region

The WHO European Region comprises 53 culturally diverse countries, spanning from the Atlantic to the Pacific Oceans, with one billion people living within its territory.

The Region encompasses various socioeconomic landscapes, demographics, rich histories, diverse populations and health systems. It represents a tapestry of health priorities, health challenges, different levels of health infrastructure development and systems striving for equitable health outcomes for all.

We are living in an era of multiple intertwined crises, including pandemics, wars, natural disasters, climate change, political instability and refugee and migrant flow, along with ageing, disinformation and misinformation which amplify the burden on health systems across the Region. These challenges exacerbate rising inequities and strain systems already struggling with chronic conditions, antimicrobial resistance, vaccination coverage and protecting vulnerable populations.

Understanding CRDs: burden and trends in the WHO European Region

KEY MESSAGE 1

Even though CRDs are often preventable and can be effectively managed, they continue to be significant contributors to the growing burden of NCDs in the WHO European Region.

Determining the burden of CRDs is fundamental to identifying unmet needs at population level and to reducing individual suffering and providing a policy argument to address this burden as part of the priority NCDs.

CRDs pose a significant challenge as they contribute to the rising burden and inequalities in the WHO European Region, where they exacerbate issues of morbidity, disability and mortality (Fig.1.1).

Fig. 1.1. CRDs in the WHO European Region

Source: Authors.

Over the last three decades, the age-standardized death rate from CRDs in the WHO European Region had been steadily decreasing, with a slight increase since 2019 after the coronavirus disease (COVID-19) pandemic, echoing the global trend. However, the burden of CRDs in the 53 countries of the Region is quite diverse in terms of prevalence, mortality and disability-adjusted life years (DALYs).

Additionally, due to the multiple crises that have been ongoing in the Region rising inequalities both across the Region and within individual countries is a matter of concern, regardless of the level of health system development or country income.

KEY MESSAGE 2

In the WHO European Region, progress in addressing CRDs is being jeopardized by inequalities and emerging challenges, which means that many disadvantaged populations are feeling the impact more acutely.

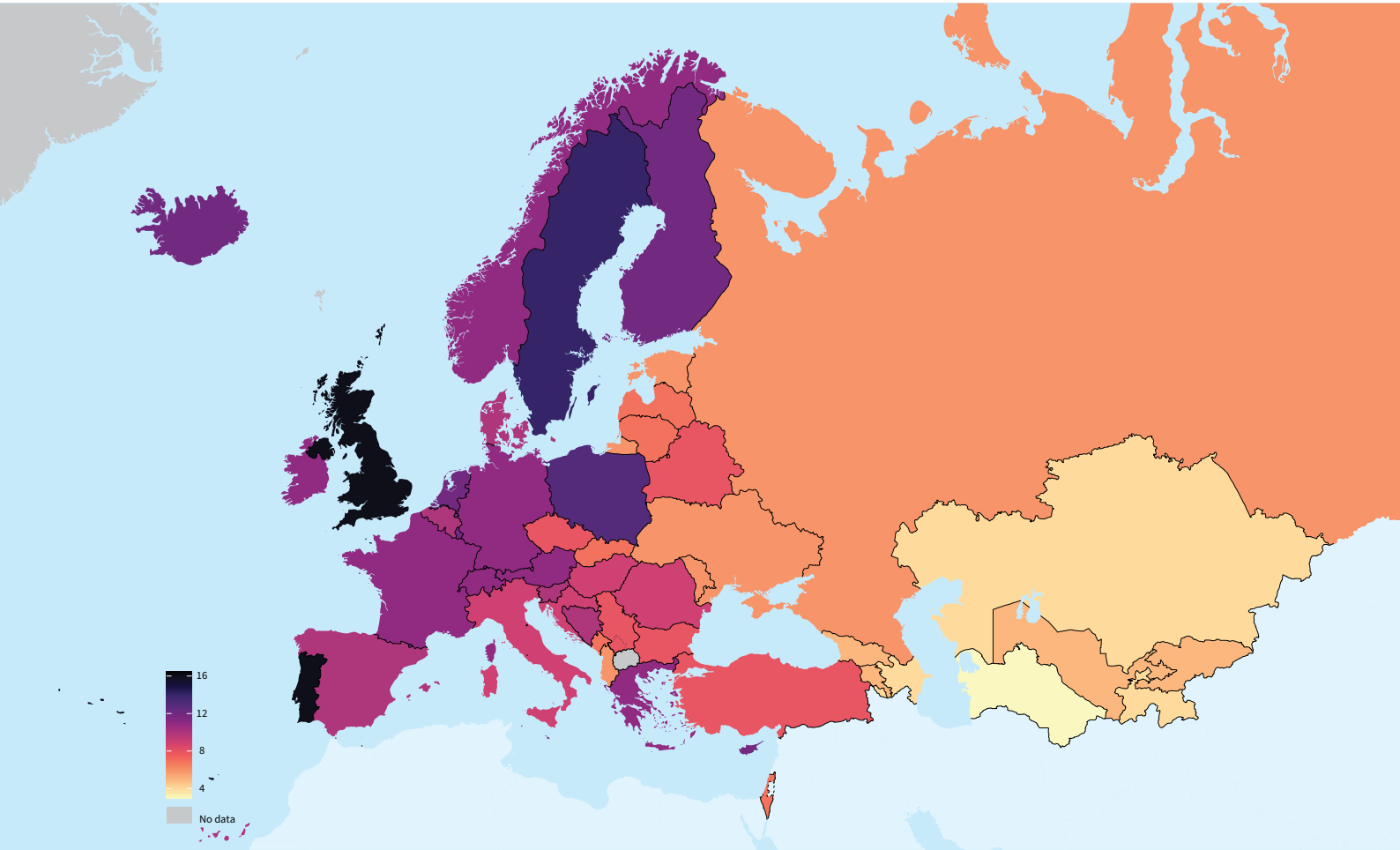
Prevalence and incidence

According to the GBD, in the WHO European Region in 2021:

- 81.7 million people (from all ages, both sexes) were living with CRDs; and
- 6.8 million people were diagnosed with CRDs.

Within the Region in 2021, prevalence varied between three cases per 100 people (e.g. in Turkmenistan) to 16 per 100 people (e.g. in the United Kingdom), representing a four-fold difference. Fig. 1.2 also demonstrates a gradient of higher prevalence in the west of the Region moving to lower prevalence in the east of the Region.

Fig. 1.2. Prevalence of CRDs as a percentage, both sexes, all ages



Source: GBD 2021 *(1)*.

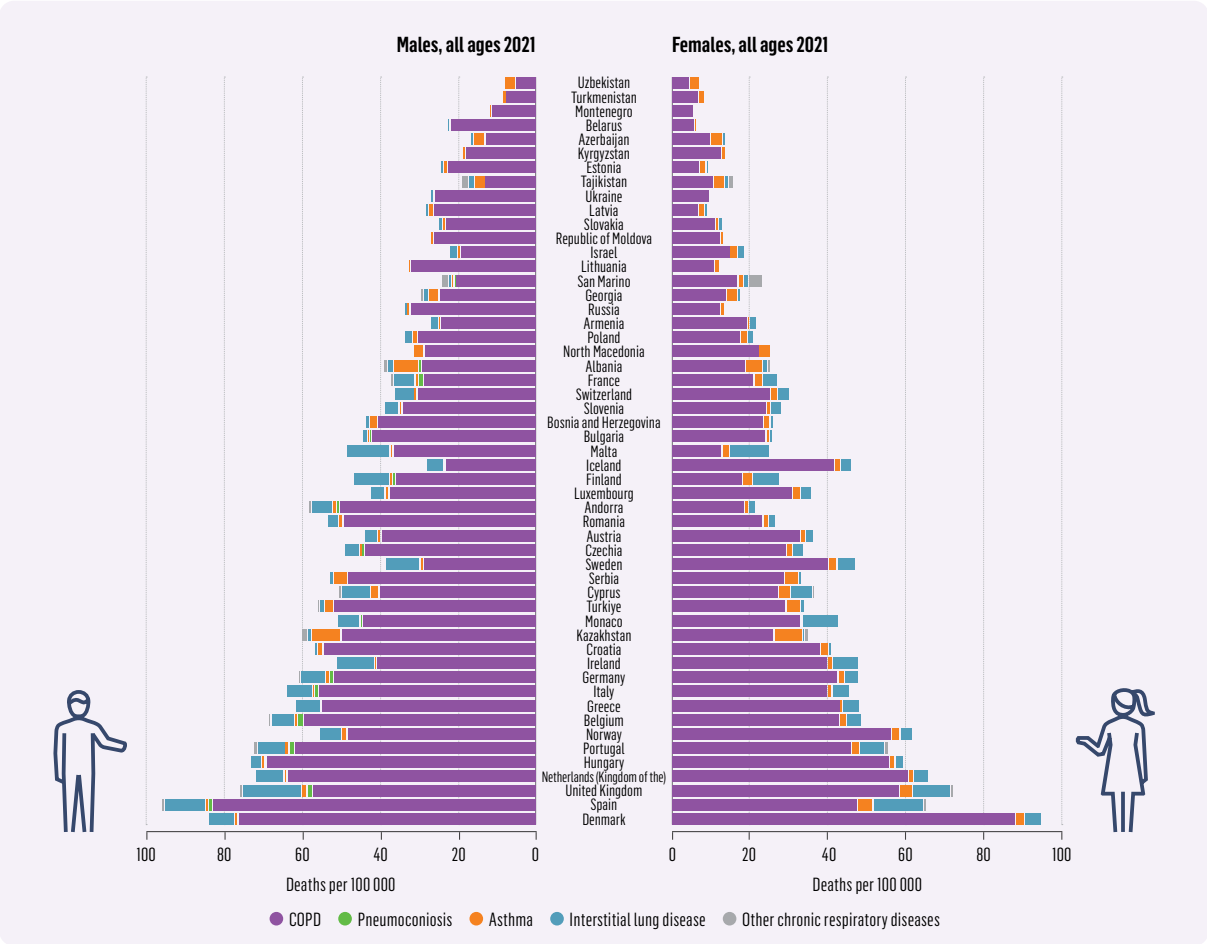
These differences can be partially explained by variation in risk factor distribution, such as smoking prevalence. However, this is an incomplete assessment of true CRD prevalence and burden as there is a lack of uniformity in the diagnosis, reporting and monitoring of CRDs across countries, as well as different diagnostic capacity. These issues present a further challenge to addressing the burden of CRDs and are explored further in this chapter.

Mortality

CRDs are the sixth leading cause of death in the WHO European Region, causing approximately 400 000 deaths every year *(2)*. Nearly 80% of all CRD deaths in the Region are caused by chronic obstructive pulmonary disease (COPD) (78.6%) *(3)*.

Over the past decades, CRD mortality had been decreasing globally with the best reduction trends in the WHO Region of the Americas and the WHO European Region, although there has been a slight increase since 2019. However, there is a huge heterogeneity in mortality rates between the countries in the Region, also characterized by variations in sex distributions (Fig. 1.3).

Fig. 1.3. Age-standardized death rates due to CRDs in the WHO European Region, all ages, disaggregated by sex, 2021



Source: GBD, 2021 *(1)*.

Despite the lower prevalence of CRDs in the eastern part of the WHO European Region; the Central Asian Republics have the highest age-standardized death rates of asthma (Fig. 1.4) and COPD (Fig. 1.5) in the Region, followed by the Western Balkans.

Asthma death rates are significantly lower in general and in European Union (EU) countries, however, the death rates are almost six times higher in the Central Asian Republics (Fig. 1.4).

COPD death rates are around two-fold higher in the male population in the Region, however, the difference is larger in Commonwealth of Independent State (CIS) countries (Fig. 1.5).

Fig. 1.4. Age-standardized death rates due to asthma by subregional groups of countries in the WHO European Region, all ages, by sex, 2019

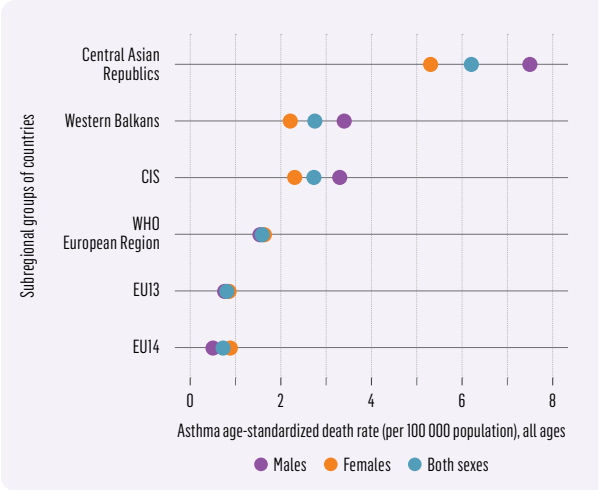


Fig. 1.5. Age-standardized death rates due to COPD by subregional groups of countries in the WHO European Region, all ages, by sex, 2019

Legend:
Central Asian Republics: five Central Asian Republics including Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.
Western Balkans: Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia as well as Kosovo[a].
CIS: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
WHO European Region: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands (Kingdom of the), North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Türkiye, Turkmenistan, Ukraine, United Kingdom and Uzbekistan.
EU13: EU member states who have joined since 2004: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.
EU14: EU member states who have joined prior to 2004; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands (Kingdom of the), Portugal, Spain and Sweden.

[a] All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999).

Source: WHO Global Health Estimates, 2019 *(3)*.

Data on risk factor attribution also helps shed light on the drivers of CRD mortality. These risk factors are explored later in this chapter but there is variance across the Region in the causes of CRD-related deaths.

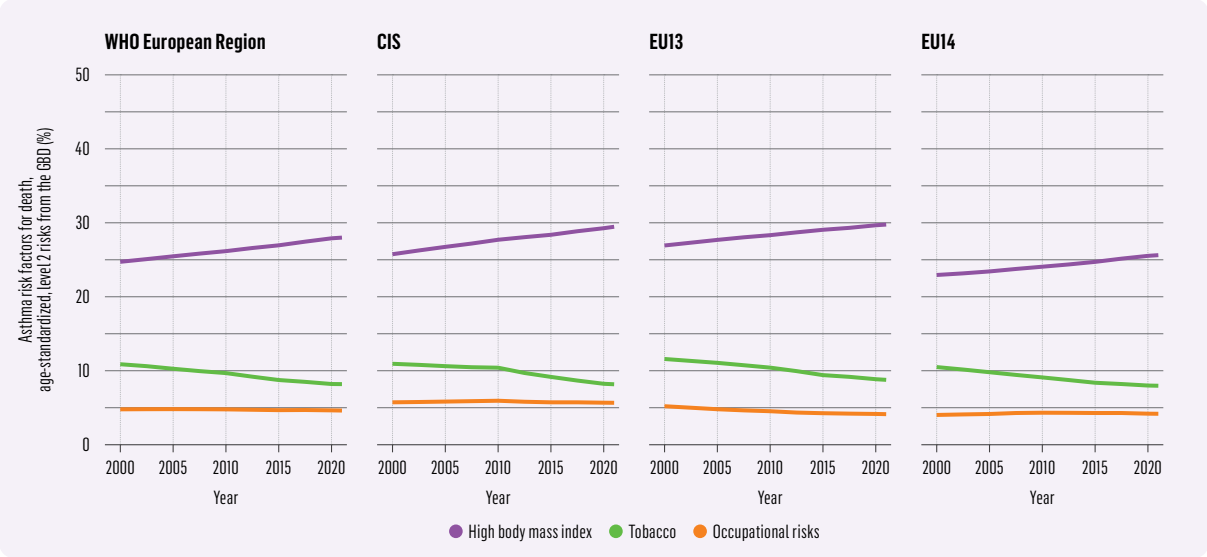
Overall, there has been a notable increase in asthma mortality due to metabolic risks (e.g. asthma linked with obesity), while asthma mortality linked to behavioural risks (e.g. smoking) is decreasing slightly. Asthma mortality associated with occupational risks is relatively stable (Fig. 1.6).

Over the last two decades, COPD deaths related to its main risk factors – tobacco use and air pollution – have decreased, but there are still concerns with worryingly high tobacco-related death rates (Fig. 1.7).

It is also clear that CRDs can be considerable contributors to mortality for cardiovascular diseases (CVD), cancers and other causes of death and vice versa. Some studies in different countries suggest that patients with COPD die of other respiratory or non-respiratory diseases, such as pneumonia, respiratory failure, cancers (mainly lung cancer) and others more often die ofcardiovascular causes *(4–8)*.

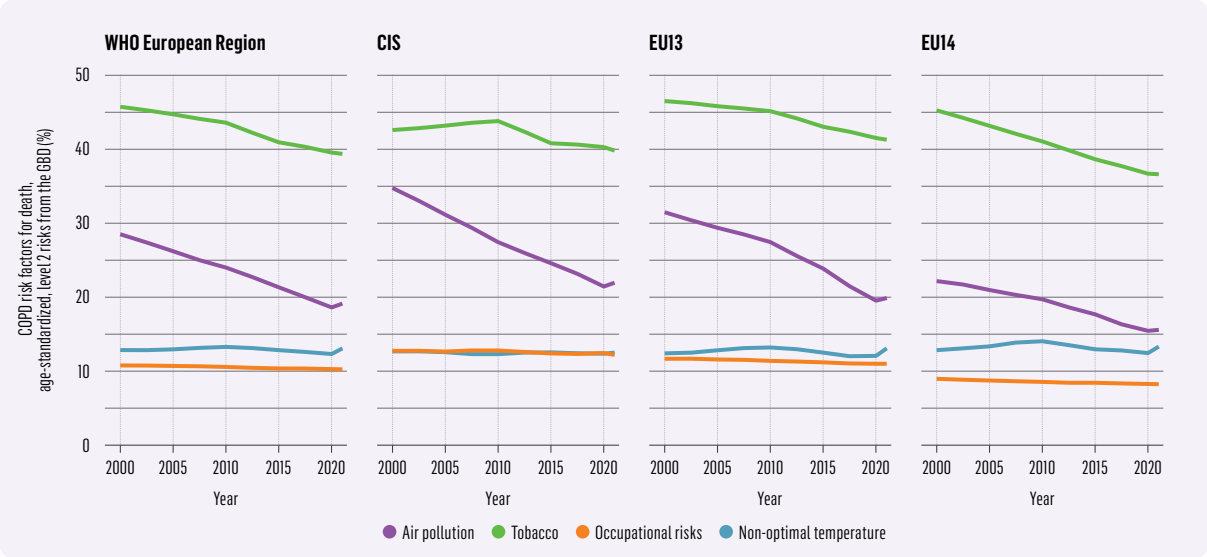
Reducing the burden of CRDs can contribute to a decrease in mortality and in the burden of CVD and cancers; the leading causes of death in the Region and globally. The estimations of these benefits need further exploration and can support priority-setting and help measure the effects of evidence-based preventive and integrated care measures.

Fig. 1.6. Percentage of asthma-related mortality attributed to risk factors, by subregions, all ages, both sexes, 2021



Legend: GBD classifies risks in a hierarchy containing four levels. At Level 2, there are 20 risk categories, including air pollution, child and maternal malnutrition, and high body mass index.
Source: GBD, 2021 *(1)*.

Fig. 1.7. Percentage of COPD-related mortality attributed to risk factors, by subregions, all ages, both sexes, 2021



Legend: GBD classifies risks in a hierarchy containing four levels. At Level 2, there are 20 risk categories, including air pollution, child and maternal malnutrition, and high body mass index.
Source: GBD, 2021 *(1)*.

Disability and quality of life

In terms of DALYs, CRDs were responsible for 3.5 million DALYs in 2021 in the WHO European Region and the burden is projected to rise *(9)*. The GBD estimated that COPD-related DALYs would move from sixth position among the top 20 leading causes in 2022 to fourth position by 2050. COPD is likely to remain the third leading cause of death in 2050 after ischaemic heart disease and strokes, globally, as in 2022 *(10)*. Additionally, this growth is projected to be largest among women and in low- and middle-income countries *(11)*.

Countries in the east of the Region, such as Tajikistan, Turkmenistan and Uzbekistan, reported the lowest DALYs and years lived with a disability (YLDs) rate for both males and females; Denmark, Greece, Netherlands (Kingdom of the), Portugal and the United Kingdom have the highest rates (Fig. 1.8) *(12)*.

Fig. 1.8. DALYs and years lived with a disability rates (per 100 000 population) due to CRDs, all ages, 2021

Source: GBD, 2021 *(1)*.

Western European countries are likely to see this higher burden and disability rates due to higher diagnostic capacity, risk factor distribution (e.g. tobacco use), better detection of CRDs and health information systems (HIS), along with the effect of other factors such as longer life expectancy.

Fig. 1.8 also illustrates that the contribution of COPD to the CRD DALYs is dominant, whereas the contribution of asthma is almost equal to COPD in terms of disability and quality of life. Many studies and GBD estimates also suggest that the contribution of different CRDs to its burden changes over the life course. In fact, a greater proportion of asthma and other early-onset conditions begin in early childhood, while the impact of COPD becomes more evident starting from ages 15 to 19.

Vignette 1. People's experience of living with CRD

Hilary is 44 years old, living with severe asthma in France. She is the Patient Chair of the European Respiratory Society's Severe Heterogeneous Asthma Research collaboration, Patient-centred (SHARP) Clinical Research Collaboration.

I was first diagnosed with allergic asthma when I was eight. It was moderate for much of my life, but when I turned 35, it suddenly became very severe and I began experiencing constant exacerbations. I am now 44 and despite taking many different types of medication, I am extremely limited in my daily activities.

My biggest trigger is cat and dog dander, so I cannot visit people's houses and we cannot have guests who have pets at our house as they bring the allergens on their clothing, bags and shoes. I also struggle to be around people out in public who may have pet hair on them. This affects our whole family as my husband and son also have to be careful to avoid animals when they spend time with friends.

As a result of spending many years on prednisone to treat my asthma, I developed adrenal insufficiency, so I now have to deal with the ups and downs of that condition too, which is also difficult to manage. I have daily and ongoing symptoms from both conditions and am usually hospitalized at least once per year for one of the conditions.

I used to have a very busy career and life. I served on boards and ran half marathons and loved to hold dinner parties. It is sad and strange to suddenly find myself stuck at home so much of the time doing part-time, remote work and volunteering virtually.

My diseases impact my life in every single way, every single day.

I want to see more research focused on the different types of severe asthma and more access to specialists who understand this disease. I found mine through the ERS SHARP Clinical Research Collaboration, but specialist centres are lacking across the European Region.

Policy needs to focus on removing risk factors for developing CRD and also the things that trigger exacerbations. For me and millions of other people with allergic asthma, this would be encouraging businesses to be more thoughtful about whether to allow non-service animals in public places.

We can prevent asthma from becoming severe in some cases by introducing biologics earlier. We should do whatever we can to keep the prices of biologics low and make them widely available before lung damage happens.

Importantly, we should also promote the involvement of patients in research: patients are the experts in their condition – we can help identify and prioritize research questions; ensure research questionnaires and other tools are well-designed; disseminate research findings to our support networks; and democratize health and medical research which is often funded using public money.

Hilary Hodge

The economic toll of CRD: insights from the WHO European Region

KEY MESSAGE 3

CRDs contribute to widening health inequalities in the WHO European Region by placing a significant economic burden on governments, societies and individuals – a burden that remains insufficiently measured.

NCDs, including CRDs, are responsible for significant health expenses worldwide. These diseases require long-term care and management, which leads to substantial direct and indirect costs. A 2011 model forecasted that the five leading NCDs could cost the global economy around US$ 47 trillion between 2010 and 2030, or an average of more than US$ 2 trillion per year.

These conditions often strike when people are in their most productive years, with more than 18 million people dying prematurely between the ages of 30 and 69 each year globally *(13)*. NCDs decrease productivity and human capital, while increasing health-care costs from serious illness, disability and premature death. NCDs lead to poverty; they affect the economies of countries and millions of families. Each year, out-of-pocket (OOP) health expenses force approximately 100 million people worldwide into extreme poverty *(14)*.

WHO calculated that the cost of productivity loss between the ages 30 and 74 years from CRDs in the WHO European Region was US$ 20.7 billion for the last available year, or 3.7% of the total cost of productivity loss caused by the four major NCDs.

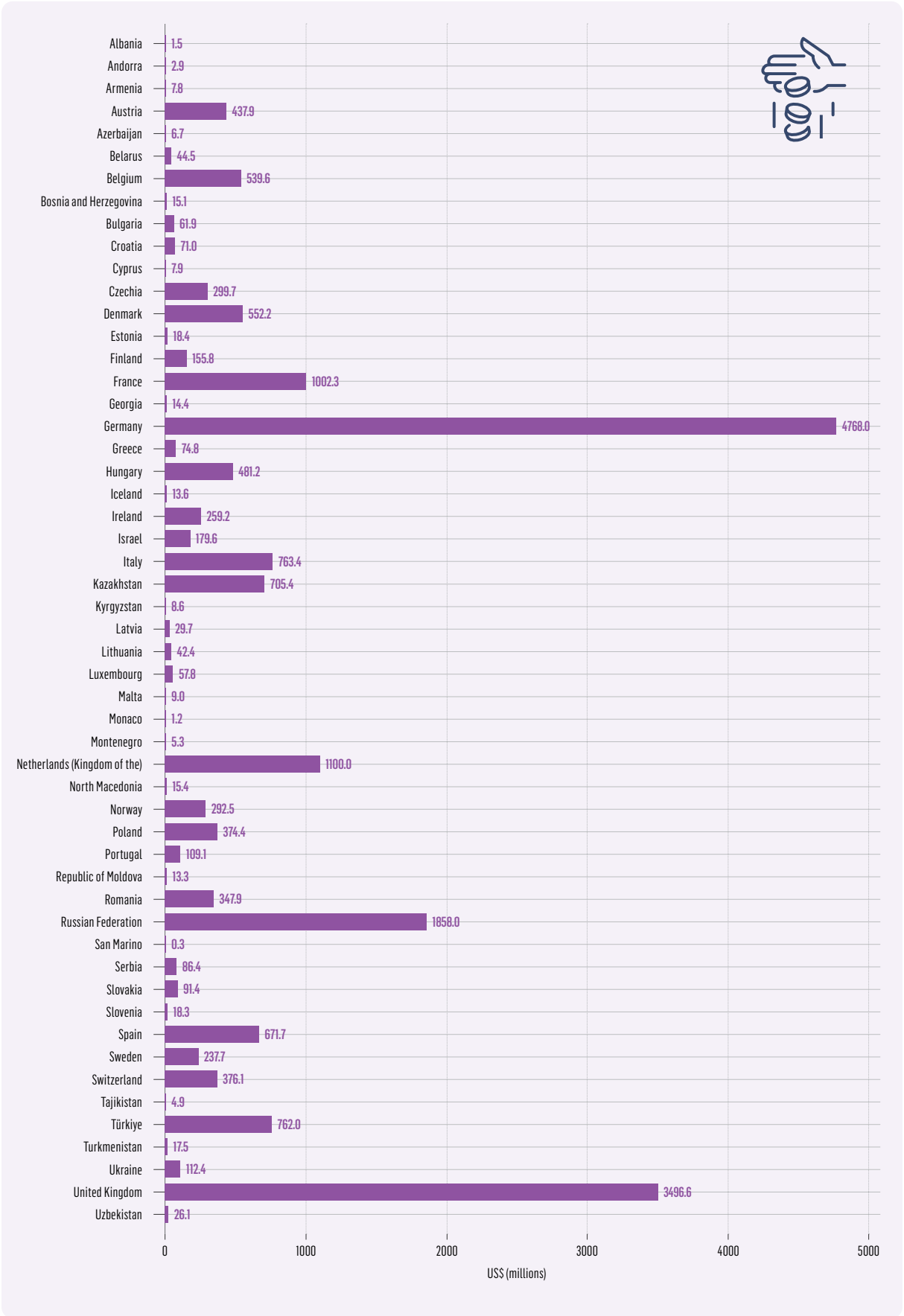
There are large differences between countries. France, Germany, the Russian Federation and the United Kingdom all saw productivity losses of more than US$ 1 billion, while the losses of Albania, Monaco and San Marino were under US$ 2 million (Fig. 1.9).

The productivity loss given in Fig. 1.9 demonstrates the absolute economic burden for the 53 countries in the Region and provides an estimated amount for each individual country in the last available year. For this purpose, absolute numbers are better suited and more powerful than rates. Of course, it is obvious that countries with bigger economies and a larger population will have greater productivity loss and require more investment than others.

As mentioned above, CRD productivity loss costs include both direct and indirect expenses. Direct costs are those immediately related to managing CRDs. These include hospital admissions, emergency department visits, clinical visits in both primary and secondary care, and treatments. Treatments can be pharmacological, such as inhaled medicines, or non-pharmacological, such as pulmonary rehabilitation and lung transplantation.

For example, in 2021, approximately 4.2 million patients with respiratory conditions were discharged from EU hospitals *(15)*. In the same year, there were, on average, 117 hospital admissions per 100 000 population in the EU, of which 84% were due to COPD *(16)*. High impact interventions for COPD and other CRDs, such as pulmonary rehabilitation for COPD, medication optimization and personalized action plans for people with asthma can improve outcomes and reduce health spending. It was also estimated that in the EU around 4% of avoidable mortality due to COPD is preventable.

Fig. 1.9. Productivity loss from CRDs in the WHO European Region, last available year



Source: WHO Regional Office for Europe estimates, last available year.

Admission rates for COPD and asthma varied more than 12-fold across EU countries, with Croatia, Italy and Portugal reporting the lowest rates, and Denmark, Ireland and other European countries such as Norway and the United Kingdom reporting the highest rates. These latter four countries also have among the highest rates of COPD prevalence in Europe.

The direct cost of COPD in the EU was estimated to range from US$ 1 889 in Greece to US$ 11 787 in Norway, per patient per year *(17)*.

Tobacco use and air pollution along with other NCD risk factors increase the risk of becoming sick and death from CRDs as well as having a larger economic impact.

Indirect costs mostly include productivity losses, such as being absent from work or school, presentism with low productivity or education capability, or early retirement due to CRDs. NCDs cause lasting social and economic harm to individuals, their families, communities and countries.

CRDs through the life course: highlights for the WHO European Region

All stages of a person's life are intertwined and adopting a life-course approach and taking early action can improve health outcomes in later life. This is particularly relevant in the field of CRDs as numerous factors during early childhood can contribute to the risk of developing CRD in adulthood (Fig. 1.10).

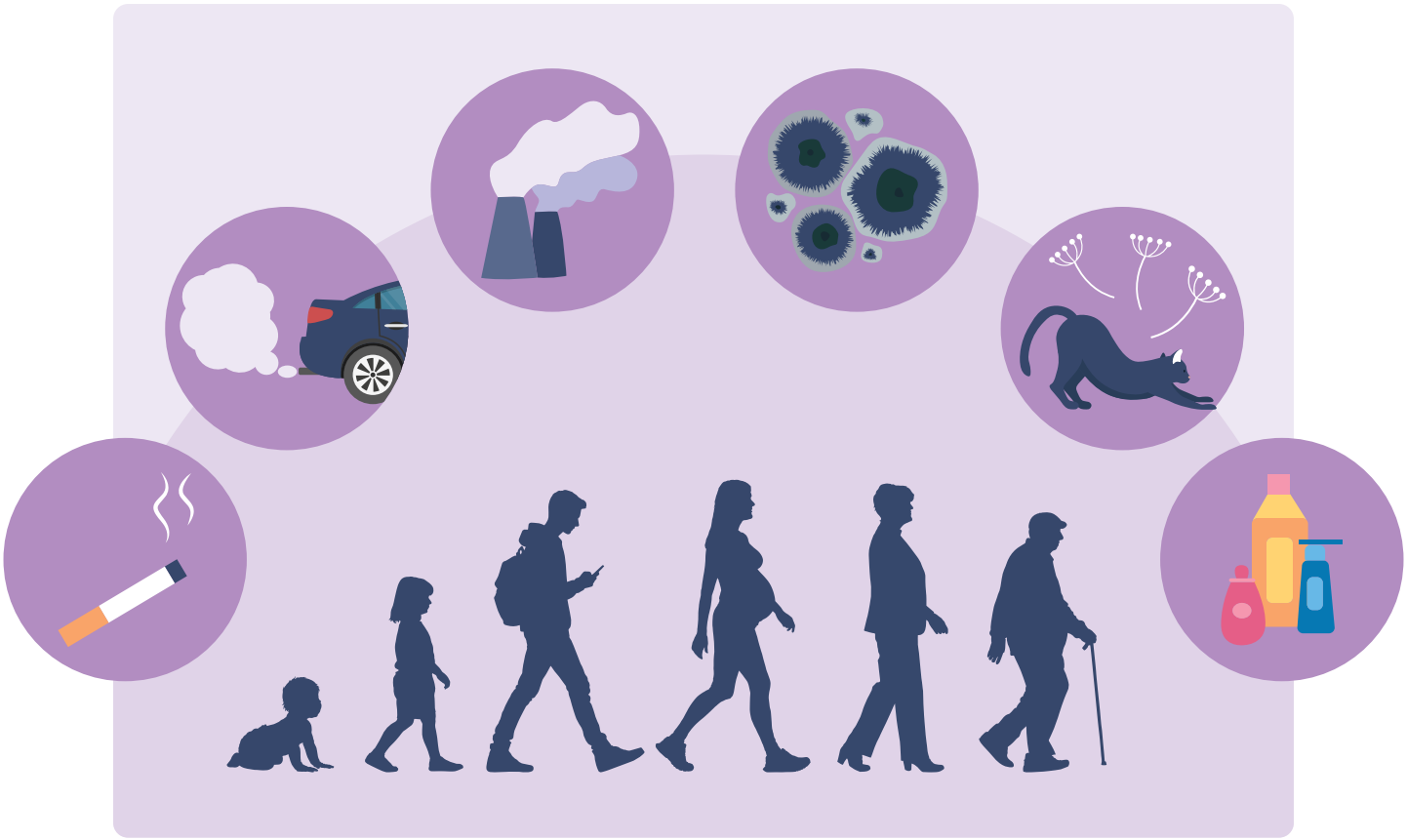
Environmental tobacco smoke exposure (including maternal smoking), preterm birth, lower respiratory tract infections, allergies and childhood asthma as well as air pollution, climate change and social disadvantage negatively impact lung growth and contribute to lung function decline in later life, with some of these factors acting as early as from conception.

There is growing evidence that environmental factors can change how our genes work, making us more prone to asthma *(18)*. These changes, known as epigenetic changes, can be passed down to future generations, increasing the likelihood of asthma and COPD.

If such epigenetic changes happen during pregnancy, they can affect not only the unborn baby but also his/her future children. This is called an intergenerational effect. If the changes affect generations beyond the grandchildren, it's called a transgenerational effect. Some evidence shows that environmental factors such as smoking and air pollution can have these long-lasting effects on lung health *(19–21)*.

There is a lack of awareness about some of these risk factors across the life course and a need to encourage people to keep their lungs healthy as a fundamental part of future health.

Fig. 1.10. Factors contributing to lung health over the life course



Source: Authors.

Being aware that lung disease trajectories begin in the womb and that lung health is at risk throughout each person's lifetime *(22)*, it is essential that respiratory care begins with prevention from the beginning of life until old age and continues through diagnosis and treatment to sensitive and appropriate palliative and end-of-life care. Evidence suggests that allergic rhinitis, chronic rhinosinusitis and asthma experienced in adolescence and adulthood begins in childhood when children are exposed to the first negative impact of airborne viruses and potential allergens *(23)*. Early diagnosis and assessment of the airways across the life course are crucial.

The overall burden of CRDs increases with age (Fig. 1.11) but it is essential to get every aspect over the life course right in order to ensure the best possible outcomes and quality of life for people living with CRDs and to ensure healthy ageing in the Region *(24)*.

The burden from other respiratory conditions (Fig. 1.11), - such as bronchiectasis, CF, ILD, pulmonary sarcoidosis and pneumoconiosis - is lower than that of COPD and asthma, but it also increases with age.

Fig. 1.11. DALYs from CRDs in WHO European Region, by age groups and by sex, 2021

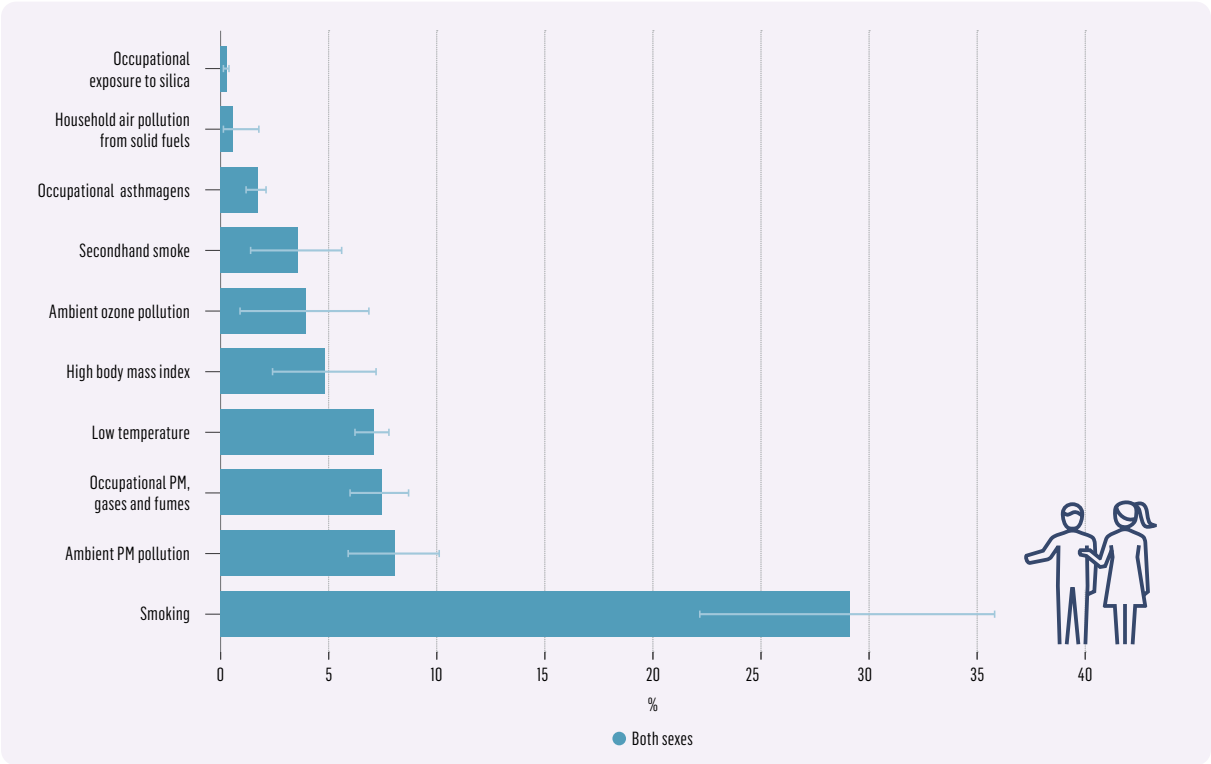
Source: Global Health Estimates, 2021 *(3)*.

CRD risk factors: a comprehensive overview

The development of CRDs involve two major processes in the body: inflammation and structural changes in the airways, such as the thickening or narrowing of the airway walls. Environmental exposures or risk factors can trigger inflammation, which leads to damage in the lining of the lungs. Although the body aims to repair this damage, repeated cycles of inflammation and imperfect repair lead to permanent changes in the airways and ultimately low levels of oxygen in the body *(25)*. The risk factors that trigger this process are multifaceted.

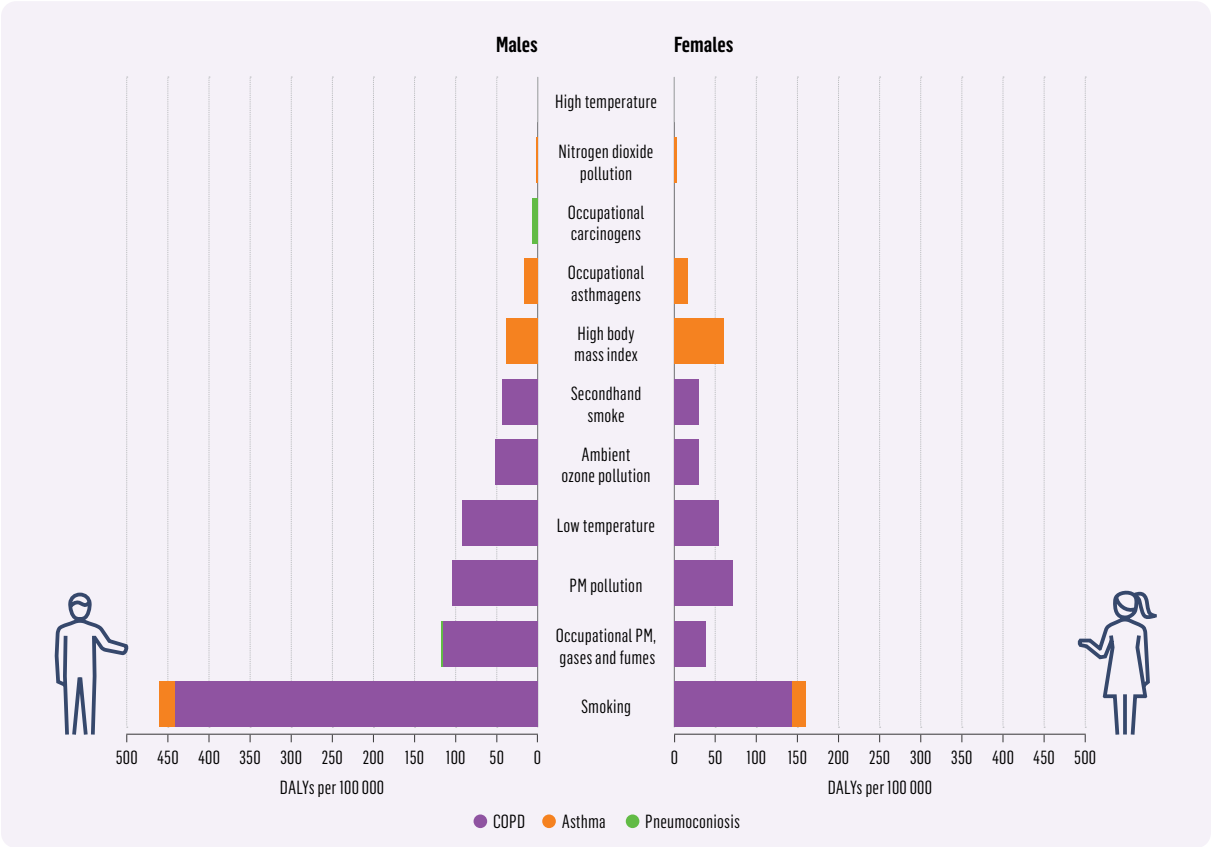
Interestingly, there were no major changes in the ranking of risk factors contributing to CRDs in the WHO European Region from 1990 to 2021, according to the GBD *(1)*. Smoking continues to be the main risk factor for CRDs (Fig. 1.12, Fig. 1.13) for both sexes and all ages. This is followed by particulate matter (PM) (air quality) and other environmental risks, such as low temperatures *(1)*.

Fig. 1.12. Percentage of DALYs due to CRDs attributable to risk factors, both sexes, 2021



Source: GBD, 2021 *(1)*.

Fig. 1.13. DALYs due to CRD attributable to risk factors, per 100 000, by sex, 2021



Source: GBD, 2021 *(1)*.

The GBD database *(1)* broadly grouped the risk factors into the following categories:

- behavioural – relating to the way a person lives their life;
- environmental – relating to where a person lives and their surroundings; and
- metabolic – relating to internal biological factors such as blood pressure, blood sugar, cholesterol and body weight.

Most of these risk factors can be avoided, treated or modified. The following section outlines the main risk factors and their contribution to CRDs, along with the barriers to addressing these risks.

Behavioural risks

Tobacco use

Tobacco use, particularly smoking of tobacco cigarettes, stands as the foremost causal risk factor of CRDs. It contributes to their development, exacerbates symptoms, reduces response to medication and contributes to poor disease management. These effects are also present with exposure to the second-hand or third-hand smoke *(26)*. Tobacco can be consumed in a large range of products:

- traditional tobacco cigarettes;
- smokeless tobacco products (include chewing tobacco and snus); and
- heated tobacco products, which are similar to e-cigarettes but contain tobacco.

Smokeless tobacco products are a popular alternative to traditional cigarettes, particularly in central Asian countries *(27)*, but also come with associated health harms. Heated tobacco products contain the same harmful chemicals found in traditional tobacco cigarettes *(28)*.

There are several notable health impacts and trends witnessed in recent years in the WHO European Region:

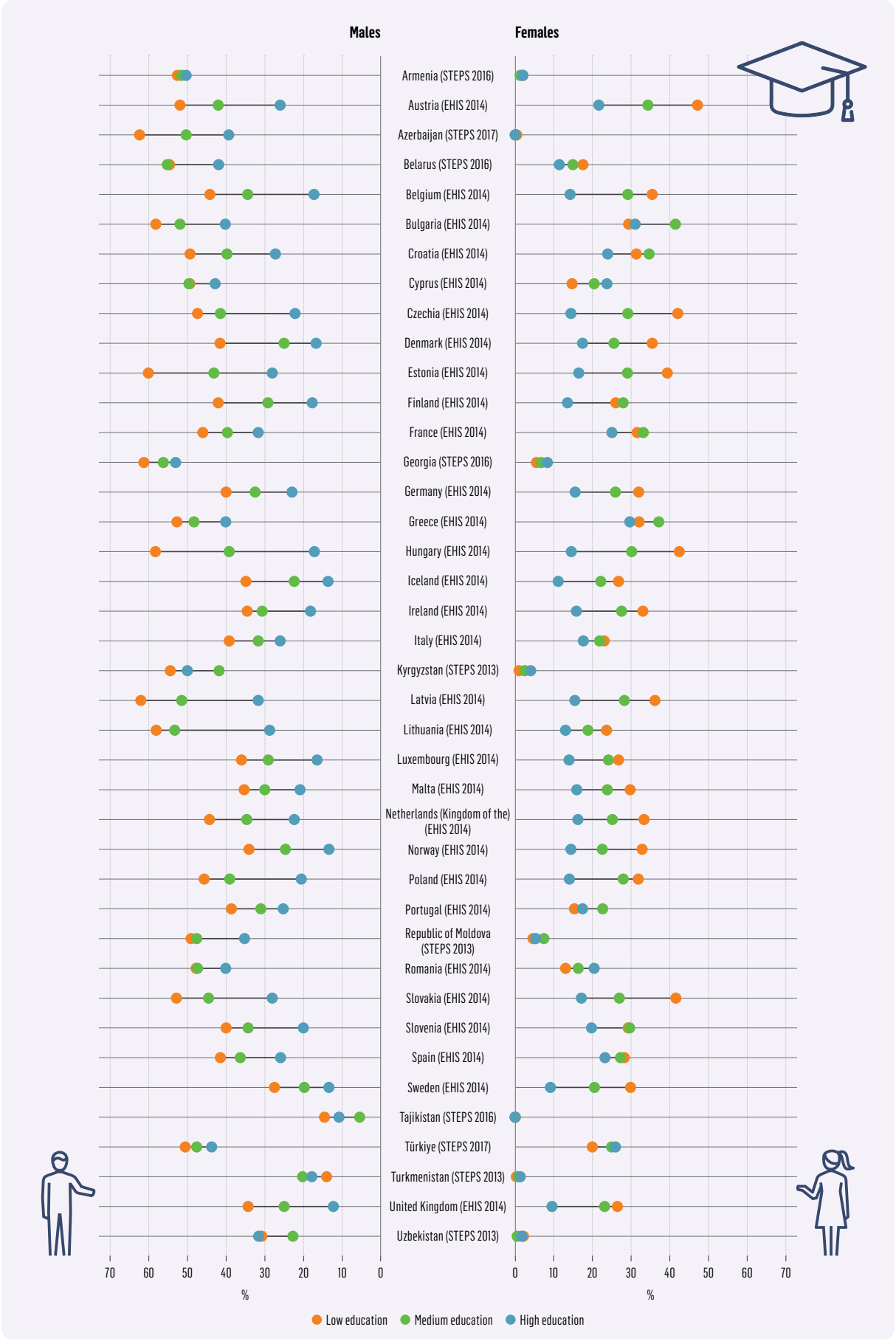
- The WHO European Region has one of the highest rates of tobacco use compared to other regions. The prevalence of current tobacco use in the Region was 25.3% for both sexes; this is higher than the global average of 20.9% *(29)*.There is also a rising trend in tobacco use among girls and women. The rates have traditionally been lower than men, but in some countries of the Region, this is levelling out as more women take up smoking (Fig. 1.14). Tobacco use is disproportionately higher among lower socioeconomic groups within the Region. People with a lower income, level of education and employment status are more likely to use tobacco, suffer from its health consequences and have less access to cessation resources, creating a vicious cycle of poor health (Fig. 1.15).

- The rates of smoking and tobacco use in young people are also cause for concern. The Region is facing a critical crisis in youth tobacco use that demands immediate attention. While many places around the globe have made progress decreasing smoking rates among young people, several countries of the WHO European Region are seeing rates among adolescents either stagnate or even rise *(30)*. This is concerning and reveals a mix of cultural influences, aggressive marketing tactics by tobacco companies and varying degrees of tobacco control policies in different countries.

Fig. 1.14. Age-standardized prevalence of current tobacco use among adults aged 15 years and older, by sex and by country, in the

Source: WHO Global Health estimates, 2021 *(3)*.

Fig. 1.15. Percentage of adults aged 18–64 years who are current smokers by level of education for 40 countries



Notes: European Health Interview Survey (EHIS), STEPwise approach to NCD risk factor surveillance (STEPS)
Source: Health Equity Dataset of the WHO European Health Equity Status Report Initiative *(32)*.

It is troubling that young individuals are experimenting with various tobacco products – traditional cigarettes, heated tobacco, e-cigarettes and shisha.

Most concerningly, a recent survey indicated that 20% of medical students and an overwhelming 40% of dental students have tried tobacco *(31)*. These statistics reveal the significant hurdles we face in tobacco control efforts in our Region and emphasize the urgent need for change.

Data from countries within the WHO European Region (Fig. 1.14) shows that Serbia, Bulgaria and Croatia had the highest rates of tobacco use in both males and females combined; while Turkmenistan, Iceland and Norway have the lowest rates. In Georgia, Kyrgyzstan and the Republic of Moldova, over 50% of males use tobacco. Rates of tobacco use had traditionally been lower in women, but in some countries, such as Andorra, Croatia and Montenegro, smoking rates in women have surpassed the rates in men.

In almost all countries, those with lower educational levels, shown in red, have higher rates of smoking compared to those with medium or higher educational levels, shown in in green and blue, respectively, in Fig. 1.15.

To reflect the waves of migration and forced displacement in the WHO European Region in the last decade, the trends of tobacco use among refugees and migrants should be specifically studied. The new migration trend could bring considerable changes in the patterns of tobacco use within countries and regionally.

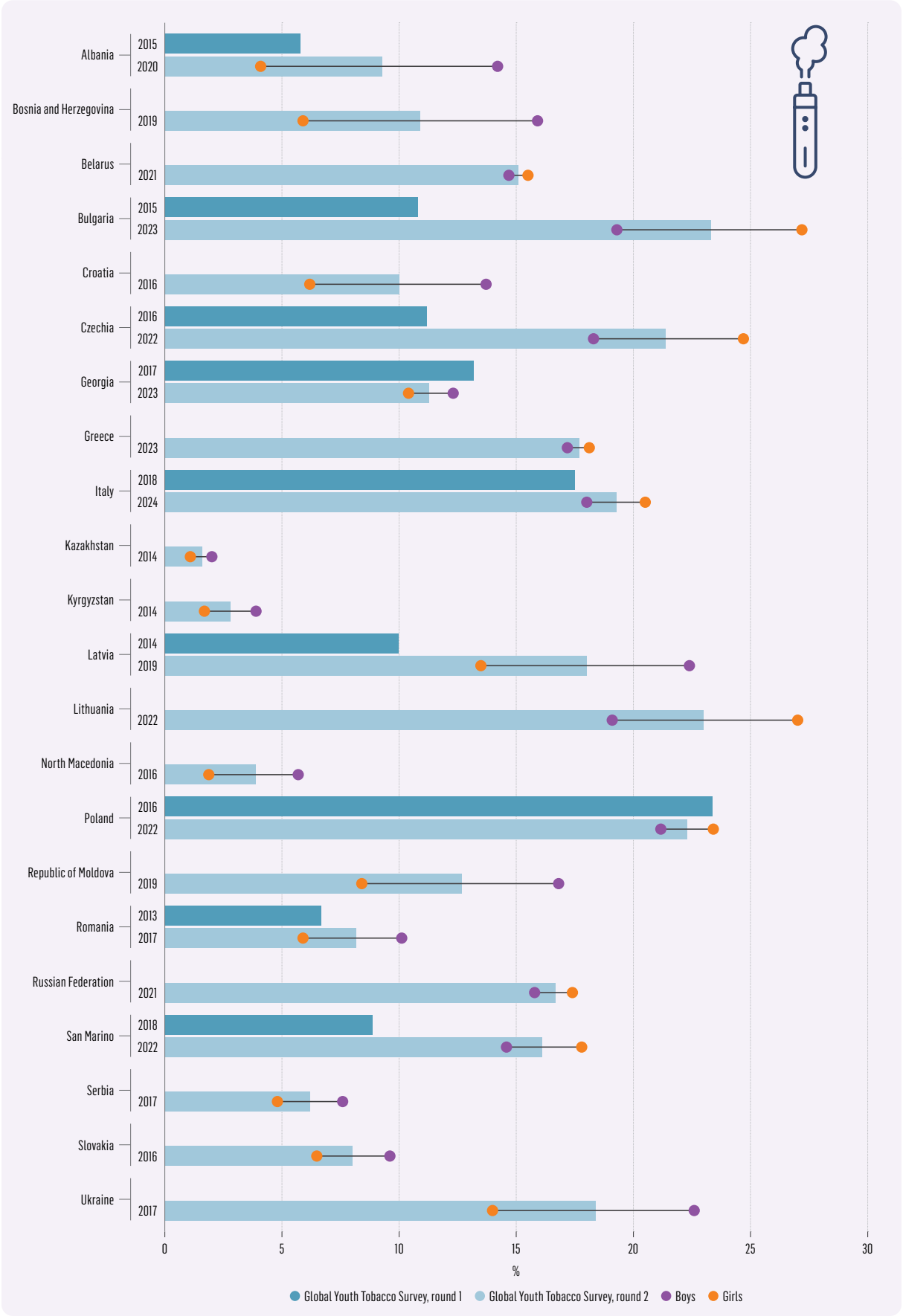
Electronic nicotine delivery systems (ENDS) and other harmful substances

ENDS and electronic non-nicotine delivery systems (ENNDS) are commonly known as electronic cigarettes (e-cigarettes). ENDS heat a liquid to create an aerosol that is inhaled by the user. These e-liquids contain nicotine and other additives, flavours and chemicals that can be toxic to people's health. ENNDS are essentially the same as ENDS, but the e-liquids used in them are marketed as nicotine-free. The most common ENDS are e-cigarettes, vapes or vape pens. Other categories of ENDS include e-hookahs, e-pipes and e-cigars *(33)*.

The introduction of e-cigarettes is bringing new challenges. **Data suggests that the use of e-cigarettes is on the rise, particularly among young people** (Fig. 1.16). The long-term data on harm are still lacking but emerging data on the short-term effects highlight substantial health concerns *(34)*. Along with the increased risk of cardiovascular and metabolic diseases and lung disorders, preliminary studies indicate an increased prevalence of asthma symptoms, including chronic cough, wheezing and shortness of breath *(35)*, as well as worsening of existing asthma conditions *(36)*.

The Global Youth Tobacco Survey is a school-based survey collecting data on smoking rates in 18 European countries *(37).* Results can be compared by rounds of the survey, completed in different years by different countries, to show how trends have progressed over time. Although these surveys were conducted at different times, they all highlight a rising trend in e-cigarette use among adolescents of both sexes (Fig. 1.16). This increase is partly due to stricter regulations on traditional tobacco cigarettes. Additionally, aggressive marketing and the misconception that e-cigarettes are healthier contribute to this trend.

Fig. 1.16. Current e-cigarette use among young people, by sex



Source: Global Youth Tobacco Survey rounds, latest available year (*37*).

Young people are also particularly vulnerable to marketing and the industry specifically targets adolescents in their promotion of these products and flavourings. E-cigarette use can also increase conventional tobacco cigarette smoking uptake by nearly three times *(38)*, particularly among non-smoking youth, setting them on a path that has proven long-term health harms.

Additionally, dual users of both e-cigarettes and tobacco cigarettes show the highest likelihood of developing COPD and experience the greatest exacerbation in asthma symptoms, which poses significant challenges for disease management *(39)*.

In addition to e-cigarettes, the evidence underscores that marijuana use is particularly detrimental to respiratory health *(40)*. Current literature highlights that marijuana smoking negatively impacts lung function, triggering symptoms such as chronic cough, sputum production and wheezing, while also increasing the risk of respiratory issues such as asthma and COPD. Given the rising prevalence of both substances, especially among young people, it is imperative to discourage their consumption and raise awareness of their significant health impacts along with establishing stronger regulatory measures and ensuring appropriate enforcement of existing laws in the European Region to protect young people from these harmful products.

Vignette 2. People's experience of living with CRD

Revaz is 84 years old, living with COPD in Georgia. He is an invited lecturer at the Georgian Institute of Public Affairs.

I have been living with COPD for 20 years and its impact on my life has been profound. Even minimal physical activities, such as climbing stairs or walking just 100 meters, can leave me breathless and cause my heart to race.

I feel that more can be done in my country to address the challenges faced by individuals like me. There is a critical need to raise awareness about the significant effects of COPD on health and quality of life. Throughout my treatment journey, I have noticed the positive benefits of pulmonary rehabilitation programmes and the medications prescribed by my doctors.

However, I believe that awareness campaigns should also focus on the dangers of using tobacco and other novel nicotine products, particularly targeting children aged 10 to 12. Educating our youth is vital to preventing future cases of this debilitating disease.

Revaz Vachnadze

Environmental and occupational exposure

Outdoor air pollution

Air pollution is a modifiable risk factor that comes with large costs to society. Air pollution, such as PM, nitrogen dioxide and ozone, poses a significant threat to respiratory health, increasing the risk of virtually all CRDs. Radon is a risk factor for lung cancer and detrimental to overall lung health *(41)*. Outdoor air pollution has been found to:

- decrease lung function and exacerbate symptoms in patients living with CRDs; and
- increase inhaler usage in patients with asthma *(42)*.

Urban areas with high levels of outdoor air pollution often experience higher rates of CRDs compared to rural areas. There are also natural causes of air pollution, including from volcanic eruptions and wildfires (this is covered in more detail below).

The impact and the trends in air pollution data are worrying:

- Over 90% of residents in the WHO European Region are exposed to annual levels of outdoor fine PM above WHO air quality guidelines *(43)*.
- According to the World Bank World Development Indicators, the region of Europe and central Asia (World Bank regions) is one of the world's largest carbon emitters on a per capita basis *(44)*.
- Trends in previous years indicated increasing emissions from a growing transport sector because of economic development but also because of an ageing car fleet and poor-quality fuel *(45)*.
- According to the 2020 World Air Quality Report, urban areas in Bosnia and Herzegovina, Poland, Serbia and Türkiye commonly experience two or more months during which the average air quality is classified as "unhealthy" (≥ 55.5 µg/m^3 of PM2.5) by United States Air Quality Index standards *(46)*. The report shows that the annual mean concentration of PM2.5 in the atmosphere exceeded the WHO recommended value in all capital cities of 40 European countries, also in the Central Asian Republics and Caucasus *(46)*.
- According to the Convention on Long-range Transboundary Air Pollution status report 2020 of the European Monitoring and Evaluation Programme *(47)*, only a few countries and territories in the Region had lower levels of PM10 and PM2.5 in 2018 in comparison to 2000 levels, and these were only slightly lower. Among them were Belarus, Georgia, North Macedonia and Ukraine; whereas Montenegro and the Republic of Moldova had the highest increase in PM10 and PM2.5 concentrations from 2000 to 2018.

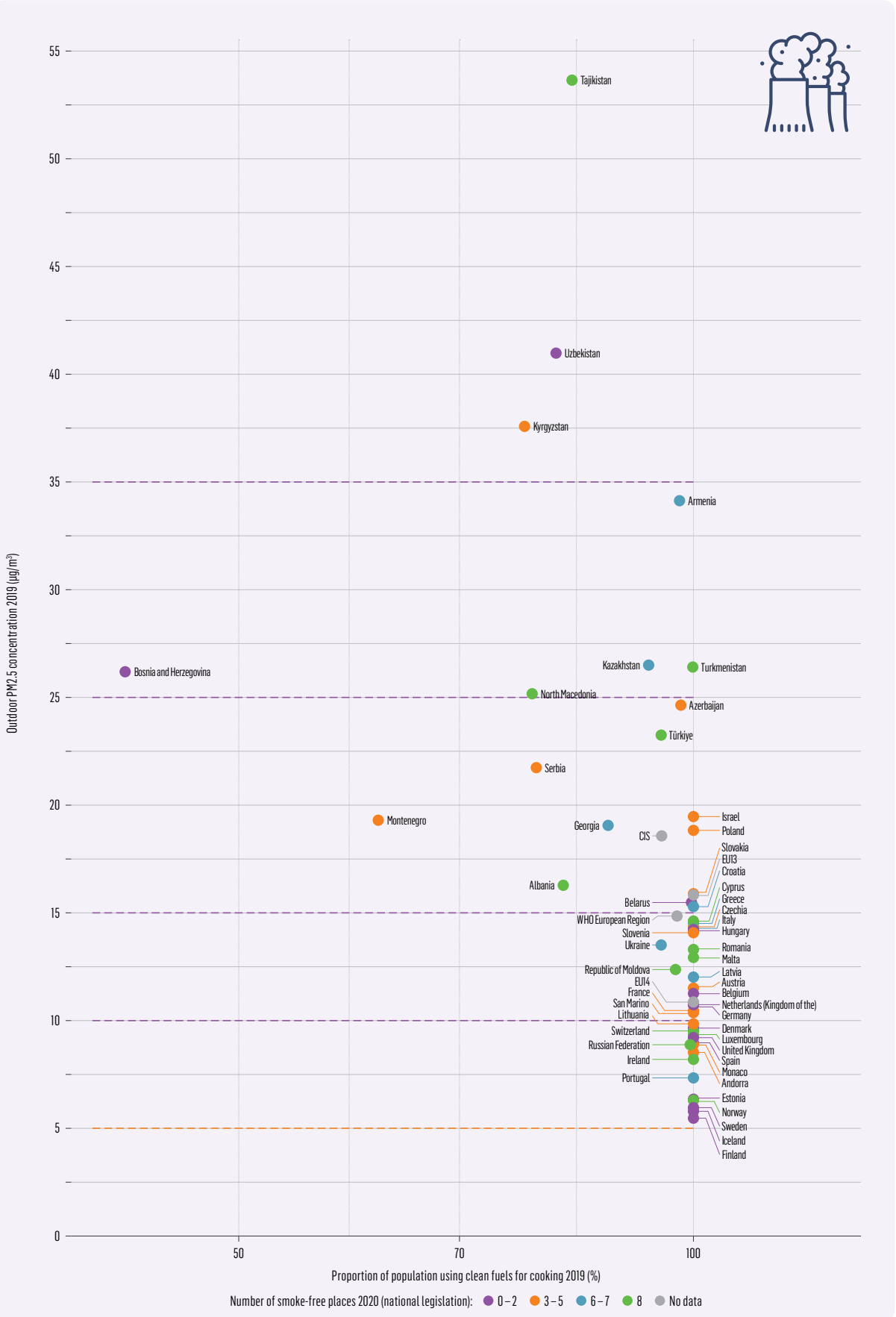
There has been some phasing out of coal-fired power plants and transformation to clean energies, along with a move towards clean industrial and agricultural practices. Despite this, air quality remains an issue in many parts of the Region. Stringent emission standards for various industries and enforcement of those standards are critical to address the problem.

Fig. 1.17 shows the outdoor PM2.5 concentrations in the WHO European Region. The red line depicts the WHO threshold. The chart also presents the number of smoke-free places each country has legislated for and the proportion of the population that uses clean fuels for cooking. This gives an idea of how countries are taking steps to tackle all sources of poor air quality.

In most countries, clean fuels are now used for cooking. However, some countries, such as Bosnia and Herzegovina, Kyrgyzstan, Montenegro, North Macedonia, Serbia, Tajikistan and Uzbekistan still depend on fossil fuels. The current geopolitical and economic crisis could worsen the situation in the WHO European Region in coming years. Although many countries have made good progress by adopting national regulations for smoke-free places, this does not reflect real enforcement. Countries should put more effort into implementing smoke-free policies in practice.

Across the WHO European Region, outdoor pollution in terms of PM2.5 concentrations remains above the WHO threshold of 5 µg/m^3 in every country. Some countries are close to this threshold (e.g. Finland, Iceland and Sweden) while others (e.g. Kyrgyzstan, Tajikistan and Uzbekistan) are far above. Even when countries can boast a high number of smoke-free places and 100% usage of clean fuels for cooking, it is not enough to reduce outdoor air pollution levels.

Fig. 1.17. Indoor and outdoor air pollution in the WHO European Region



Source: WHO estimates, latest available year *(48)*.

Indoor air pollution

Sources for indoor pollution include tobacco smoke, burning fuel for heating and cooking, poor building construction, or allergens from pets, plants, dust or mould and dampness. Volatile organic compounds are another source and are generated from chemicals such as disinfectants, pesticides, cosmetics, air fresheners and vinyl floors.

Indoor air pollution can produce symptoms such as a dry throat and a cough in the short term, and increase the risk of lung cancer, worsen symptoms of existing lung conditions and lower lung function, in the long term.

Exposure to solid biomass fuels burned indoors has been found to increase the risk of COPD by 2.7 times compared to burning non-biomass fuels *(49)*. Older adults *(50)*, women and children *(51)* are the most affected by household air pollution, which could be linked to spending more time indoors.

Strategies must consider how best to tackle indoor air pollution in different settings, for example, within homes, schools or workplaces (e.g. advocating for smoke-free stoves and tobacco-free environments). Social factors such as poor housing, which exacerbate CRDs, also require integrated policies to improve living conditions and create supportive environments.

Phasing out current subsidies for health-harming industries, such as fossil fuels for example, would yield even greater returns and potentially expand the fiscal space for health. A recent analysis estimated that scrapping explicit and implicit fossil-fuel subsidies would prevent 1.6 million premature deaths annually, raise government revenues by US$ 4.4 trillion, and put emissions on track toward reaching global warming targets *(52)*.

The are several health impacts linked to indoor air pollution.

In the WHO European Region in 2019, 154 000 deaths were attributed to household air pollution *(53)*, but there is wide variance in how air quality contributes to deaths across the Region (Fig. 1.17).

In rural areas, indoor air pollution is more of a problem, often caused by the poverty-related need for heating houses with wood or animal dung, having poor ventilation or higher rates of tobacco smoking indoors. Poor housing conditions further exacerbate the burden, particularly when houses lack proper insulation for roofs and windows.

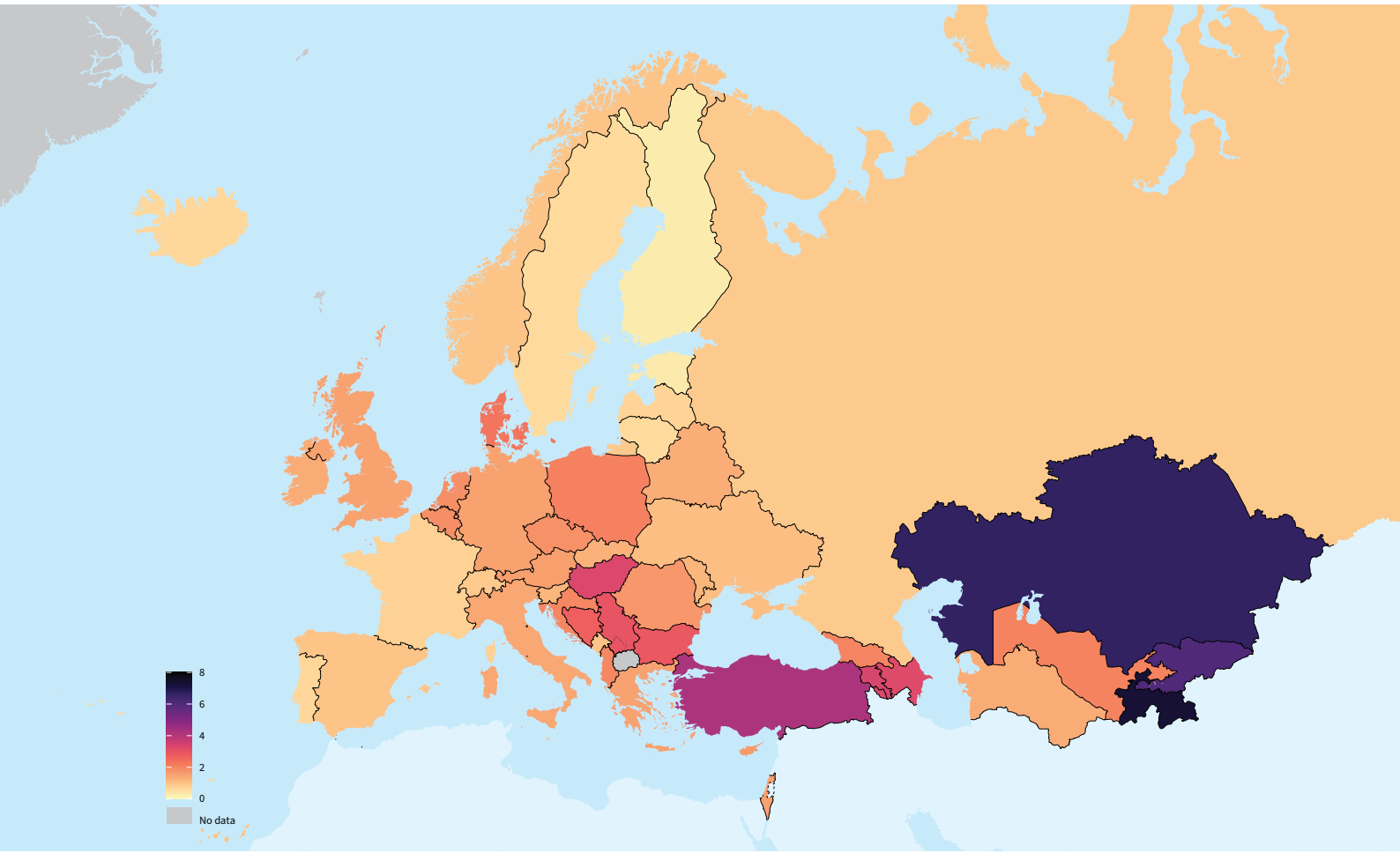
This is particularly the cases in marginalized communities. Kyrgyzstan, for instance, ranks among one of the most affected countries in the Region for diseases resulting from indoor air pollution. One of the reasons is that households mainly opt for coal-based stoves and boilers over electric devices because of their low cost and because operation is not interrupted by frequent power outages *(54)*.

According to data from the GHO, in 2019 the highest COPD death rates due to combined air pollution (Fig. 1.18) were seen in countries in the east of the Region; Kazakhstan, Kyrgyzstan and Tajikistan (eight per 100 000), with the lowest rates seen in Estonia and Finland (one per 100 000).

There is little public awareness of the health risks of indoor air pollution and evidence-based information on this is not consistently available. In Skopje, North Macedonia, 40% of households admit to burning plastic, rubbish and other toxic materials for heating purposes *(46)*. These practices are hazardous to health leading to such effects as respiratory difficulties, shortness of breath and carbon monoxide poisoning.

The trends in poor indoor air quality are decreasing slightly, which could be due to newly established clean stoves policies in rural and suburban areas or decreases in tobacco smoking rates. However, the decrease is happening at a relatively slow rate. It will take a long time to achieve the recommended targets if action is not taken. Fuel selection, stove operation and maintenance and advocacy for tobacco-free environments will all play a role in improvements in this area.

Fig. 1.18. COPD death rate attributable to ambient and household pollution (per 100 000 population), age-standardized, both sexes, 2019



Source: GHO, 2019 *(3)*.

Occupational exposures

Exposure to harmful substances and pollutants in the workplace can contribute to the development of asthma, COPD, ILD and mesothelioma *(55)*. Work-related asthma is the most common occupational lung disease in developed countries and has been linked with a growing number of substances including metallic agents used in industrial factories and synthetic chemicals, such as spray paints, foams and adhesives. Cereals and flour have also been found to contribute to work-related asthma in industries such as agriculture and baking *(56)*. Agricultural workers, miners and quarry workers are at risk of developing COPD *(57)*.

The issue of occupational health is also closely related to the working conditions and services provided for under labour migrant's health policies. In Romania and many other countries, many labour migrants lack adequate health insurance, making access to necessary medical care and regular check-ups difficult *(58)*. In Poland, migrant workers in construction and agriculture are often exposed to hazardous substances such as asbestos and pesticides, leading to respiratory and skin diseases *(59)*.

The data suggests that occupational exposures are underestimated, as seen in the global resurgence of pneumoconiosis, which is prevalent in coal miners *(60)*. Occupational exposures in industries such as mining, construction and agriculture affect more men, while those found in the cleaning professions affect more women *(61)*.

Occupational exposure is responsible for approximately 17% of all adult-onset asthma cases *(62)*. According to a joint statement from the American Thoracic Society and ERS, workplace exposures contribute to 14% of all COPD cases *(63)*.

These exposures vary according to local workplace health and safety regulations. The EU has set exposure standards to define a safe level of pollutants in the workplace. This level is the point at which no major health risks are anticipated. However, there are differences in how countries use these limits and some set their own standards, leading to variance across the Region.

Geography, weather and temperature extremes

Weather events, such as heatwaves and cold spells, also impact respiratory disease, with extreme temperatures triggering exacerbations and worsening symptoms in vulnerable populations. Regions with cold climates may see increases in respiratory infections, exacerbating the CRD burden. Patients with respiratory disease are specifically vulnerable to prolonged heat, as they suffer from impaired heat regulation mechanisms. This could lead to increases in medication use along with doctor and hospital visits or admissions *(64)*.

Temperature extremes have wider consequences, such as flooding, wildfires and dust storms, which can all contribute to poor air quality and further impact respiratory health. Thunderstorms have also been linked to increases in asthma hospital visits thought to be caused by an increase in pollen and fungal spora in the air during a storm *(65,66)*.

The WHO European Region encompasses diverse landscapes and population distribution between urban and rural areas. There is diversity across the Region but also within each country. Notably, living in rural areas is associated with poverty and more limited access to health-care facilities such as specialty care in hospitals. In Kyrgyzstan, for example, COPD prevalence in rural, high-altitude areas was found to be three times higher than in low altitude areas *(67)*.

Extreme weather events are becoming more common and more severe. The inland continental area of central Asia, for example, is at risk of severe desertification, due to global climate change, and consequently is at risk of more intense sand and dust storms.

A systematic review found that an increase in extreme weather events also increased the risk ratio of asthma hospital admissions in Europe by 1.17-fold *(68)*. Incidences of respiratory diseases have also increased due to the intensification of processes of soil salinization and land degradation *(69)*.

The EU-funded EXHAUSTION project has created a Health Impacts Projection tool that visualizes the impact of warming temperatures on mortality *(70)*. The WHO Air Quality and Health Database, AirQ+ software, also allows for health risk assessments of air pollution *(71)*. These useful tools allow us to get a picture of the expected number of excess deaths due to temperature extremes.

Metabolic risks

Body mass index (BMI) and nutrition

People with a high BMI of over 30 are considerably more likely to develop asthma than those with a lower BMI *(72)*. Higher weight gain in childhood has also been linked with childhood asthma *(73)*.

Obesity is the major driver of obstructive sleep apnoea – represented in two thirds of cases – this condition is highly prevalent worldwide, estimated at 1 billion people *(74)*.

Conversely, low BMI is increasingly associated with exacerbations of COPD and an increased risk of death *(75,76)*. This could be because weight loss has been linked to muscle weakness, decreased lung function and inflammation in the body.

Poor nutrition can also leave people vulnerable to respiratory infections and can increase the risk of respiratory disease later in life. Ensuring a balanced diet can help individuals reduce the risk of developing lung conditions as they age.

Globally, high BMI was found to be the leading risk factor for asthma in both sexes, according to the GBD. The link between high BMI and asthma was also more prominent in women *(77)*.

Overweight and obesity affect almost 60% of adults and nearly one in three children (29% of boys and 27% of girls) in the WHO European Region *(78)*. Estimates from the 2016 WHO GHO, indicate that obesity prevalence for adults in the WHO European Region is higher than in any other WHO region except the Region of the Americas, with the highest levels of both overweight and obesity found in Mediterranean and eastern European countries *(78)*.

As high BMI is a further modifiable risk factor, dietary interventions, focused on ensuring a balanced diet and healthy weight, are needed, targeting countries which generally have higher obesity rates. However, they also need to consider the wider context, as the conflict in Ukraine, the COVID-19 pandemic and climate change have impacted food production and increased food costs, particularly for more nutritious foods, in recent years.

It is estimated that 25–40% of COPD patients are underweight while 35% of patients have a severely low fat-free mass index *(79)*, a marker of muscle mass. The effect of being underweight has been found to increase hospital admissions, mortality rates and costs to health-care systems *(80)*. More recognition is needed among health-care professionals to spot signs of underweight and malnutrition, offer appropriate advice and education as well as referrals to other services.

The broader picture: factors contributing to the CRD burden

There are a range of other external factors that have a role to play in the burden of CRD. WHO defines these factors as the social determinants of health. These determinants are widespread and play a role in the inequalities seen within respiratory health. Addressing these mostly contextual factors through multifaceted approaches is essential to reducing respiratory inequalities and improving the respiratory health of populations across the Region. These solutions are offered in the next chapter.

Social and cultural factors

Disparities in social and economic status, including income inequality, education level and access to health care, impact the prevalence and management of CRDs. These factors are often linked to an accumulation of risk, including environmental exposures, housing conditions, tobacco use, increased challenges to adopting a healthy lifestyle (such as cost) and impaired access to care.

Social and economic inequality, measured as national gross domestic product per capita *(81)*, ranges from US$ 1054.20 in Tajikistan to US$ 240 862.20 in Monaco.

Individuals from lower social and economic backgrounds and marginalized populations are more exposed to a range of CRD risk factors and often face barriers to accessing preventive services, diagnostic tools and medication,

exacerbating health inequalities by negatively impacting on health as a whole and contributing to the burden of CRDs (Fig. 1.19). In Europe, the excess risk of dying among middle-aged adults in the lowest socioeconomic groups ranges from 25% to 150% *(82)*.

People living in poverty might also experience overcrowding and the unequal distribution of living space. Within countries this is a risk factor for poor health generally and poor lung health specifically.

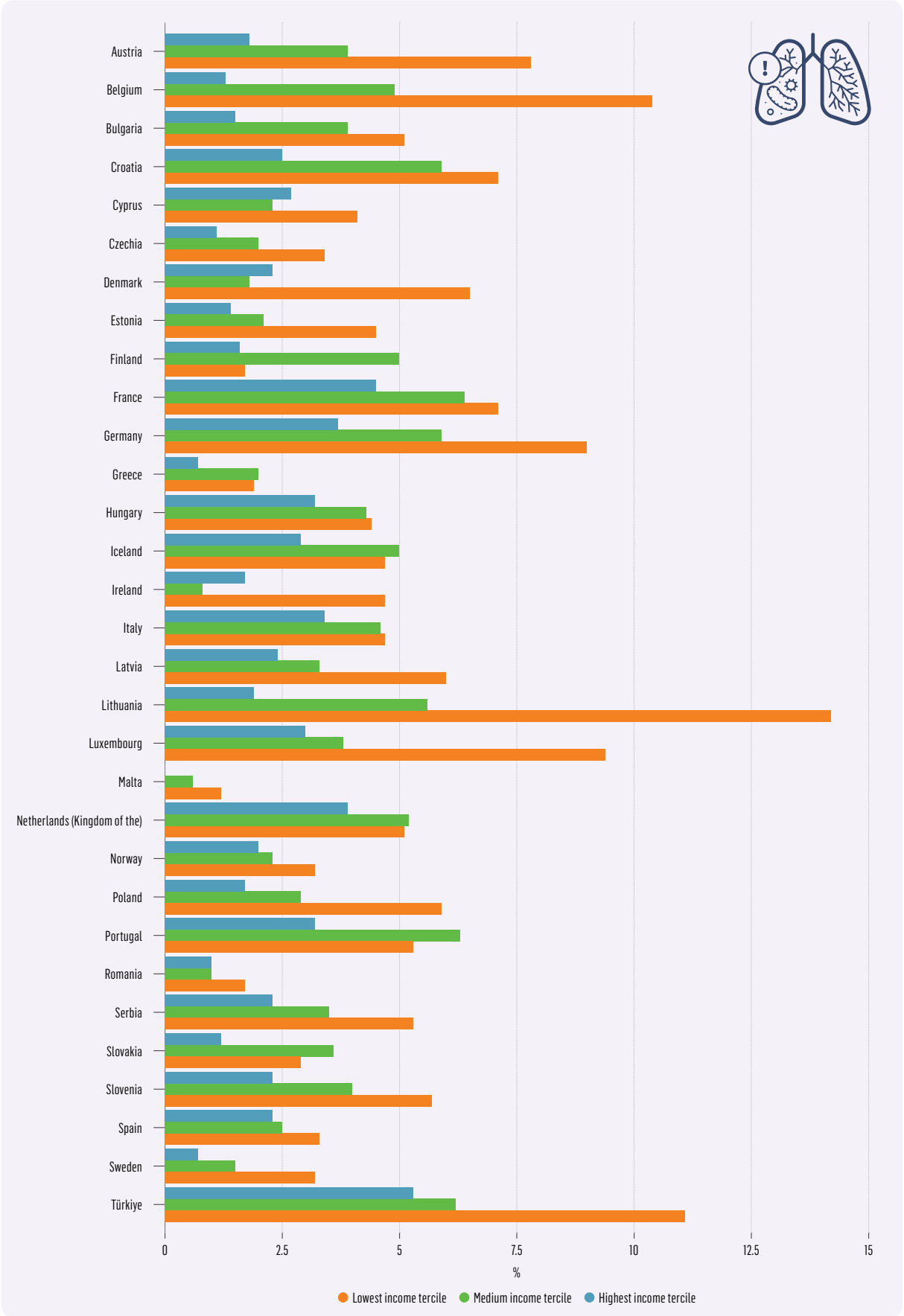
Cultural factors may also impact disease burden. This could include smoking-related stigma: when a person is labelled with negative stereotypes or experiences discrimination when they smoke. Religious and cultural beliefs can also prevent people seeking help for symptoms.

Evidence highlights this impact for both asthma and COPD.

- In most countries, the prevalence of asthma is higher among people with a lower level of education than those with a higher level of education *(83)*.
- The *Burden of Obstructive Lung Disease* study, conducted across 21 sites globally, found that 6% of the population over 40 years old suffer from chronic airflow obstruction attributable to poverty *(84)*.

Data from Eurostat (Fig. 1.19) highlights the percentage of the population living with CRDs (excluding asthma) by income level across countries *(15)*. As with tobacco use, discussed earlier in this chapter, rates of CRDs are highest in those living in the lowest income quintile, suggesting those with lower socioeconomic status are more affected by CRDs.

Fig. 1.19. Percentage of population reporting chronic lower respiratory diseases (excluding asthma) by income quintile, both sexes, 2019



Source: Eurostat, 2019 *(15).*

Commercial interests

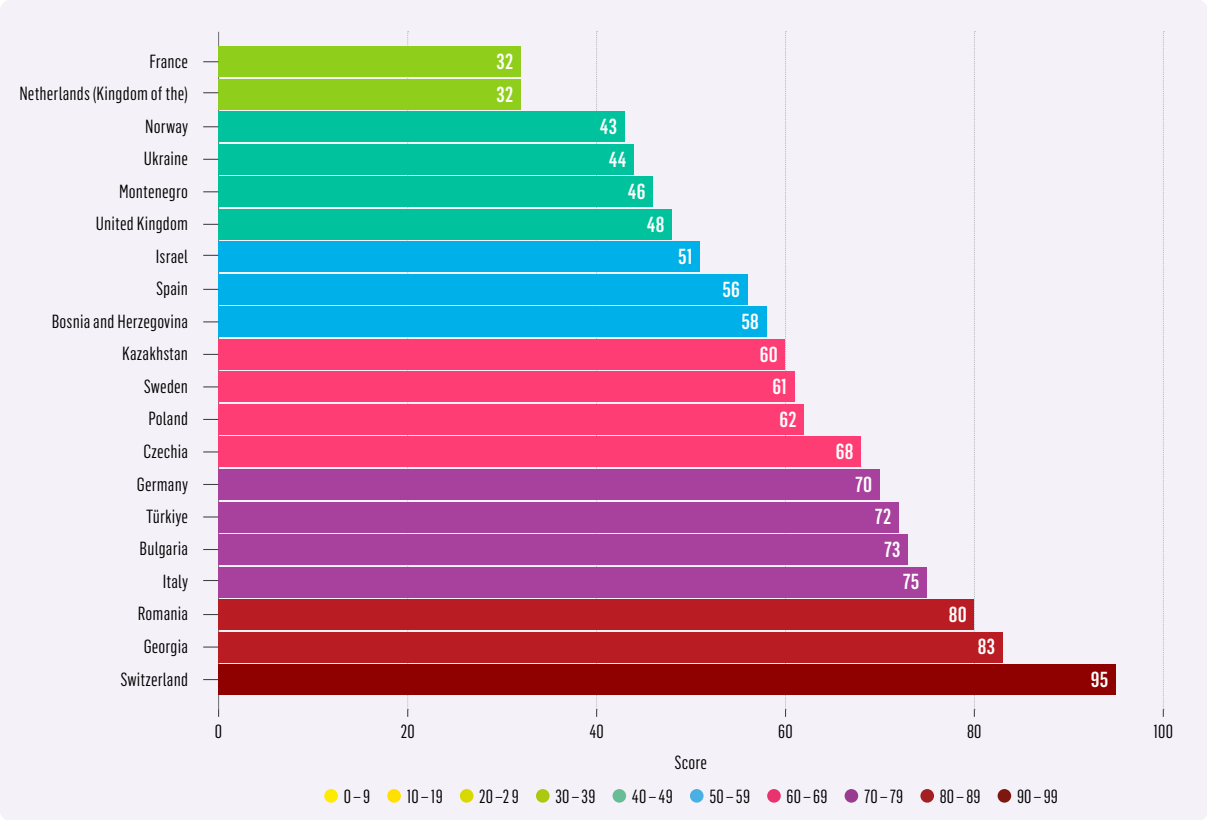
Commercial interests, from industries such as tobacco, fossil fuels, forests, agriculture and pharmaceuticals, significantly contribute to the CRD burden.

A recent WHO report highlighted the substantial impact of commercial determinants on NCDs in the WHO European Region. Nearly 7500 deaths per day in the Region are attributed to commercial determinants, such as tobacco, alcohol, processed food, fossil fuels and occupational practices *(85)*.

Tobacco industries and their lobbyists try to counteract implementation of proven, effective strategies of tobacco control such as increasing tobacco taxes. For instance, by introducing smokeless, but still harmful and addictive alternatives *(85)*.

Comprehensive, up-to-date analysis on tobacco industry interference can be seen in the *Global Tobacco Industry Interference Index 2023* (Fig. 1.20) *(86)*. This index reflects analyses on how 20 countries in the WHO European Region are affected by tobacco industry interference and how far they have progressed in the implementation of Article 5.3 and its Guidelines of the WHO Framework Convention on Tobacco Control (WHO FCTC) (*87*). Ranked against seven indicators of the index, the lower-scoring countries, such as France and Netherlands (Kingdom of the), are demonstrated as having effective policies against tobacco industry interference; while Switzerland, Georgia and Romania had high scores due to the complete absence of measures against tobacco industry interference.

Fig. 1.20. European ranking of the Global Tobacco Industry Interference Index, 2023.



Source: Global Tobacco Interference Index, 2023 *(86)*.

Another relevant player in the private sector is the pharmaceutical industry, with both positive and negative impacts. On the one hand, the industry has developed innovative treatments to improve the treatment of CRDs, supporting prevention products (e.g. vaccines and preventive medicines). On the other hand, access to

products and treatments can be compromised by the same industry setting prices too high or through aggressive marketing *(85)*. Overtreatment could be stimulated by effective marketing campaigns and disease mongering when the boundaries that define a medical illness are widened to expand markets. This is why health must remain a highly regulated business and searching for synergies and partnership for mutual benefit should be streamlined.

Demographics

There are notable differences in lifestyle and habits between age groups and between men and women that have an impact on CRD distribution and on all other contextual factors.

Between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22% *(88)*. With this demographic change, the Region grapples with a growing mental health crisis among young people, stagnating immunization coverage and high rates of chronic diseases. Older age is a contributing factor for the development of COPD and other CRDs; this presents a challenge and also an opportunity to ensure that longer lives can be spent in good health.

Men and women are impacted by risk factors in various ways:

- Men are more likely to engage in behaviours such as smoking, which increases the risk of developing CRDs. However, in adolescents, new trends suggest that girls are using substances, including cigarette smoking as well as electronic cigarettes, alcohol and cannabis, to similar levels, or even higher than boys *(89)*.
- Women who are looking after children may be disproportionately affected due to indoor air pollution from biomass fuel use for cooking and heating in some areas.
- In asthma, it is well described that prevalence is higher in boys and male adolescents, then after puberty, due to hormonal changes, it is more common in women than men *(90)*.

When considering the impact of CRDs, trends and rates should be standardized to account for these differences and to give a correct interpretation.

Political and policy factors

Government policies related to tobacco control, environmental regulations, health-care infrastructure and access to affordable medications have a significant impact on CRD burden. Countries must prioritize CRDs in the national health agenda with sustainable financing. The section Unveiling the roots of the CRD burden explores how some of these factors could help improve this burden.

Complex trends shaping the CRD burden

Comorbidities

CRDs are major contributors to multimorbidity, and the risk factors causing CRDs often overlap with other respiratory conditions and NCDs. Living with other conditions can impact the treatment burden, increase health-care costs and worsen outcomes for patients. Multimorbidity affects approximately 75% of patients with CRDs, indicating a higher burden compared to the general population. Asthma combined with COPD are more frequently related to maternal smoking and respiratory infections in childhood than COPD alone. Distinguishing between these conditions can be problematic and is usually diagnosed in older adults.

The coexistence of COPD and asthma with many other respiratory conditions are very common such as with lung cancer, sleep apnoea, pulmonary fibrosis and pulmonary hypertension. Those coexisting diseases substantially amplify the burden.

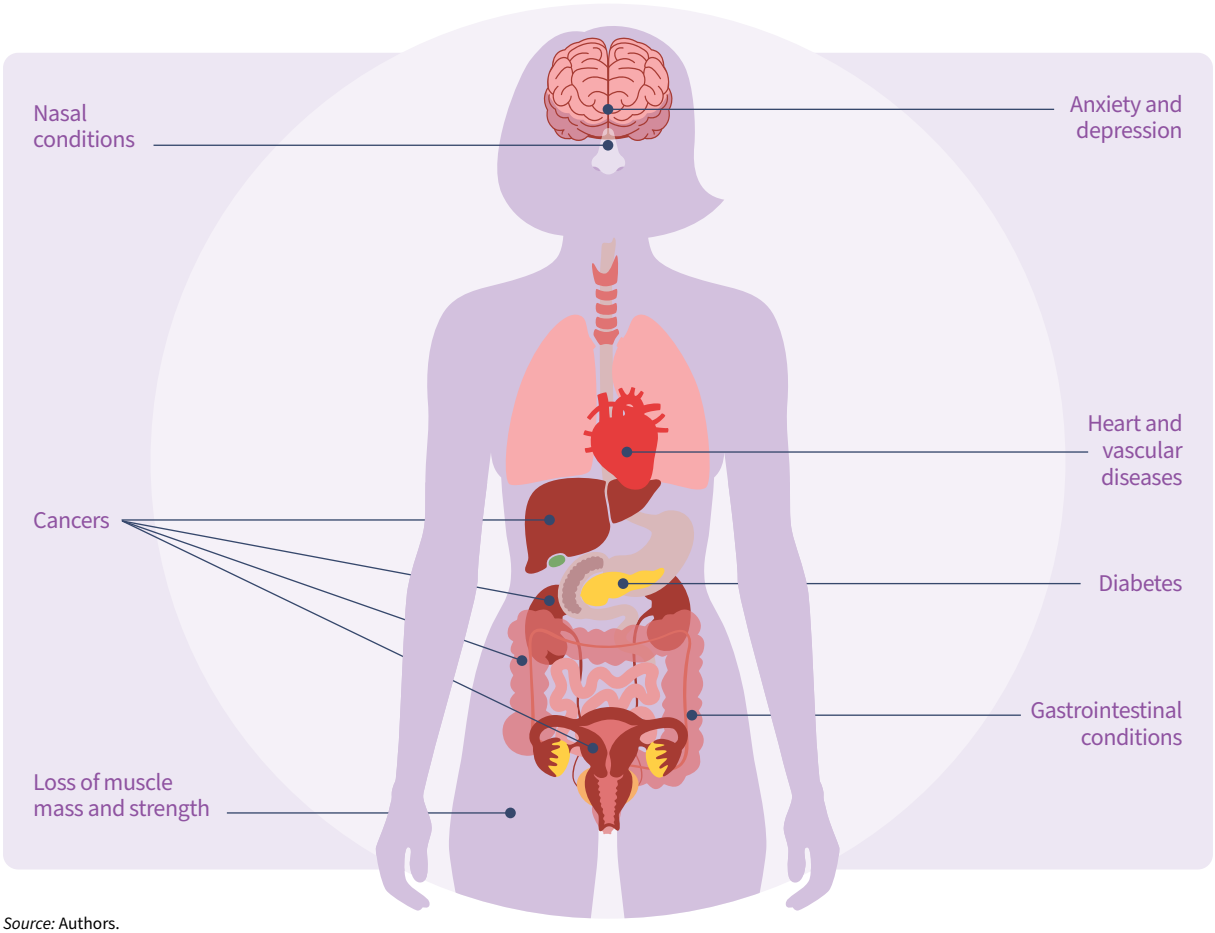
Some of the comorbidities most closely linked with certain CRDs, such as asthma with allergic rhinitis and other types of chronic rhinitis and rhinosinusitis. As the airways are all closely connected, treating any upper airway symptoms can help with the management of lower airway symptoms. Rhinitis and asthma stand out in the early stages of life, with asthma representing the most common chronic disease in children. Conversely, COPD and obstructive sleep apnoea often appear later in life and usually in combination with frailty and disability.

Pneumonia poses a significant risk for individuals with CRDs, as the underlying respiratory impairments can complicate treatment and recovery, leading to higher rates of hospitalization and mortality *(91)*. Additionally, patients with COPD have an increased risk of lung cancer due to shared risk factors such as smoking and chronic inflammation, highlighting the intertwined nature of these conditions *(92)*.

Moreover, the prevalence of tuberculosis (TB) is notably higher among individuals with CRDs, as the compromised respiratory function can facilitate the progression of such pulmonary infections *(93)*. Equally, individuals with prior pulmonary TB have an increased risk and high prevalence of COPD, further complicating management and treatment of both conditions. COPD and other CRDs often occur alongside other conditions including cancer, heart disease (heart failure) and hypertension, cerebral disorders, gastrointestinal conditions *(94)* and depression *(95,96)*.

Frequent comorbidities of CRDs are provided in Fig. 1.21.

Fig. 1.21. Frequent comorbidities for CRDs



Source: Authors.

Understanding how different conditions link to each other and having clear guidance on management of these conditions is crucial. To meet these challenges, policies need to be tailored to an individual rather than being disease specific. One example of this is the multidisciplinary action programme in Finland, which is discussed further in the next chapter.

Climate change

According to the European Environmental Agency, Europe is the fastest warming continent in the world and climate risks are threatening its energy and food security, ecosystems, infrastructure, water resources, financial stability and people's health.

Extreme heat, drought, wildfires and flooding, as experienced in recent years, will worsen in Europe even under optimistic global warming scenarios and will affect living conditions throughout the continent *(97)*. The eastern part of the WHO European Region also experiences significant climate-related changes each year.

Heatwaves are associated with increased mortality from stroke, ischaemic heart disease and respiratory conditions. Climate change exacerbates environmental risk factors for CRDs, such as air pollution and allergen exposure from pollens, and exacerbates existing health inequalities by disproportionately affecting vulnerable populations.

The economic impacts of climate change (with parts of the Region experiencing abnormally high and low temperatures, wildfires, dust storms and severe flooding in recent years), including increased health-care costs and loss of livelihoods, further strain health-care systems and exacerbate social disparities, including CRDs.

Health emergencies (crises)

Emerging infectious diseases, with ever faster spread in this interconnected world, pose a serious threat to the burden of CRDs. The COVID-19 pandemic put health higher on the political and development agenda and caused a sharp decline in life expectancy.

Armed conflicts present additional challenges to addressing CRDs, with the destruction of infrastructure and the shortage of medical personnel impeding the delivery of essential services *(98)*. The Russian Federation's full-scale invasion of Ukraine has precipitated a new range of complex challenges, from humanitarian and refugee crises to an environmental disaster for air pollution levels, economic shocks and a cost-of-living crisis borne from soaring energy, food and fuel prices.

Vulnerable populations, such as those who are socioeconomically disadvantaged, children and adolescents, refugees, migrants, homeless people, those with low levels of literacy, older people, prisoners, and Roma and other ethnic minorities *(99)*, are disproportionately affected in everyday life but are even more vulnerable during any type of crisis or emergency. As an example, inequities and vulnerability are magnified by conflicts and war *(100)*, exacerbating existing respiratory health inequities within the WHO European Region *(101)*.

Building resilient and agile health systems ready for any crisis in the future, includes policies and measures to identify and protect the vulnerable in times without crisis, and implementing efficient preparedness, response and recovery plans.

Interconnectedness of risk factors

These determinants are often interconnected. Within the field of CRD there is a complex interplay of various determinants and risk factors, including pandemics, economic instability, natural disasters, war and other conflicts *(102)*, and climate change.

These crises can disrupt pharmaceutical production chains, as happened during the COVID-19 pandemic and in recent conflicts. When these factors are combined, they can amplify each other's effects. Yet, they can also be tackled together with overarching programmes. Some of these innovative approaches are discussed in the next chapter.

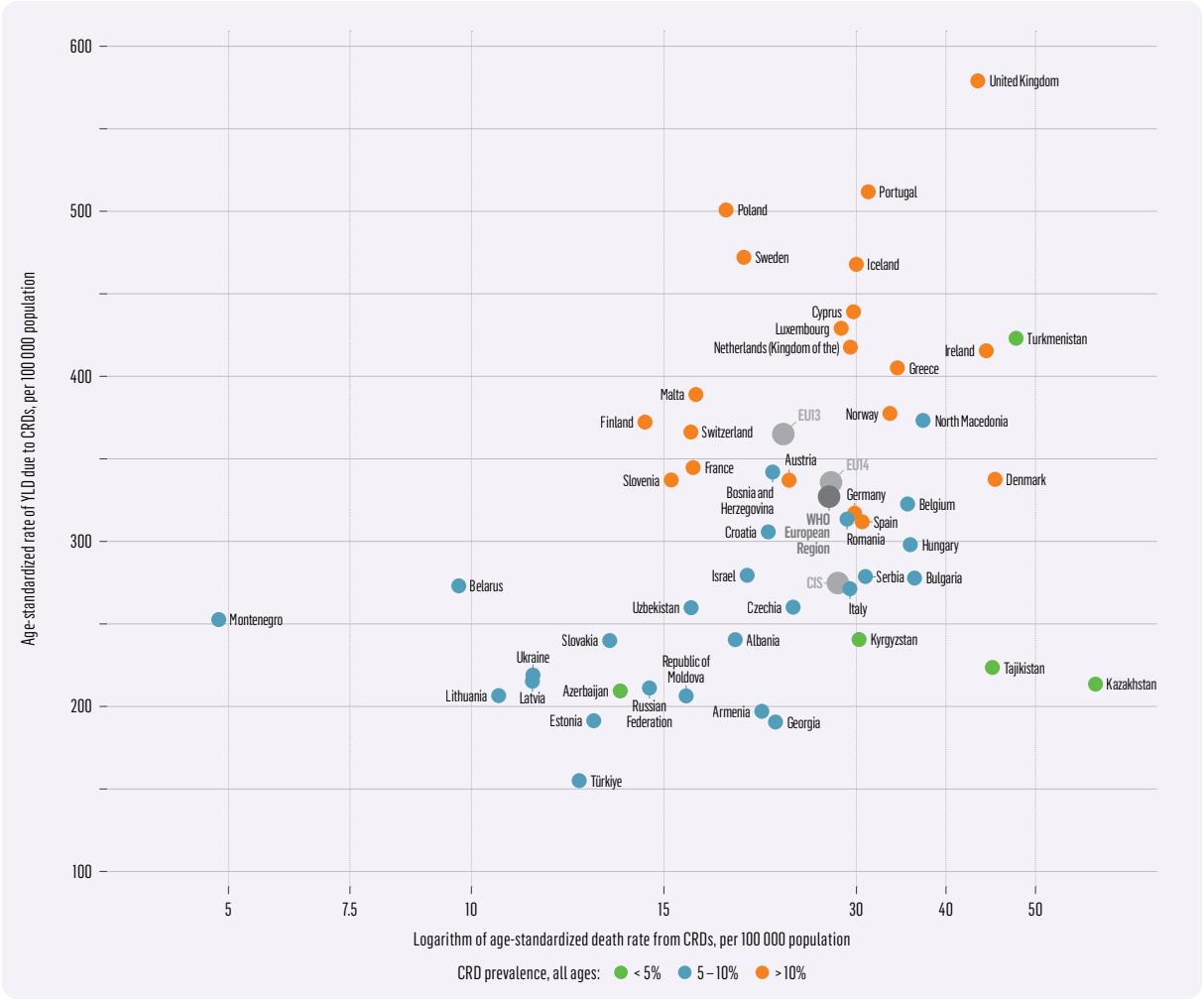
Unveiling the roots of the CRD burden

As this chapter outlines, CRDs affect a large proportion of people in the WHO European Region, despite CRDs being preventable and manageable in some cases. There are large disparities in the Region that are influencing CRDs and disproportionately affecting disadvantaged populations in most societies. There are several issues behind these data that signal areas for action.

As illustrated in Fig. 1.22, the countries in the upper right corner have higher age-standardized mortality, disability and prevalence of CRDs (above regional averages). This group of countries includes Greece, Iceland, Ireland, Luxembourg, Netherlands (Kingdom of the), Portugal and the United Kingdom.

Central Asian countries lead the Region with the highest age-standardized mortality, with Kazakhstan and Turkmenistan at the forefront with low age-standardized prevalence rates at the same time. Tajikistan and Kyrgyzstan, despite having lower prevalence (less than 5%) and lower rates of YLDs, also show high mortality rates.

Fig. 1.22. Age-standardized mortality versus disability rates with prevalence levels of CRDs, all ages, both sexes



Legend:
CIS: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
EU13: EU member states who have joined since 2004: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.
EU14: EU member states who have joined prior to 2004; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands (Kingdom of the), Portugal, Spain and Sweden.
WHO European Region: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands (Kingdom of the), North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Türkiye, Turkmenistan, Ukraine, United Kingdom and Uzbekistan.

Source: Global Health Estimates *(3)* ,GBD, 2021 *(1)*

Significant variability is seen in the Western Balkans, with North Macedonia exhibiting the highest age-standardized mortality and disability rates, and mid-level prevalence, while Montenegro has the lowest mortality in the Region, with mid-level prevalence and YLDs.

This figure shows a clear mismatch in the eastern part of the Region: where relatively low prevalence and disability rates from CRDs contrast with disproportionately high mortality rates. As previously discussed, these countries also face a greater burden from air pollution and tobacco use, which are major risk factors for CRDs.

This mismatch can be explained by several factors:

- limited healthcare service capacity, which restricts early detection and ongoing management of chronic conditions;
- late diagnosis, meaning CRDs are often not identified until they are in advanced stages; and
- lower life expectancy, which reduces the time during which chronic conditions are observed and recorded.

As a result, many patients are only diagnosed when they present with complications or comorbidities. This leads to either earlier mortality or the registration of other conditions instead of CRDs, masking the true burden and impact of CRDs.

Additionally, Fig. 1.22 also illustrates that those countries with better diagnosis, reporting and surveillance capacities, supported by a developed HIS, have higher prevalence, mortality and disability rates. Underdiagnosis or misdiagnosis may be key reasons for lower CRD prevalence but high mortality rates in many countries.

This variation can only be addressed by increasing diagnostic capacity at primary care level. Diagnosis should incorporate both patient history and the use of technology such as spirometry and peak flow meters.

During COVID-19, several countries, such as France, responded to the demands placed on the hospital sector by allowing diagnosis to take place at primary care level as well as management of CRDs. Lessons were learned about the need for agreeing both incentives (such as the provision of equipment and reimbursement) and monitoring requirements.

Low-income and lower-middle-income countries have the lowest availability of both peak flow measurements and spirometry, which can explain the variance in prevalence data outlined at the outset of this chapter. Underdiagnosis, due to a lack of basic technologies, is distorting the picture and preventing action on CRDs.

An additional reason that explains the disparities in the prevalence data is the variance in reporting systems used by countries in the Region. One example of this is death registration which varies between countries. In the United Kingdom, for example, it is possible to register multiple causes of death on a death certificate. This compares to countries in the east of the Region, where people often do not receive a diagnosis of CRDs, but present with later complications such as chronic vascular disease.

Sustainable access to essential evidence-based respiratory medicines and treatment remains scarce in low- and middle-income countries *(103)*. Achieving universal health coverage (UHC), where all people have access to the full range of quality health services including health promotion, prevention, treatment, rehabilitation and palliative care, is a strategic priority for the WHO.

Patients with CRDs usually have multiple conditions or complications. However, service delivery systems have been designed and organized in many countries to address individual diseases rather than patients with multiple conditions, and therefore are not fit for purpose. General practitioners and clinicians are needed to provide personalized, comprehensive continuity of care, especially in socioeconomically deprived areas *(104)*.

Service delivery is also hampered by various factors, such as:

- Patients perceptions and beliefs about medicines and smoking *(105)*
- Low literacy levels, along with a lack of available self-management resources, which contributes to poor adherence to preventive and treatment strategies *(106)*

- A lack of training in lay communication for health-care professionals, that recognizes cultural differences and beliefs, as well as how to support patients' self-management.
- A lack of reporting and evaluation on patients quality of life and whether they are satisfied with the care provided to them.

More robust and targeted health policies and services are needed to comprehensively address CRDs as part of the broader NCD strategy, together with public financing and comprehensive health insurance systems to achieve UHC, aiming for both universality and financial sustainability *(107)*.

National respiratory policies, strategies or actions plans are required to help reduce the burden of CRDs and effectively tackle the major risk factors. The WHO NCD Country Capacity Survey 2023 indicates that 70% of countries in the WHO European Region have a national NCD policy, strategy or action plan that includes CRDs and 83% of these policies are operational. Only 19% of countries had a stand-alone CRD policy in place according to the survey data *(108)*.

Having policies is not enough. There must be clear prioritization of resources, effective implementation and government accountability in carrying out these plans. This can be attributed to several key factors, namely:

- limited public and political awareness of the burden of CRDs leads to weaker advocacy for dedicated policies *(109,110)*;
- insufficient data on the prevalence and impact of CRDs can reduce the urgency to create effective policies *(111)*;
- economic constraints may further divert attention from long-term CRD strategies *(112)*; and
- recognition of the gap between the lack of availability of essential medicines and vaccines and need may concern payors *(113)*.

Some steps have been taken to address this. The International Respiratory Coalition was established to promote lung health and improve respiratory care. Their vision is for every country to have the tools to implement a national respiratory strategy based on best practice. This includes the Lung Facts online resource, which provides an easy- and free-to-access tool with the latest data on CRDs in Europe by country *(114)*.

Policies focused on addressing risk factors are also weak or inadequate and have failed to address tobacco control, sources of air pollution and occupational hazards effectively. Lack of enforcement mechanisms and compliance monitoring contribute to continued exposure to respiratory health risks, exacerbating the burden of CRDs. Where efforts to tackle these risks are universal in their approach, they do not always deliver universal outcomes. Policies need to be tailored to each setting and work in conjunction to deliver results.

Policies also need to account for limited awareness and education in some populations. Limited understanding about the risks associated with tobacco or e-cigarette use, exposure to indoor and outdoor pollutants, and occupational hazards hinder efforts to prevent and mitigate CRDs. Tobacco control advocacy groups need to include CRDs within campaigns to help raise the profile of this burden. Policies aimed at reducing the burden also need to focus on awareness-raising activities, in conjunction with civil society, local communities, non-state actors and patient organizations.

The intersectionality of socioeconomic status, environmental exposures and access to health care exacerbates disparities in respiratory health outcomes, perpetuating health inequalities across populations.

Vulnerable populations are at higher risk of exposure to most environmental pollutants, tobacco use and occupational hazards, leading to a higher prevalence of CRDs and poorer respiratory health outcomes. For instance, the chances of having a respiratory condition, including asthma and COPD, are reported to be 3–6 times higher among individuals in prisons than in outside communities *(115)*.

Addressing these barriers requires comprehensive policies that tackle all underlying determinants of health *(116)* and promote equitable access to preventive measures and health-care services for all individuals, regardless of socioeconomic status or geographic location.

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Many countries in the WHO European Region are prioritizing tobacco control, air quality measures, public health promotion, health literacy campaigns on healthy lifestyles and providing healthy choices in their multisectoral strategies.

Chapter 2

Building resilient health systems for CRD: creating an equitable future for everyone

There is considerable variation in CRD-related policies and practices across the WHO European Region. As outlined in the previous chapter, this variation has important implications for both population health and economic outcomes. Despite progress in some areas, many countries face challenges in prioritizing CRDs and allocating resources at a level that fully reflects the scale of the need.

This chapter addresses two fundamental questions:

What? – What measures should each country prioritize in the CRD area to achieve the best outcomes?

How? – How do countries try to solve key challenges and how does it work in practice?

This chapter provides an overview of policy options, health service delivery relevant to CRD, various models of care and vital enabling factors for achieving the best CRD outcomes and global commitments.

It is important to note that not all described country examples provide evidence-based practices nor are they validated by WHO or the ERS. However, they offer a broad overview of what is happening in the Region and a compilation of promising examples of how to address common challenges, leading to better health outcomes, improved equity, and enhanced social and economic inclusion.

Essential CRD policy options and interventions

KEY MESSAGE 4

Integrating vital CRD interventions into UHC will reduce inequities, improve access to care and enhance health outcomes for all.

To reduce the CRD burden and meet the NCD and UHC Sustainable Development Goals (SDGs) by 2030 *(1)*, countries must protect the vulnerable and ensure no one is left behind. On top of the silent NCD epidemic, the Region faces multiple economic, demographic, environmental and climate crises, and conflicts, affecting all countries in the Region. Addressing inequalities and building resilient health systems are crucial.

Evidence-based policy options and recommended actions, as described in *Tackling NCDs: best buys and other recommended interventions for the prevention and control of noncommunicable diseases (2)* should be prioritized by all countries in the WHO European Region. These "best buys" are high impact, cost-effective and affordable, and should be implemented across the whole WHO European Region.

In 2018, WHO estimated that if countries put in place the most cost-effective interventions, by 2030 they would not only save millions of lives but also see a return of US$ 7 per person for every dollar invested *(3)*.

To improve CRD outcomes and address inequities, every country should aim to cover all people in need through the fundamental CRD-related best buys provided in Fig. 2.1. Every country should also ensure that these core interventions are accessible, high-quality and safe for their entire population, including vulnerable groups, during both normal times and emergencies.

Fig. 2.1. Extract of CRD-related "best buys" and other recommended interventions

Objective 3 of the Global NCD action plan

To reduce modifiable risk factors for noncommunicable disease and underlying social determinants through creation of health-promoting environments

OVERARCHING / ENABLING ACTIONS

For the Parties to the WHO Framework Convention on Tobacco Control (WHO FCTC):

- Strengthen the effective implementation of the WHO FCTC and its protocols.
- Establish and operationalize national coordinating mechanisms for the implementation of the WHO FCTC as part of a national tobacco control strategy with specific mandates, responsibilities and resources.

For the Member States that are not Parties to the WHO FCTC:

- Consider implementing the measures set out in the WHO FCTC and its guidelines for implementation, as well as the Protocol to Eliminate Illicit Trade in Tobacco Products, if applicable, as the foundational instruments in global tobacco control.

REDUCE TOBACCO USE

BEST BUYS AND OTHER RECOMMENDED INTERVENTIONS

Best buys: Effective interventions with cost-effectiveness analysis ≤ I$100 per healthy life years (HLY) gained in low-income and lower middle-income countries	Increase excise taxes and prices on tobacco products Implement large graphic health warnings on all tobacco packages, accompanied by plain/standardized packaging Enact and enforce comprehensive bans on tobacco advertising, promotion and sponsorship Eliminate exposure to second-hand tobacco smoke in all indoor workplaces, public places, public transport Implement effective mass media campaigns that educate the public about the harms of smoking/tobacco use and second-hand smoke, and encourage behaviour change Provision of cost-covered effective population-wide support (including brief advice, national toll-free quit line services and mCessation) for tobacco cessation to all tobacco users
Effective interventions with cost-effectiveness analysis > I$100 per HLY gained in low-income and lower middle-income countries	Provision of cost-covered effective pharmacological interventions to all tobacco users who want to quit, through the use of nicotine replacement therapy (NRT), bupropion and varenicline
Other recommended interventions from WHO guidance (cost-effectiveness analysis not available)	Establish a tracking and tracing system to support the elimination of illicit trade in tobacco products that is in line with Article 8 of the Protocol to Eliminate Illicit Trade in Tobacco Products Ban cross-border tobacco advertising, promotion and sponsorship, including those through modern means of communication

Fig. 2.1. Contd.

Objective 4 of the Global NCD action plan

To strengthen and orient health systems to address the prevention and control of noncommunicable diseases and the underlying social determinants through people-centred primary health care and universalhealth coverage

OVERARCHING / ENABLING ACTIONS

- Integrate very cost-effective noncommunicable disease interventions into the basic primary health care package with referral systems to all levels of care to advance the universal health coverage agenda.
- Explore viable health financing mechanisms and innovative economic tools supported by evidence.
- Scale up early detection and coverage, prioritizing very cost-effective high-impact interventions, including cost-effective interventions to address behavioural risk factors.
- Train the health workforce and strengthen capacity of health systems, particularly at primary care level, to address the prevention and control of noncommunicable diseases.
- Improve the availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases, in both public and private facilities.
- Implement other cost-effective interventions and policy options in objective 4 to strengthen and orient health systems to address noncommunicable diseases and risk factors through people-centred health care and universal health coverage.
- Develop and implement a palliative-care policy, including access to opioids analgesics for pain relief, together with training for health workers.
- Expand the use of digital technologies to increase health service access and efficacy for NCD prevention, and to reduce the costs in health care delivery.

MANAGE CHRONIC RESPIRATORY DISEASES

BEST BUYS AND OTHER RECOMMENDED INTERVENTIONS

Best buys: Effective interventions with cost-effectiveness analysis ≤ I$100 per HLY gained in low-income and lower middle-income countries	Acute treatment of asthma exacerbations with inhaled bronchodilators and oral steroids Acute treatment of chronic obstructive pulmonary disease (COPD) exacerbations with inhaled bronchodilators and oral steroids' Long-term management of COPD with inhaled bronchodilator
Effective interventions with cost-effectiveness analysis > I$100 per HLY gained in low-income and lower middle-income countries	Long-term management of asthma with inhaled bronchodilator and low-dose beclomethasone
Other recommended interventions from WHO guidance (cost-effectiveness analysis not available)	Seasonal influenza vaccination for people with chronic respiratory diseases Access to improved stoves and cleaner fuels to reduce indoor air pollution Cost-effective interventions to prevent occupational lung diseases, for example from exposure to silica and asbestos COVID-19 vaccination for people with chronic respiratory diseases

Source: WHO, 2024 *(2)*.

Despite their established effectiveness, uptake of the WHO "best buys" for tackling NCDs has been uneven and disappointing over the last one and a half decades.

To support policy decisions, on 24 March 2025, the WHO Regional Office for Europe introduced a set of "quick buys", evidence-based NCD cost-effective interventions with measurable public health impacts within 5 years. Using a strict evidence hierarchy, the effects of each intervention against the global targets agreed upon by countries was estimated. Of the 49 best buy interventions, 25 qualified as "quick buys" *(4)*, including five interventions on tobacco control and one on COPD.

For tobacco, five out of seven tobacco interventions had evidence of impacts within 5 years. The fastest effect was for eliminating exposure to second-hand smoke, which had immediately detectable effects. This was followed by increasing excise taxes and prices, which demonstrated a significant effect at 4 months; followed by nicotine-replacement therapy (6 months), graphic health warnings (14 months) and enacting and enforcing comprehensive bans on tobacco advertising, promotion or sponsorship (2 years).

For CRDs, the four NCD "best buys" were evaluated for their ability to achieve the NCD premature mortality target. Acute treatment of COPD exacerbations with inhaled bronchodilators and oral steroids was linked to a significant reduction in mortality rates at 6 months and recognized as an NCD "quick buy".

These findings not only offer guidance to policy-makers deciding on interventions that align with short-term political cycles but also have the potential to accelerate progress towards global health targets, particularly the 2030 SDG (Target 3.4) of reducing premature NCD mortality by one third.

Joined-up governance and CRD-related policies

KEY MESSAGE 5

Collaborative governance and resilient health systems for CRD, as part of the broader NCD strategy: streamlining funding and enhancing stakeholder collaboration, improving health outcomes and delivering greater value while addressing the unique needs of individuals with NCDs.

People living with CRDs have similar needs to those with other NCDs, making coordinated care essential and effective. Countries should adopt and implement joined-up multisectoral approaches and governance mechanisms to tackle NCDs in a unified way. By aligning policies and actions across these areas, governments can more effectively address the interconnected challenges to public health.

This chapter highlights various strategies that countries have implemented, showing that aligned and coherent policies can significantly improve outcomes for individuals with CRDs and NCDs.

According to the WHO 2023 Country Capacity Survey *(5)*, 70% of countries in the Region have developed integrated CRD-informed policies into their broader NCD strategies and 19% have stand-alone policies. To effectively implement NCD/CRD prevention and control policies, and address multiple crises, it is crucial to combine health, environmental, social and other perspectives and strategies.

From a single-condition approach to integrated health-related policies

Different countries adopt various approaches to developing national CRD policies and programmes. Most countries take a stepwise approach, addressing one or two respiratory conditions at a time, but ultimately covering all priority conditions over the long term. For instance, Finnish Lung Health Programme is a good example of a practical long-term stepwise approach to multiple lung health priorities that integrates public health strategies, stakeholder collaboration and sustainable national funding (Box 2.1) *(6)*.

Box 2.1. Building a healthier future: Finland's stepwise approach to lung health

The Finnish Lung Health Programme has taken a long-term stepwise approach to improving lung health, starting with the TB strategy in the late 19th century. Over 30 years, six subsequent nationwide programmes have addressed CRDs such as asthma, COPD, TB, allergies and sleep apnoea. Each programme integrated public health strategies and engaged various stakeholders effectively. For instance, the Asthma Programme led to significant declines in asthma-related emergencies and hospital admissions, resulting in considerable cost savings. Between 2000 and 2013, the number of asthma-related emergency room visits decreased by 46%, with an even sharper decline among children. Notably, over the past decade, Finland has reported no asthma-related deaths among children.

Recently, Finland introduced Nature Step in children's daycare. This initiative includes diet changes, reduced food waste and increased exposure to natural environments, reducing medicines intake and potentially improving the immune system. Underpinned by sustainable funding, strong collaboration and clear targets, this approach supports building a resilient health system capable of addressing other NCDs and health emergencies such as pandemics.

Detailed Finnish country case provided in the Annex 1.

Another example is an approach taken in Hungary, which incorporated COPD into its broader NCD action plan. This plan also addresses high tobacco use rates and implements innovative health financing mechanisms to improve care and patient outcomes (Box 2.2).

Box 2.2. New financial mechanisms to enhance COPD management in Hungary

Hungary has focused on COPD due to its high burden and the country's high smoking rates. The adopted "Healthy Hungary 2021–2027" Strategy *(7)* aims to improve COPD care among other priority health issues.

Various implemented measures include early COPD diagnosis with spirometry, better patient pathways, team-based integrated care and the introduction of quality indicators. Innovative interventions such as bundled payments coupled with clinical governance empowered and capacitated ambulatory care teams. A demonstration project strengthened professional collaboration, teamwork and patient adherence. A preliminary evaluation by the National Working Group after 12 months highlighted reduced hospitalization rates, shorter admissions and improved follow-up therapies. From 2022 to 2023, hospital readmission rates were 1.14 at pilot sites compared to the national average of 1.25, showing promising results for expansion and gaining political support.

Future plans include boosting ambulatory pulmonary rehabilitation, enhancing patient engagement and exploring digital tools for better COPD management.

Detailed Hungarian country case provided in the Annex 3.

Joined-up NCD and CRD prevention and environment programmes

A number of countries in the east of the Region have implemented projects for integrated prevention and health protection. For example, Uzbekistan's early warning systems for dust storms connect air quality and CRDs with other NCDs, providing timely information to reduce risks and prevent exacerbations *(8)*. Effective joint policies require enhanced coordination and optimized resource allocation. Key to success is effective leadership, strong

coordination, sustainable funding and robust outcome-measuring frameworks.

Other countries in the Region have addressed the urban–rural health-care divide by improving rural health-care infrastructure and implementing stricter air quality regulations. To reduce indoor air pollution, governments should ensure access to improved stoves and cleaner fuels in accordance with WHO guidelines. Kyrgyzstan exemplifies integrating air quality initiatives into broader health policies, reducing indoor air pollution and improving respiratory health, especially in mountainous regions. Many other countries implement healthier environment infrastructure (Box 2.3).

Box 2.3. Better air quality strategic approaches to reducing the burden of CRDs

Austria has introduced innovative initiatives, such as the Walking Masterplan *(9)*, to promote cycling and walking within its National Energy and Climate Plan.

Denmark has shifted from a major oil and gas producer to a leader in renewable energy, particularly offshore wind, with a goal to cut greenhouse gas emissions by 70% by 2030 *(10)*. This aligns with the EU's stringent air quality standards aimed at reducing harmful pollutants *(11)*.

Estonia is diversifying its energy sources by investing in renewables such as wind and solar.

Kyrgyzstan's Health in the Mountains Agenda *(12)* integrates air quality initiatives into broader environmental and public health policies, addressing the unique challenges faced by mountainous populations such as indoor air pollution from traditional heating and harsh climates that worsen CRDs. The country measures CRD outcomes to assess the effectiveness of its efforts.

While lacking a specific CRD policy, Kyrgyzstan focuses on improving air quality, health-care infrastructure and access to specialized respiratory care, especially for remote communities. Since 2015, the Ministry of Health has coordinated initiatives such as smoking cessation, promoting clean cookstoves and training health-care workers, with support from international partners. These measures have led to a significant decline in CRD death rates, from 33.1 to 24.4 per 100 000 population between 2017 and 2022. Tackling air pollution remains central to improving respiratory health outcomes and reducing disease burden.

Detailed Kyrgyz country case provided in the Annex 4.

Norway is leading the transition to electric vehicles, with a significant increase in their market share *(13,14)*.

Several cities in the WHO European Region, including Stockholm (**Sweden**) and London (**United Kingdom**), have established Low Emission Zones to restrict the use of polluting vehicles, paving the way for future Zero Emission Zones

Overall, these examples illustrate how joint policies linking environmental, air quality and NCD prevention strategies can effectively address the burden of CRDs and promote better health outcomes across the Region.

Joined-up tobacco control and lung health programmes

Tobacco control is another vital example requiring multisectoral collaboration to improve lung health and NCDs. Effective tobacco control measures, including smoke-free environments and tobacco cessation, can significantly reduce COPD over 10–30 years. After 15–25 years of abstinence, COPD risk can equal that of a never-smoker. Tools are available to help people quit smoking.

The WHO European Region has made significant progress in adopting comprehensive tobacco control policies that improve lung health and reduce smoking-related diseases, addressing social determinants such as health-care access and clean environments. Tobacco control is a key element of a holistic strategy for CRD prevention and management.

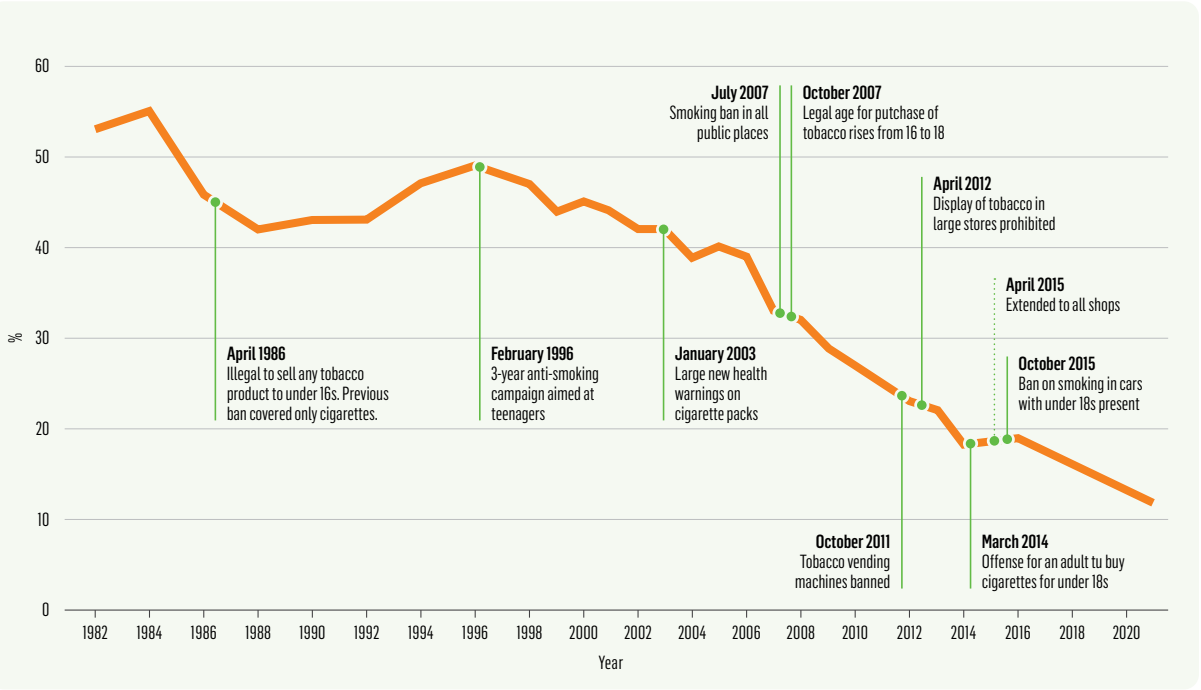
In the WHO European Region, 51 of the 53 Member States have ratified the WHO FCTC, reflecting a strong commitment to reducing tobacco use *(15)*. WHO recommends that at least 75% of the retail price of tobacco be comprised of taxes. This goal has already been met by 28 of the 53 countries in the Region *(16)*. However, for the WHO European Region to further reduce tobacco use prevalence it is important to fully implement the WHO FCTC requirements and all six WHO MPOWER[1] measures *(17)*, which provide a solid framework, with many successful implementation examples across the Region.

Many countries in the WHO European Region have recognized tobacco control as a multisectoral priority, leading to significant public health improvements:

- In Sweden, the prevalence of moderate-to-severe COPD dropped to just 3.5% between 1994 and 2009 *(18)*, following a three- to four-fold reduction in smoking rates over 30 years. Norway and Spain have also reported declines in COPD rates alongside decreased smoking prevalence.
- Ireland pioneered global tobacco control by banning smoking in all workplaces in 2004, resulting in 800 000 fewer smokers and a drop in smoking prevalence from 27% to 18%. Rigorous enforcement and increased budgets for cessation programmes have further reduced youth smoking rates from 19% to 5% *(19)*.
- Similarly, the United Kingdom has been proactive since 1982, currently maintaining an 11% smoking prevalence rate. In 2023, the British government pledged to double its budget for stop-smoking services, targeting support for 360 000 individuals annually and addressing health inequalities in deprived areas *(20)*. New legislation is aiming to prevent anyone under 14 years old from ever purchasing tobacco, with strong cross-party support. From June 2025 the sale of single-use/disposable e-cigarettes. The impact of policies on smoking rates is in Fig. 2.2. Detailed United Kingdom country case provided in the Annex 6.
- Belgium was the first country in the Region to ban the sale of disposable e-cigarettes on health and environmental grounds from 1 January 2025, followed by France from 26 February 2025 *(21,22)*.

1 WHO MPOWER measures: M – Monitoring tobacco use and prevention policies; P – Protecting people from tobacco smoke; O – Offer help to quit tobacco use; W – Warn about the dangers of tobacco; E – enforce bans on tobacco advertising, promotion and sponsorship; R – Raise taxes om tobacco.

Fig. 2.2. Pupils aged 11–15 who have ever smoked, by year, mapped against key tobacco control interventions, 1982–2021 (England, United Kingdom)



Source: NHS England, 2022 *(20)*.

A whole health system approach that simplifies messaging to galvanize health-care professionals to support quit attempts in all settings can be impactful *(20)*. Evidence on how to help people addicted to e-cigarettes quit is emerging, with over 20 ongoing trials. However, it remains crucial to prevent people from starting.

Another successful country example from the eastern part of the WHO European Region is Georgia (Box 2.4).

Box 2.4. Georgia's example in improving lung health through effective tobacco control policies

Georgia has implemented comprehensive tobacco control legislation since 2017, banning the use of all tobacco products and e-cigarettes in enclosed public spaces and public transport. This initiative led to a 21% decline in COPD incidence and a 15% reduction in asthma cases by 2019, with a notable 48% decrease in asthma among children. The improvements in indoor air quality contributed to these health outcomes, with reductions in PM levels in public buildings. However, challenges remain, particularly due to aggressive marketing of heated tobacco products and attempts by the tobacco industry to undermine regulations.

To address these challenges, Georgia must continue strengthening enforcement of existing policies, counteract industry interference and enhance public education on the health risks of tobacco use. Continued political commitment, multisectoral collaboration and sustainable funding for tobacco control efforts have been the cornerstone to sustaining progress in Georgia and can serve as a model for other countries in the WHO European Region.

Detailed Georgian country case provided in the Annex 2.

These examples highlight that wide use of tobacco control measures, especially those that protect people from the harms of second-hand smoke and ensure access to cessation services (part of cost-effective CRD interventions recommended by WHO), are crucial for improving CRD outcomes. By reducing tobacco use rates, preventing the spread of the use of ENDS and improving air quality, these measures help prevent new CRD cases and manage existing conditions. The success of these countries highlights the importance of robust tobacco control strategies, including legislative changes, public health campaigns and accessible cessation services, in improving public health and reducing CRDs.

Joined-up climate impact and lung health programmes

CRDs are influenced by various factors beyond air pollution and smoking such environmental and occupational hazards, and social determinants of health. A multisectoral approach is essential to address all of them.

The joined efforts to reduce CRDs should focus on addressing ozone depletion and global warming, which contribute to respiratory health risks, and enforcing asbestos and silica regulations to protect workers. In this regard, the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer *(23)* have successfully phased out ozone-depleting chlorofluorocarbons in metred-dose inhalers, achieving over a 98% reduction. This milestone reflects 30 years of global efforts to protect the ozone layer. Affordable, chlorofluorocarbon-free alternatives are now widely available, benefiting both patient health and environmental safety. Moreover, this transition has raised awareness of the advantages of these alternatives, showcasing a successful collaboration among stakeholders *(24)*. These efforts are being taken further through a commitment to reduce "forever chemicals" by the European Chemicals Agency target date of 2026 *(25,26)*. A coordinated, multisectoral approach involving environmental, occupational, health care and social policy reforms is essential to reducing the CRD burden and improving health outcomes. Civil society engagement, with young people and people living with CRDs, in policy design and implementation, ensures a people-centred approach and addresses the most pressing needs.

Sustainable financing for CRDs

Sustainable financing for CRDs is crucial to improving health outcomes and achieving UHC. Most health systems struggle to provide preventive services, quality ongoing care and financial protection for individuals with CRDs. Enhancing health financing systems involves increasing pooled funding for CRD interventions, negotiating better prices for essential medicines and adapting financial protection policies for long-term needs.

Strategic collaboration

WHO and the World Bank held a hybrid) multistakeholder briefing on 15 March 2024, to share an overview of the preparation for the international financing dialogue. The meeting was organized to support the preparatory process leading up to the Fourth High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs and Mental Health in 2025 *(27).* It comprised non-state actors in official relationships with WHO, United Nations agencies and multilateral organizations.

Further web-based multistakeholder consultations took place until 17 June 2024 to enable all interested parties to contribute their view. Technical policy briefs were developed to support sustainable financing for NCDs and mental health *(28)*.

Four key messages emerged from the consultations:

- The policy response to NCDs and mental health conditions needs to include a greater focus on publicly financed, primary health care (PHC)-based services.
- The principal way to improve the value in NCD and mental health spending is to change the incentives around how resources are allocated to providers and then used.
- NCD and mental health policy leaders have several entry points for using existing funding more effectively.
- There is urgent need to implement policies that improve access and financial protection for individuals needing essential NCD and mental health services.

Countries can leverage a range of financing sources to invest in cost-effective NCD/mental health services, including CRD interventions, by increasing and optimizing health budgets, implementing fiscal measures and streamlining service delivery.

Fiscal policy

Country pooled funding can be increased through win-win fiscal policies, such as taxes on tobacco, alcohol, sugary drinks and unhealthy food which can then be allocated to health in general or earmarked for NCD programmes.

Country examples are given in Box 2.5

Box 2.5. Country examples of taxation policy

Denmark, Georgia, Netherlands (Kingdom of the), Portugal and **Türkiye,** are among the 28 countries levying taxes that comprise at least 75% of retail prices on tobacco products *(16)*.

In 2020, 10 of the 53 Member States had national sugar-sweetened beverage taxes, including **Belgium, Finland, France, Hungary, Ireland, Latvia, Monaco, Norway, Portugal and the United Kingdom** *(29)*. Some countries also introduced taxes on unhealthy food products.

Development assistance for health

CRDs, as part of the broader NCDs, should be included in global, regional and national development goals; they cause the biggest burden and should be aligned with national and regional priorities for funding and development assistance for health.

Research funding

Respiratory research funding is inequitable. Research funding in this area remains significantly lower than for other NCDs. There are striking discrepancies between the respiratory disease burden and the awarded grants by year, for example COPD is the third leading cause of death worldwide but funding has plummeting from 50th to 114th place in the global biomedical research funding ranking since early 2000s *(30)*. The lack of robust scientific data in the diverse WHO European Region and at country level further exacerbates this issue.

Efficient use of resources

Equitable and needs-based allocation, along with the efficient use of resources, is crucial for achieving UHC. Financial protection mechanisms for people living with NCDs and the inclusion of essential cost-effective CRD services in the national health benefit packages can ensure better health outcomes (Box 2.6).

Box 2.6. Country examples of reducing OOP expenses

Germany has introduced policies to limit OOP expenses for essential treatments, thereby enhancing financial protection for people living with CRDs. While Germany provides public coverage for essential medicines, it is not alone in doing so. The critical issue, especially for less well-off countries, is whether this coverage is sufficient – and to what extent the actual needs of the population are met through public funding. This highlights the need to assess not just the presence of policies, but their depth and equity across different contexts *(31)*

Sweden has successfully integrated essential respiratory care into its health benefit packages, ensuring that preventive measures and treatments are accessible *(32)*.

Not only Germany, Sweden and other high-income countries publicly cover essential medicines to reduce OOP expenditures. A proper monitoring system and regular analysis is required to measure the extent to which public funds cover needs in essential medicines.

Regulating medicines and health devices

To reduce OOP expenses and ensure UHC, one of the nine global voluntary targets on NCDs includes the following.

An 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases in both public and private facilities by 2025 *(33)*.

As part of sustainable funding strategies and financial protection, efficient use of resources is very important. There are some recommended strategies for consideration:

- **Policies and regulations:** Ensuring access, affordability and coverage for essential medicines is crucial. Medicines should be evidence-based and available nationally. The National Essential Medicines List should be regularly updated and aligned with evidence-based guidelines. WHO biennially updates the Model List of Essential Medicines *(34)* to support countries.

Ensuring access, affordability and coverage for essential medicines is crucial. Medicines should be evidence-based and available nationally.

- **Price regulation:** Regulating prices of essential medicines and devices for CRDs can make treatments more affordable.
- **Reimbursement and procurement:** CRDs require both inpatient and outpatient treatment. Reimbursement should be a key strategy, alongside centralized procurement for expensive medicines.
- **Appropriate medicine selection:** In some Eastern European countries, resources are spent on non-essential products . Prioritizing essential medicines in public funding is key to improving access and efficiency.
- **Diverse reimbursement lists:** Ensuring a diverse list of reimbursed medicines improves coverage and individual choice. Selection should follow prioritization, referencing and pricing processes.
- To ensure affordability and avoid corporate interference, in 2020 **WHO published pricing policy guidelines** to improve affordable access to medicines *(35-37)*.

By focusing on these strategies, countries can create sustainable funding and health financing mechanisms with efficient resource allocation (Box 2.7).

Box 2.7. Country examples of price control and sustainable funding mechanisms

Germany has created sustainable funding and health financing mechanisms, ensuring efficient allocation and use of resources. This includes internal and external reference pricing, regulation of mark-ups, competitive tendering, and promoting generics and biosimilars *(38)*.

Spain has implemented price controls on asthma medications to ensure affordability through its National Health System. The Spanish Ministry of Health regulates the prices of medicines, including asthma treatments, to ensure they remain accessible to patients *(39)*.

Redefining CRD service delivery

In addition to policies and population-based interventions through health promotion and reducing exposure to risk factors, it is essential to deliver health services within the entire cycle of care – from prevention to end-of-life care. These services are crucial for responding to the individual needs of people already exposed to and living with CRDs, who often experience poor quality of life.

This section describes fundamental essentials of the health system response and promising country examples of health service delivery across the Region.

A whole cycle of care

KEY MESSAGE 6

Investing in primary care will ensure accessible, affordable and comprehensive management throughout the care cycle, helping to reduce inequalities and improve health outcomes related to CRD.

Health promotion and CRD prevention

As described in the previous sections, health-care systems alone cannot drive improvements toward social, economic and environmental standards without multisectoral collaboration. In response, many countries within the WHO European Region are prioritizing tobacco control, air quality measures, public health promotion, health literacy campaigns, healthy lifestyles programmes and providing healthy choices in their broader multisectoral population-based strategies.

Simultaneously, effective prevention depends on a combination of population-based and individual-level interventions. PHC serves as a vital bridge between public health and clinical services, fostering greater engagement from communities and civil society – including youth, communities and individuals affected by CRDs and their associated risk factors.

At the health system level, prevention efforts for CRDs focus more on reducing community and individual exposure to common risk factors, starting from pregnancy and early childhood and continuing throughout the life span.

Preventive interventions for CRDs that can be considered by countries for implementation at community and individual levels (also included in the NCD "best buys") include the:

- identification of **risk factors**;
- **promotion of healthy lifestyle**, including counselling on physical activity, healthy diets and reducing exposure to occupational and environmental pollutants;
- implementation of **tobacco cessation programmes**, including counselling and pharmacological treatments which have also proved to be effective for people living with CRDs;
- support for risk identification of exposure to **avoidable air pollution**, advocating for policies and practices that reduce air pollution and improve indoor air quality at community level, including support for **smoke-free environments** in homes, public places and health facilities;
- promotion and provision of influenza and COVID-19 **vaccinations** as part of the WHO recommended best buys along with pneumococcal immunization to prevent exacerbations from respiratory conditions; and

- vaccinations for respiratory syncytial virus (RSV) recommended by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) *(40)* also have the potential to be considered as national policies in the future. Currently, two products (nirsevimab and an RSV prefusion-F protein vaccine), have recently been licensed for preventing severe RSV disease in young infants *(41)*. Strengthening the **management of acute respiratory infections** and TB can help prevent long-term consequences including the development of COPD

These interventions aim to minimize risk factors and enhance overall respiratory health.

Avoiding direct and indirect tobacco smoke exposure is crucial for healthier lungs and preventing major NCDs, as outlined in WHO *Global strategy for the prevention and control of noncommunicable diseases (42)*. Tobacco cessation programmes, including brief counselling, quit lines and evidence-based nicotine-replacement treatments, significantly improve lung health and should be integrated into health-care systems to be widely accessible for anyone at risk of or living with CRDs *(43)*. Identification of second-hand smoke exposure is often missing in risk identification questionnaires.

Respiratory infections contribute to the development of CRDs and their exacerbations. Preventing them is essential to reducing avoidable mortality, morbidity and hospital care demand. Influenza and COVID-19 vaccinations are cost-effective primary and tertiary prevention measures *(44)*. A rapid review *(45)* during the COVID-19 outbreak highlighted the value of influenza vaccinations for people with CRDs in keeping them out of hospitals, thereby freeing up beds for COVID-19 patients *(40,46–48)*.

Pneumococcal and RSV vaccinations are also effective for preventing severe respiratory infections, particularly in vulnerable populations such as young children and older people. Effective vaccines have significantly reduced the incidence of pneumococcal diseases and RSV-related hospitalizations *(49,50)*. However, vaccination uptake remains challenged by a lack of awareness and hesitancy, with pneumococcal vaccination rates in Europe at 24.20% for older adults and 17.95% for at-risk groups, compared to 88.30% for children. Notable disparities exist in recommendations and funding for vaccination programmes between eastern and western parts of European Region *(51,52).* The United Kingdom launched an RSV vaccination programme in September 2024 for adults aged 75–79 years old and pregnant women *(53)*.

In the WHO European Region, many countries have established vaccination programmes targeting at-risk populations, including individuals with CRDs. However, vaccination rates remain low, particularly among patients with COPD *(44)*. Rethinking patient' pathways to vaccination and interdisciplinary partnerships with health professionals should be leveraged to ramp up vaccination coverage (Box 2.8). Vaccination of at-risk adults in community pharmacies is one of the levers to bring both vaccines and immunization services closer to patients. Programmes that enhance vaccine confidence through education and community engagement are also important for improving acceptance and immunization rates. The Vaccine Confidence Project *(54)* investigates public beliefs about vaccination and factors influencing acceptance, as well as providing resources for the general public, educators and policy-makers. As part of the WHO's Vaccine Safety Net, the Vaccine Confidence Project is supported by an interdisciplinary team and upholds strict policies on sponsorship and content integrity *)*. By collecting and disseminating harmonized data on influenza, COVID-19 and RSV, the WHO European Region can better identify and address barriers to vaccination. Additionally, digital tools such as electronic vaccination registries serve as valuable resources for enhancing vaccine confidence and facilitating data-driven public health initiatives *(55)*.

Portugal serves as a compelling example of how high vaccination coverage combined with comprehensive tobacco control policies can significantly reduce hospital admissions and respiratory mortality among high-risk populations.

Box 2.8. Rethinking patients' pathways to vaccination and interdisciplinary partnerships with health professionals

Portugal has prevented CRDs through successful vaccination and tobacco control measures.

The Portuguese National Programme for Respiratory Diseases, launched in 2012, aims to reduce the CRD burden. It focuses on preventing CRD exacerbations and hospital admissions through high vaccination coverage and comprehensive tobacco control policies.

Free influenza and pneumococcal vaccinations are offered to high-risk groups, such as those over 65 and patients with COPD. This initiative, along with national awareness campaigns, has increased vaccination rates from 44.9% in 2012 to 76% in 2022, surpassing the WHO target. This success has helped reduce hospital admissions for respiratory diseases, especially among older populations.

Tobacco control is another major pillar. The National Programme for Smoking Prevention and Tobacco Control, also launched in 2012, reduced smoking prevalence from 20% in 2014 to 17% in 2019. Free smoking cessation services in primary and secondary care have significantly reduced CRD exacerbations.

Together, these strategies have lowered respiratory mortality and hospital admissions due to CRD exacerbations, improving asthma and COPD outcomes. Detailed country case of Portugal provided in the Annex 5.

Spain offers a strong example of how community pharmacies can be mobilized to support vaccination efforts. In Andalusia, a region in southern Spain, a new initiative started in autumn 2022 to offer influenza vaccination to children for the first time, supported by educational posters and training materials for pharmacy staff, which positively influenced parental awareness. Several Autonomous Regions – including Castile and León, Aragon, Andalusia and Catalonia – have formalized procedures enabling pharmacists to provide advice, identify eligible individuals and refer patients for vaccination, in collaboration with regional health authorities.

During the COVID-19 pandemic, community pharmacies in Spain played a critical role in the public health response: they participated in testing, distributed personal protective equipment and diagnostic kits, provided health education, referred patients to vaccination centres and even vaccinated pharmacy staff to help increase coverage. These efforts earned pharmacists high levels of public trust and professional recognition, with surveys by the General Pharmaceutical Council ranking them as the most trusted essential service provider *(56)*.

Ukraine has also recognized the potential of expanding vaccination pathways. Community pharmacies are increasingly seen as accessible points of contact that could help increase vaccination coverage among adults with chronic conditions, particularly through improved referral mechanisms and collaboration with primary care providers *(57)*.

CRD detection and diagnosis

KEY MESSAGE 7

CRDs are often overlooked, preventing patients from receiving essential treatments for a better quality of life. Integrating CRD diagnosis into primary care can make a difference, but it requires well-trained health providers, technological support and effective incentives.

As described in the previous chapter, there are several barriers to the early and effective diagnosis of CRDs which can be summarized into three main groups:

- Nature and complexity of CRD:
  - shared and overlapping symptoms in many respiratory conditions and between CRDs;
  - multiple interacting risk factors complicating identification of the primary cause;
  - complex definition and nature of airflow changes, particularly for COPD; and
  - frequent comorbidities with other health conditions, often leading to misdiagnosis.
- Health system constraints:
  - limited access to diagnostic tools, such as spirometry and imaging;
  - limited health provider knowledge and skills, especially at PHC level, leading to underdiagnosis, overdiagnosis and misdiagnosis;
  - lack of respiratory health specialists and multidisciplinary teamwork for specific CRDs; and
  - time constraints, high workloads in PHC settings, and often no incentives for identifying and managing CRDs at PHC level.
- Behavioural and cultural barriers:
  - lack of awareness about CRDs in both patients and health providers, delaying admissions to health facilities and timely diagnosis; and
  - stigma associated with respiratory disease or the fear of a serious diagnosis drive patients to avoid seeking medical help.

Early diagnosis

For decades, professional communities and public health experts have debated the most cost-effective and efficient approaches for the early or timely diagnosis of CRD. There is no single agreed-upon approach for early detection programmes, including screening and case finding for some CRDs. Experts are comparing the advantages of using broader, more general models with the need for more accurate, specific ones. More research is required before recommending any regional actions.

However, there is overall agreement that screening programmes among asymptomatic individuals or those without specific risk factors should not be considered a method for the early detection of CRDs.

There are two types of early diagnosis approaches: active case-finding and screening.

Active case-finding approach is based on a risk stratification is beneficial for identifying individuals at high risk of developing severe conditions, allowing for targeted interventions and better resource allocation.

In the context of lung health, there are trials to develop similar risk stratification charts for COPD *(58)* and lung cancer *(59)*. However, more evidence is required for further validation and proof of their cost-effectiveness, benefit and applicability. Early diagnosis of asymptomatic patients, particularly for COPD, is currently not recommended due to the absence of validated diagnostic tests, unclear recommendations on specific biomarkers and uncertainties in treatment at the early stage without symptoms. To address the underdiagnosis of COPD some countries are piloting or implementing opportunistic or proactive case-finding programmes for COPD using questionnaires targeting at-risk populations, followed by clinical consultations and lung function testing by family physicians. See Box 2.9.

Box 2.9. Active case-finding examples for COPD

Netherlands (Kingdom of)	Netherlands (Kingdom of the) introduced a self-administered, online COPD screening questionnaire – a COPD risk test for people aged 40–70. The test includes 10 questions derived from various international research questionnaires, adapted and tested nationally. The results prompt individuals to make an appointment with their general practitioner (GP) for diagnosis and provide a helpline and useful information *(60)*.
Poland	A large national screening programme among the high-risk population and COPD case finding have been investigated and implemented in Poland. This early detection and prevention of COPD programme targeted smokers aged 40 years or older. Identified high-risk individuals were invited by phone to local outpatient chest clinics for free spirometry tests by family doctors. Out of the 8% of detected COPD patients, only 19% had been previously diagnosed *(61)*.
United Kingdom and others	Some countries such as the United Kingdom are studying models of active COPD case finding using online/mail symptom-based questionnaires or opportunistic case finding during visits to PHC facilities *(58)*. Other studies have shown promising results using artificial intelligence (AI) and machine learning for early diagnosis of COPD and other respiratory diseases. Both examples require a well-developed HISs and patient e-records, limiting their applicability in most low- and middle-income countries.
Uzbekistan	Under the WHO and German Government's BMU[a]-funded project in 2009–2010, Uzbekistan had experience in implementing integrated Practical Approach to Lung Health in the Republic of Karakalpakstan. This approach strengthened differential diagnosis skills and the capacity of PHC doctors to distinguish between TB and CRDs. This was an example of linking a well-designed TB-detection programme with CRDs. Unfortunately, scaling up and sustainability measures were not considered after the project closed. However, based on recent interviews by WHO experts with the health providers trained under thet project, the practical skills obtained and equipment provided are still used by PHC teams, and were also widely used during the COVID-19 pandemic.

[a] The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection in Germany.

For the past decade many countries are struggling with the dilemma of cost-effectiveness and feasibility of **organized screening programmes in CRDs,** Some countries are implementing or considering implementation of specific screening programmes in CRDs.

There are growing evidence confirming effectiveness of some of the screening programmes, such as regular screening for lung cancer or CF for specific groups of the population, for example, workers of high-risk industries.

WHO emphasizes that while some screening programmes can be beneficial, their effectiveness depends on proper implementation, quality assurance and minimizing potential harms. To support countries in making informed decisions and evidence-based policy design, WHO published a guide for screening programmes as well as a guide on cancer screening *(62,63)*.

Effective screening programmes should be well-planned, adequately financed and continuously monitored to ensure they provide more benefits than risks.

There are many examples in the Region of when countries have included specific organized screening programmes or regular prophylactic check-ups without cost–benefit estimates, with inadequate funding or without providing proper treatment options after detection.

Countries should consider their overall health priorities, including other national priority screening programmes, available resources, country capacity and ethical perspectives (such as overdiagnosis or misdiagnosis and the ability to provide treatment for those detected) before implementing any organized early detection or screening programmes. Countries considering lung cancer screening must adopt a comprehensive approach that includes prevention, diagnosis, treatment, follow-up, rehabilitation and palliative and end-of-life care. Screening without strong tobacco control, adequate health-care capacity and integrated services risks wasting resources and limiting health impact. As screening increases demand, systems must be ready to manage it. A well-designed pilot, embedded in a broader public health strategy, is essential before scaling up.

There are some promising examples of organized screening programmes, which relate to very specific conditions such as lung cancer and CF. Some countries have considered how one screening or early detection programme can be used to link to the diagnosis of other conditions, such as COPD.

However, more discussions and research should be conducted to support such approaches, especially in low- and middle-income countries, to ensure the development of wider recommendations for all countries in the Region and globally with different health systems and income levels.

As discussed above, implementation of any additional large-scale national programmes requires thorough considerations and solid evidence, tested in the country context and estimating cost-effectiveness and outcomes (Box 2.10).

Box 2.10. Country examples of organized screening programmes

Lung cancer screening	
EU	The EU, as part of *Europe's Beating Cancer Plan (64)*, supports exploring the feasibility and effectiveness of low-dose computed tomography (CT) for high-risk lung cancer individuals, linking screening with primary and secondary prevention. The EU-funded Strengthening the Screening of Lung Cancer in Europe programme *(65)* tests integrated approaches in 15 countries. The project has trained mediators and ambassadors to ensure that people belonging to hard-to-reach populations (e.g. socioeconomically deprived people, ethnic minorities) are reached and their participation in screening is facilitated. Mobile CT units help to reach people in remote areas and other lung health checks including lung function testing are provided together with the CT scan. By March 2025, more than 6000 high-risk people had been screened.
Kazakhstan	In Kazakhstan, the government adopted a comprehensive plan on oncological diseases for 2023–2027, which includes the implementation of a national lung cancer screening programme using low-dose CT scans with AI technologies for high-risk individuals, particularly targeting those with a history of smoking.
United Kingdom	The United Kingdom has launched a targeted Lung Check Programme, to screen over 1 million high-risk individuals and have identified over 5000 cases, with 75% at early stages of lung cancer . High-risk individuals are notified by text, triaged by phone and offered a CT scan at a mobile unit or local hospital *(66,67)*. On 1 February 2025, the NHS Targeted Lung Health Check Programme was renamed the National Health Service (NHS) Lung Cancer Screening Programme, becoming a targeted national screening programme for people aged 55-74. Patients will have their risk of cancer assessed based on their smoking history and other factors; those considered high risk will be invited for specialist scans every 2 years. Currently, lung health checks are only available in some parts of England. The NHS is planning to roll out targeted lung cancer screening across the whole of England by 2029. The proposed annual implementation cost for the lung cancer screening programme is £270 million. This initiative aims to conduct nearly 1 million scans each year, with the goal of detecting approximately 9000 cancer cases at an early stage. By targeting high-risk individuals aged 55-74, the NHS expects to reduce the number of deaths caused by lung cancer, which currently claims around 35 000 lives annually in the United Kingdom.
CF screening	
25 countries in the WHO European Region	Around 25 countries in WHO European Region, are implementing specific national or regional screening for rare diseases – CF is part of the wider neonatal screening with the majority of countries using DNA tests, with a few still using biochemical tests *(68, 69)*. Evidence from research and the implementation experiences of these countries shows that this screening programme can increase life expectancy to 48 years or more with the available treatment. However, the introduction of such expensive screening programmes requires thorough consideration of several critical factors, including minimal incidence rate criteria, ensuring the availability of resources to introduce sensitive diagnostic tests, follow-up efficiency, human workforce capability, the availability of evidence-based guidelines, and the availability and affordability of specific advanced treatments for some neonates.
Regular check-ups for high-risk workers	
Germany, Hungary, Italy, United Kingdom and many others	Many countries have regular health check-ups for high-risk workers, including xrays and lung function tests. For example, Germany tests workers exposed to silica dust; the United Kingdom conducts spirometry tests for construction and manufacturing workers; in Italy it is mandatory by law for silica-exposed workers to be periodically screened by occupational health physicians for silica-related respiratory effects using ad hoc respiratory questionnaires, chest x-rays and spirometry *(70)* and Hungary mandates health surveillance for workers in agriculture and construction *(71)*.

Early detection of occupational exposures in high-risk industries is crucial for public health *(72)*. Countries have successfully introduced regulations and specific programmes in this regard. The European Network for Silica, formed by the employee and employer European sectoral associations through the *Agreement on Workers' Health Protection Through the Good Handling and Use of Crystalline Silica and Products containing it*, established nearly 20 years ago, provides good practice guides on exposure prevention *(73)*.

Health mediation is an effective tool for addressing health inequalities and reaching the hard-to-reach population. Mediators and ambassadors (also called community health workers) live and work in the communities and can improve health literacy and facilitate access to care. Health mediators employed in primary care, have been shown to be an effective way to improve population health in socioeconomically deprived areas or communities *(74,75)*. They can contribute to improving primary prevention and may improve patient outcomes in asthma and COPD, however, further studies are warranted to decide their potential *(76–78)*.

Ensuring access and availability of diagnostic services

Due to a shortage of respiratory specialists, limited permission for family physicians to diagnose and manage CRDs, and barriers for the community in accessing diagnostic services, countries are expanding the role of PHC to include the identification of CRDs. The COVID-19 pandemic caused a backlog in testing, but new initiatives across the WHO European Region are addressing this and exploring innovations for timely and safe testing.

Spirometry is one of the essential tools for diagnosing and monitoring CRDs, however, it requires well-trained staff, reliable equipment and standardized procedures. Country examples of improving timely access to accurate diagnosis using spirometry and other tools are given in Box 2.11.

Box 2.11. Country approaches of better and timely diagnostics

Italy	In Piedmont, Italy, pharmacists were trained to identify individuals at high risk of COPD using **a questionnaire and portable spirometer**, suggesting that an advanced role of community pharmacists could contribute to the identification of at-risk individuals. This intervention, conducted from October 2017 to February 2018, revealed that nearly half of those at high risk had impaired respiratory function. These individuals were then referred to their primary care physicians *(79)*.
Netherlands (Kingdom of the)	Dutch family physicians have been responsible for diagnosing and managing CRDs for decades. More than 80% of people with CRDs are managed successfully in PHC without needing secondary care engagement. A national audit 15 years ago revealed that most PHC practices had spirometry, but quality assurance processes were not universal. Reforms introduced **peer-led educational programmes** by the COPD & Asthma Hulsartsen Advisory Group for spirometry and established **central hubs** for practices without spirometry facilities *(80,81)*.
Spain	In Spain, national guidelines, developed jointly by primary and secondary care, recommend spirometry at PHC level. PHC teachers with a special interest in respiratory disease, from a national primary care society, have boosted competence and confidence through courses. Based on this experience, a teaching team member co-produced **a new e-learning programme**, Spirometry Simplified, with an international expert team *(82)*.
United Kingdom	To address the COVID-19 backlog, the United Kingdom introduced a quality improvement (QI) scheme in 19 GP practices using **fractional exhaled nitric oxide tests alongside spirometry** leading to better asthma diagnosis. Fractional exhaled nitric oxide, a simple breath test, detects type-2 airway inflammation which reveals asymptomatic asthma with possible normal spirometry readings. Practices were trained locally and complex cases were referred to a virtual multidisciplinary team meeting. Due to its success, a community of practice was formed and plans were made for wider scale-up under the new asthma guidelines in November 2024 *(83)*.
Italy and Spain	A promising approach being tested in countries such as Italy *(84)* and Spain *(85)* involves **tele-spirometry (an online procedure)**. In this method, a technician remotely controls a computer with spirometer software from a tele-spirometry central office or hospital room, which is connected online to the spirometry room with the patient at PHC level. This approach could potentially address the issue of poor-quality spirometry use in primary care settings. However, more research and cost analysis are required for future implementation at national level.

While such approaches aim to tackle underdiagnosis, other approaches aim to tackle misdiagnosis: there are many examples for asthma in PHC *(86)*.

Awareness of frailty as a treatable trait in CRDs (particularly in COPD) is growing but not yet widely implemented. Validated screening tools can detect frailty in PHC, prompting comprehensive assessment and personalized management. However, more evidence is needed on the best implementation methods *(87)*.

In 2022, The Lancet Commission on COPD proposed a new approach that involves changing the definition, classification and diagnostic criteria of the condition. The primary reason for these changes is that relying solely on a spirometry-based definition restricts the ability to identify early changes in the airways or damage to lung tissue, which limits opportunities for preventing COPD. This new approach will need thorough validation and further discussion among experts *(88)*.

Treatment and control of CRD

The Region faces increasing challenges in providing quality evidence-based treatment, controlling CRDs and reducing inequalities.

In line with global commitments and evidence for better outcomes, countries can prioritize the following targets related to treatment:

- One of the nine global voluntary NCD targets includes an 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities by 2025 *(32)*. Acute and long-term treatment of asthma and COPD as NCD "best buys" and recommended interventions are recommended to be included in national programmes.
- Deaths from asthma and COPD can be considerably reduced by improving disease control and the risk of infection, thereby reducing exacerbations which lead to hospitalization, readmission and long-term poorer outcomes.

There are many underlying factors which are related to the organization of health care, health providers, people with lived experience and societies.

These factors collectively lead to inconsistent and suboptimal CRD treatment and control. Addressing these issues requires a multifaceted approach involving better training for health-care providers, patient education, community engagement and supportive interventions to encourage adherence and behavioural change. This section of the report focuses on treatment variability and access issues, with provider capacity and service delivery models are addressed later in the report.

Variety of CRD treatment results within and between countries are often driven by different **prescribing practices.** Health-care providers experience challenges in accessing evidence and updates regarding CRD treatment. There is a dual challenge: a shortage of respiratory specialists and weak capacity among PHC providers. Poor adherence to treatment, stigma and misbeliefs about medicines also result in inconsistent and suboptimal care.

Treatment trajectories for asthma and COPD vary widely across countries in the Region. An analysis of health providers' prescription practices revealed significant variation in prescriptions, a wide variety in the selection of first-line and follow-up treatments, and an over-reliance on short-acting bronchodilators for asthma compared to long-acting and combined inhalers. There is also underutilization of inhaled corticosteroid (ICS) in asthma.

These variations in prescriptions can be managed through evidence-based clinical guidelines and clear, simple protocols for PHC providers, supported by education and wider communication.

Quality of national guidelines and protocols is another challenge. CRD treatment and control approaches vary significantly between and within countries. The lack of updated guidelines and clear clinical protocols for common conditions such as asthma and COPD contribute to this variation in quality.

Despite solid evidence for asthma and COPD interventions, many countries, especially in the eastern part of the Region, lack the capacity and mechanisms for developing and updating national guidelines. Some countries use multiple protocols simultaneously (e.g. national and international). Implementing national guidelines is another challenge.

The WHO Country Capacity Survey 2023 shows that 46 out of the 53 countries in the Region (86.8%) have national guidelines for COPD and asthma; 26 (56.5%) of which have updated these guidelines within the last 5 years.

Reducing variability in CRD treatment can be achieved by ensuring UHC for all population groups. This involves inclusion of essential services, recommended medicines and devices in national guidelines and protocols, and incorporating them into health benefit packages and reimbursement schemes. Countries can then build on these with a wider scope of services and treatments based on their specific contexts and available resources.

WHO's "best buys" – as described above – are evidence-based and cost-effective interventions and recommended policy options related to CRDs. They provide a foundation for essential services and potential inclusion in national health benefit packages to protect the vulnerable.

Most of the WHO's "best buys" are incorporated in the WHO Package of Essential NCD interventions (PEN) for PHC *(89)*, which includes a protocol on COPD and asthma prevention and management.

Currently it is undergoing a revision and update process. Asthma and other respiratory conditions are also addressed in the *WHO Pocket book of primary health care for children and adolescents (90)* and the *Pocket Book of Hospital Care for Children (91)*. Some countries also utilize the *Integrated Management of Adolescent and Adult Illness* guidelines for first-level healthcare facility teams, which include protocols for the management of asthma and other chronic conditions, ensuring a standardized approach to care across various healthcare settings. *(92)*.

The WHO Package of Essential NCD Interventions protocol on COPD and asthma has been adapted and implemented in PHC in Kyrgyzstan, as well as the Republic of Moldova and Uzbekistan. Ukraine has introduced the adapted version of these protocols with special training modules for PHC mobile teams during the war.

While these protocols are designed for PHC, specialists use broader GOLD and Global Initiative for Asthma *(93)* recommendations or nationally developed guidelines.

Many countries still face issues with setting an official standardized process for developing national guidelines. These countries lack strict regulations which would prevent pharmaceutical sector interference in the guideline development process and ensure that trade names of medicines are not included in guidelines and protocols.

Furthermore, the majority of countries face issues with adherence to guidelines and protocols by health providers.

To support countries in overcoming these challenges, WHO has introduced the innovative Standards-based, Machine-readable, Adaptive, Requirements-based, and Testable guidelines, so called, SMART Guidelines – a digital-friendly framework that helps translate evidence-based recommendations into adaptable, interoperable tools. This innovation is particularly relevant for CRDs such as asthma and COPD, where standardized, updatable protocols can improve care quality and consistency. SMART Guidelines can help accelerate digital transformation in health systems, supporting countries in achieving their UHC goals *(94)*.

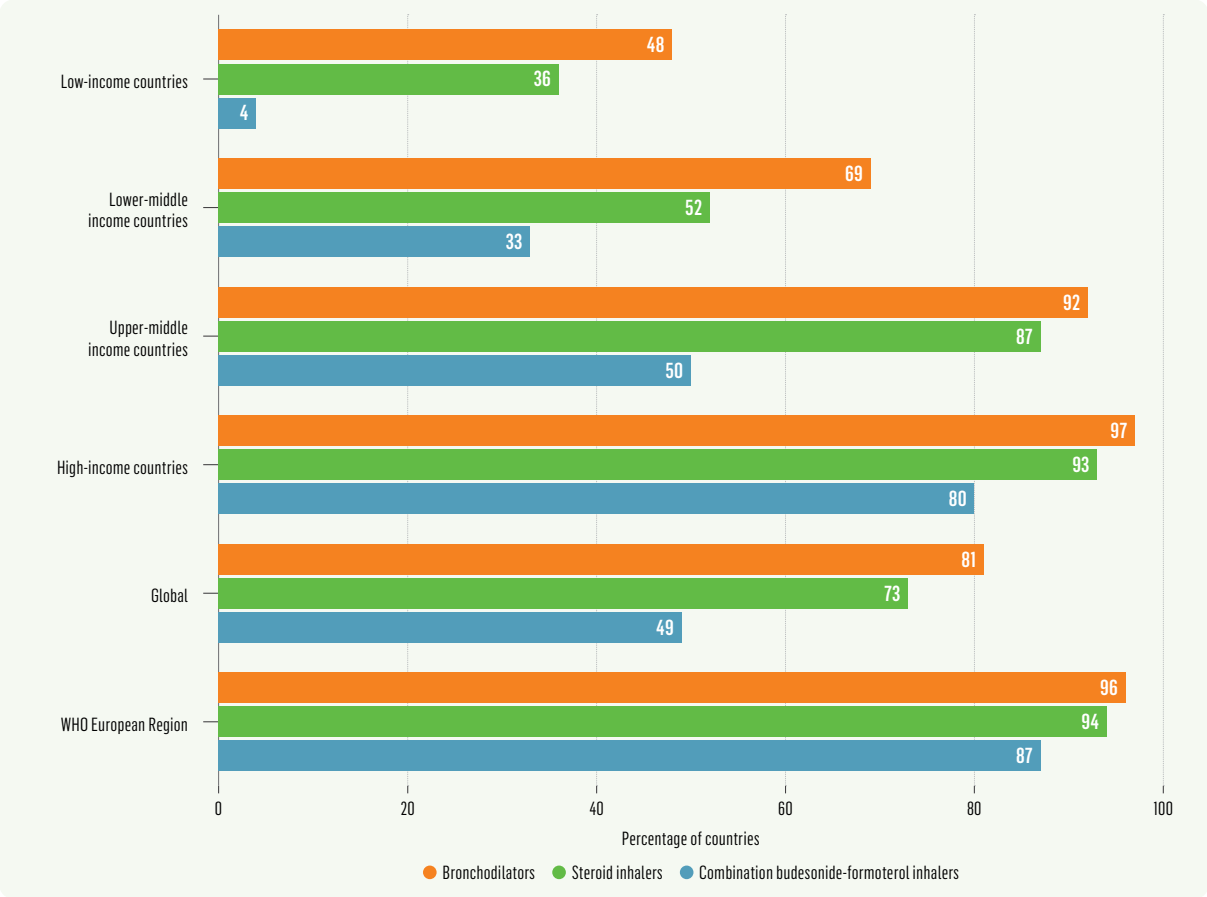
Another challenge with treatment and control relates to the **affordability, availability and access to essential medicines.** As previously mentioned, disparities in access to CRD treatment remain a significant challenge. Populations in rural or underserved areas, as well as migrants, refugees and other vulnerable groups, face notable barriers. Additionally, many essential medicines and devices are frequently excluded from basic benefit packages and reimbursement lists *(95).*

WHO highlights that outpatient medicines are the main cause of financial hardship across the Region, accounting on average for 38% of OOP expenses in households with catastrophic health spending. Outpatient medical products account for 15% and inpatient care for 13% of these OOP payments *(96)*. Outpatient medicines consistently represent a larger share of catastrophic health spending, especially in the poorest quintile.

European Health Interview Survey data show that the high cost of prescribed medicines is a major driver of unmet needs, particularly among the poorest quintiles *(97)*. Medicine use and expenditure are lower among migrant populations compared to host populations, with access varying between urban and rural areas.

The availability of inhalers for CRDs at PHC level is indeed high in 87–96% of countries in the WHO European Region. However, the availability of ICS and combined budesonide–formoterol inhalers recommended for asthma is significantly lower in low- and middle-income countries (Fig. 2.3). According to the World Bank classification, in the WHO Region, there were three countries in this lower-middle-income group in 2024–2025 – Kyrgyzstan, Tajikistan and Uzbekistan *(98)*.

Fig. 2.3. Availability of inhalers for CRDs in PHC facilities of the public health sector in the WHO European Region, by World Bank income groups, 2022



Source: WHO NCD Country Capacity Survey, 2023 *(5).*

Access to CRD-specific medicines also varies globally and regionally. Medications for symptomatic relief, such as inhaled short-acting beta-agonists (SABA), are widely available and affordable. However, access to preventive

treatments differs between asthma and COPD. For asthma, preventive therapies such as ICS and ICS-long-acting beta-agonist (LABA) combinations can be inconsistent in availability and often unaffordable in lower-resource settings. For COPD, long-acting muscarinic antagonists (LAMAs), as well as ICS-LAMA combinations, may be more accessible in certain countries but still face similar affordability challenges *(99,100)*.

Additionally, there is a significant lack of study data and, consequently, few licensed inhaled medications specifically for children with asthma *(101)*. This discrepancy in medicine availability and access may play a part in the mortality figures of asthma. There are multiple studies showing the direct impact of SABA overuse on increasing the likelihood of asthma exacerbation and lethal asthma attacks *(102)*.

The availability of steroid and combined inhalers is lower in PHC facilities across countries (Fig. 2.3). There is not information about whether patients have access to these essential medicines or if they are included in health benefit packages and medicine reimbursement schemes.

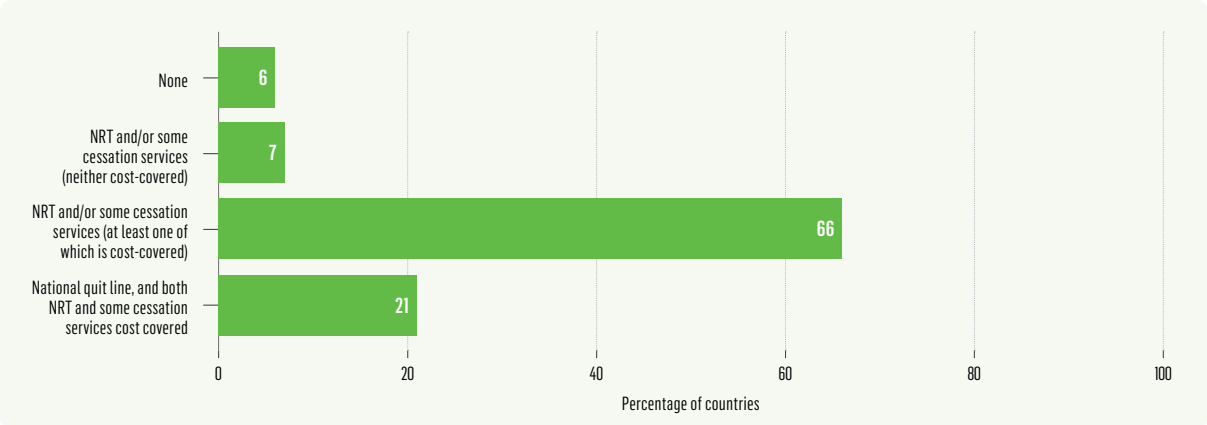
Further studies conducted in the WHO European Region also illustrate the challenges and the high costs of these two groups of inhalers and medicines both for the health systems and patients *(103–105)*.

The emerging use of biological treatments in asthma and COPD represents a new paradigm in the treatment of both conditions. However, due to their high cost, more clinical and economical studies on efficacy and effectiveness can provide the necessary tools to assist patients, policy-makers, health-care payers and providers in future decision-making *(106)*. WHO MedMon surveys *(107)* confirm higher availability of SABA in public and private pharmacies, but poor availability of ICS and combined LABAs or LAMAs. In 2019, Ukraine had the lowest availability of these inhalers, with regional variability from 0% to 83%. In 2021, in Uzbekistan, there were challenges in availability and pricing of essential medicines, with the availability of salbutamol and ICS at 86% and 31%, respectively.

To address the issue of financial access, many countries in the Region include essential medicines, essential medical devices and services in the **health benefit packages and reimbursement list**. In Ukraine, the health benefit package contains 14 international non-proprietary names of medicines (six of which have no co-payments) for asthma and other CRDs that are fully or partially reimbursed from the state budget *(108)*. In Uzbekistan, salbutamol and beclomethasone are included in outpatient medicines reimbursement schemes without co-payments.

To ensure better access, many countries also include a nicotine-replacement therapy (NRT) as part of tobacco cessation services in their health benefit packages and reimbursement schemes (Fig. 2.4).

Fig. 2.4. Percentage of countries providing cessation programmes for the treatment of tobacco dependence globally, 2022



Source: WHO Regional Office for Europe, 2022 *(109)*.

As of 2022, only four countries out of the 53 in the Region fully covered the cost of NRT for people wishing to quit, and a further 11 countries provided partial funding *(110)*.

One fifth of the countries in the Region operated a national quit line and covered the cost of NRT and some other cessation services.

In 39 countries, NRT was available in pharmacies, while in seven countries it was available for purchase in general shops. NRT was included in the essential medicines list in 13 countries in the Region, but was not available in seven countries in the Region.

Reimbursement for ICS, combined inhalers and NRT considerably reduce the financial burden of COPD and asthma, can improve adherence and can reduce the number of exacerbations and hospitalizations.

The MedMon study and others highlighted the need of strengthening **regulating measures on pricing**, e-prescriptions and price monitoring aimed at reducing the huge variability of prices within countries.

The WHO Essential Medicines and Health Products Price and Availability Monitoring Mobile Application *(111)*, piloted for the first time in the Region in the Republic of Moldova in 2019, provides a standardized approach for monitoring medicine prices and availability in health facilities and procurement centres.

Regular price monitoring throughout the health system based on relevant indicators enables policy-makers to develop strategies to enhance medicine availability and cut costs, evaluate health reform impacts and demonstrate progress towards UHC.

Implementation of treatment adherence programmes are cost-effective modes to improve treatment outcomes in patients with asthma and COPD and they can also reduce health-care resource use *(112)*. Many countries are revising their regulations for easier medicine and device registration procedures and use reference prices, defined as maximum reimbursement levels, including for CRD treatment (Box 2.12).

Box 2.12. Price regulations for medicines and medical products to improve availability of a specific product

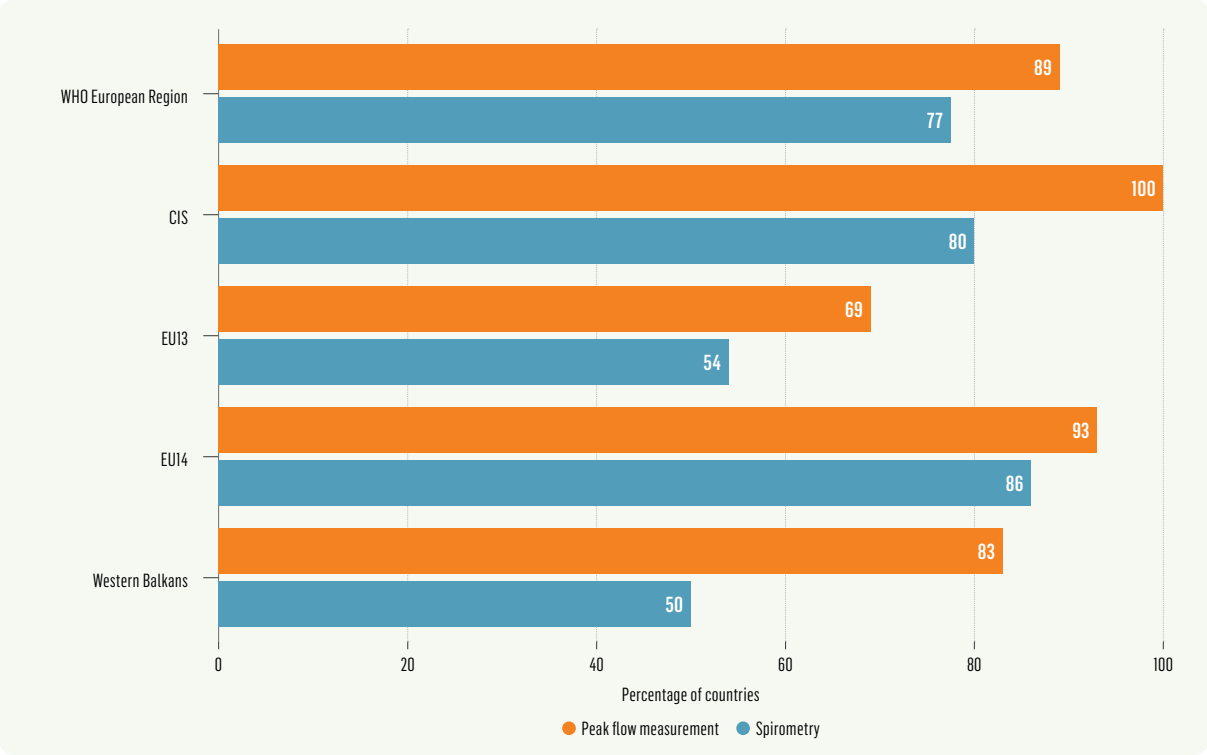
Denmark, Finland, Iceland, Norway and Sweden	The Nordic Pharmaceutical Forum, recognized as a best practice in Europe, collaborates in six key areas: horizon-scanning and knowledge exchange on new medical products coming to the market, security of supply, access to new and older medicines, manufacturing, sustainability and joint procurement. It has made significant strides in improving the availability of very expensive or hardly available medicines through joint procurement and regulatory harmonization. The forum has developed a common framework for price negotiations on new and older medicines, shared experiences on Advanced Therapy Medicinal Products and established environmental criteria for joint tenders *(113)*.
EU	WHO collaborates with EU-funded networks and projects including mapping out national medicine reimbursement policies in EU countries and enhancing the exchange of information and experiences on medicine pricing and reimbursement *(114)*. In order to facilitate the medicine registration process, EU countries implemented central registration with a centralized authorization procedure managed by the European Medicines Agency (EMA). This procedure allows pharmaceutical companies to submit a single marketing-authorization application to the EMA. If approved, the medicine can be marketed and made available throughout the EU and the European Economic Area countries (Iceland, Liechtenstein and Norway) based on a single authorization.
Armenia, Tajikistan and central Asia	The WHO Regional Office for Europe's Access to Medicines and Other Health Products and NCD Initiative teams build the capacity of Member States in pricing and reimbursement of CRD medicines through regional training. The inaugural training session took place in December 2023 in Tajikistan with over 80 participants from the five Central Asia Republics and Armenia.

Access to essential technologies

The WHO Package of Essential NCD Interventions recommends that all countries, even those with limited resources, ensure the availability of the following essential technologies at PHC level: peak flow meters with disposable mouth pieces, spacers for inhalers and, when resources permit, nebulizers and pulse oximeters.

The NCD Country Capacity Survey 2023 revealed that the lowest availability of spirometers at PHC in the public health sector is seen in the Western Balkans and the EU13 countries (Fig. 2.5). This can cause a problem with diagnosis of COPD and asthma in these countries and requires further exploration.

Fig. 2.5. Availability of basic technologies for CRD diagnosis in PHC facilities in the public health sector, 2022



Legend:

WHO European Region: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands (Kingdom of the), North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Türkiye, Turkmenistan, Ukraine, United Kingdom and Uzbekistan.
CIS: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
EU13: EU member states who have joined since 2004: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.
EU14: EU member states who have joined prior to 2004; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands (Kingdom of the), Portugal, Spain and Sweden.
Western Balkans: Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia as well as Kosovo[a].

[a] All references to Kosovo in this document should be understood to be in the context of the United Nations Security Council resolution 1244 (1999).

Source: WHO NCD Country Capacity Survey, 2023 *(5)*.

The Survey revealed that, 80% of CIS countries reported having spirometers and 100% of those countries reported availability of peak flow meters. However, recent WHO country visits to several CIS revealed that even if spirometry is included in the health benefit packages for PHC and national guidelines, only a few PHC facilities are equipped with this device. Peak flow meters are more available and very useful for asthma diagnosis, however, in many cases there are 1–2 devices available per PHC facility and spare disposable mouth pieces are not available in the facilities.

To support countries in identifying essential medical devices and decision-making, WHO introduced a special electronic database Priority Medical Devices Information System. This is an open access database of essential

medical devices for different groups of conditions. Unfortunately, it does not include asthma and COPD at this stage, however, recommendations for pneumonia and COVID-19 are there. It is highly recommended to include asthma and COPD as priority NCDs in this database and to develop guidance in the future *(115)*.

Supported self-management

Supported self-management of individuals living with CRDs is key to achieving the best possible clinical outcomes, improved quality of life and reduced avoidable health-care demand. Most care takes place at home and work without health-care professional involvement.

There are many frameworks, models and initiatives developed for supported self-management. However, experts recognize that it is the most complicated and least developed component of managing chronic conditions.

WHO estimates that only 50% of patients receiving long-term pharmacotherapy for chronic diseases adhere to their treatment *(115)*. Various studies, including retrospective analysis of patient records, qualitative group discussions and interviews have explored adherence rates for asthma and COPD medications, which range significantly from 15% to 80%.

The majority of identified challenges in self-management can be summarized by these factors: patient's low health literacy and a lack of information; poor patient–provider communication and shared decision-making; high financial burden; poor adherence to the treatment plan causing altered medication dosage and frequencies; inconvenience of multiple medicines taken by comorbid patients; irregular follow-up visits by patients, typically only when there are problems; and issues related to the stigma of having an inhaler or the diagnosis.

Addressing these issues requires the development and follow-up of individual management plans, special patient education programmes, educational-informational resources, self-management skills development and the use of supportive techniques.

Self-management support must be tailored to individual needs, which can be time-consuming and resource-intensive for providers. Applying a shared decision-making approach, empowering patients in efficient day-to-day problem-solving, monitoring and control, and preventing exacerbations, all require communication and psychological counselling skills that many medical professionals are not traditionally trained in.

To support countries in implementing an evidence-based approach, the WHO Regional Office for Europe recently updated an introductory guide on therapeutic patient education (TPE) *(117)*. The guide provides a structured person-centred learning process which supports an individualized approach to self-managing chronic conditions, with involvement from carers and families.

To implement this, policy-makers should update workforce regulations, include TPE in health-care specifications and introduce specific training for relevant health professionals. However, changes in regulations alone may not be enough. Successful implementation also depends on how care is delivered in practice, highlighting the importance of ongoing in-service training to ensure consistent, high-quality application leading to improved health outcomes. Empowering nurses to lead COPD and asthma self-management programmes and engaging other professionals such as pharmacists, community members, peers and people with lived experience have proved a successful practice in many countries.

For some time, many research and country initiatives have been focused on the implementation of various self-management programmes, starting from health literacy of patients, their families, caregivers and communities; trying to implement shared decision-making models with individual management plans; and organizing group and individual educational and practical coaching programmes in hospitals, PHC settings, communities, peer-to-peer education programmes and many other modalities.

Supported self-management of individuals living with CRDs is key to achieving the best possible clinical outcomes, improved quality of life and reduced avoidable health-care demand. Most care takes place at home and work without health-care professional involvement.

In recent decades, many countries, including those in the WHO European Region, have adopted digital decision-making support systems to assist patients with COPD and asthma in self-management. These include mobile phone notifications, live online consultations, telehealth approaches, mobile applications and mobile health tools, often used alongside traditional face-to-face care. Western and central European countries are at the forefront of these initiatives and research *(118)*.

Digital solutions show promise for enhancing self-management, improving medication adherence and increasing quality of life (Box 2.13). However, access, digital literacy and regulatory frameworks vary across the Region. The effectiveness of self-management support programmes largely depends on their implementation: well-designed and properly executed programmes have been shown to improve health outcomes and optimize health system resource utilization. However, there is a notable lack of evidence regarding the successful implementation of supported self-management programmes in the eastern part of the WHO European Region.

Box 2.13. Country examples of supported self-management initiatives

Netherlands (Kingdom of the)	Various school-based programmes have been implemented to educate children about asthma management and improve their self-efficacy *(119)*.
United Kingdom	The Self-management Programme of Activity Coping and Education for COPD has been successfully implemented in PHC settings as individual and group-based community interventions. This programme has shown improvements in patient activation, knowledge and fatigue *(120)*. The ongoing Implementing Improved Asthma self-management as Routine trial is embedding supported self-management for asthma in primary care practices in the United Kingdom *(121)*.
France, Romania, Spain	France, Romania and Spain have implemented promising initiatives to promote air quality self-management for individuals with asthma and COPD. The interventions include multiple approaches, such as regular home visits by nurses to assess symptoms; measurements of indoor and outdoor trigger factors; and the provision of air quality alerts and allergen avoidance education. *(122)*
Georgia, Kyrgyzstan and Uzbekistan	Under CVD and diabetes initiatives, WHO supported the adaptation of the TPE guide in Georgia, and the introduction of the TPE approach in Kyrgyzstan and Uzbekistan at demonstration sites. The approach is planned to be applied to other chronic conditions, including COPD and asthma.

For the effective implementation of self-management components, health system transformation toward person-centredness is required: the active engagement of patients in partnership with well-trained, motivated health professionals who are capable of using effective communication and behavioural change techniques, and applying shared decision-making based on a patient's capacity, needs and health beliefs.

Rehabilitation and respiratory support

Pulmonary rehabilitation is an integral part of treatment and self-management support featuring a tailored exercise and education programme that can be delivered in hospitals, the community and at home *(123)*. It is typically provided by multidisciplinary teams of respiratory physiotherapists and specially trained nurses. Pulmonary rehabilitation is provided in various modalities and has been shown to improve patient outcomes and health-care utilization. To achieve these benefits, individuals living with CRDs should attend such programmes regularly, at least twice per week, for a minimum of 6 weeks, which enhances its positive effects.

Transportation costs and lack of availability of rehabilitation facilities are common barriers to uptake. Therefore, many countries provide efforts to deliver rehabilitation programmes closer to the patients' homes or in online

formats *(124)*. Such programmes require special guidelines, trained professionals, changes in organizational structure and adequate funding, therefore, disparities in implementation exist due to country capacity and income level. Some countries require support in identifying evidence-based approaches.

To support countries, WHO offers comprehensive guidance on the implementation and management of pulmonary rehabilitation programmes, ensuring that health-care providers can deliver effective and evidence-based care to patients with CRDs. The WHO *Package of interventions for rehabilitation* outlines the most essential interventions for rehabilitation with Module 4 specifically on cardiopulmonary conditions, comprising specific packages of interventions for the rehabilitation of ischaemic heart disease and COPD *(125)*.

For each of the interventions, it offers information on the required assistive products, equipment and consumables.

The guidance should also specify the necessary workforce team capabilities and a comprehensive skill set required to deliver all necessary interventions effectively.

As an example, the workforce overview of rehabilitation specialists qualified to deliver interventions for the rehabilitation for COPD:

- dietitians and nutritionists
- nursing professionals
- occupational therapists
- physiotherapists
- psychologists
- social work and counselling professionals
- specialist medical practitioners/physical and rehabilitation medicine physicians.

Some countries lack many of the listed specialists; teams can then define the skills and capabilities and distribute them among the existing professionals to cover all required services, of course supported by relevant training programmes.

Integrated approaches to multiple conditions could also help to efficiently use available human and material resources, and address the challenges with managing multimorbidity: many countries have introduced cardiopulmonary rehabilitation programmes that include frailty and mental health conditions.

The package presents as an indispensable resource for countries when planning and budgeting for the integration of rehabilitation services into their health systems.

Country examples of pulmonary rehabilitation are provided in Box 2.14.

Box 2.14. Country examples of pulmonary rehabilitation

Denmark	Denmark tested new models of pulmonary rehabilitation for patients with COPD who were unable to attend centre-based programmes through the REPORT study, a multicentre randomized controlled trial. It compared tele-rehabilitation and home-based pulmonary rehabilitation with usual care. Tele-rehabilitation involved online group sessions, while home-based rehabilitation offered individual self-directed programmes with remote support. Both used tablet-based technology and included a follow-up maintenance programme. The study demonstrated the feasibility of delivering effective, low-cost pulmonary rehabilitation remotely, offering valuable lessons for increasing access to care for patients with moderate to very severe COPD *(126)*. Another example is from the municipality of Vejle, where a 9-week pulmonary rehabilitation programme targeted the reduction of COPD-related anxiety among participants through four key anxiety management strategies – planning, problem-solving, accepting and confronting – shaped by patient interactions with health-care professionals and peers. This integrated approach shows promise for enhancing patient activation and emotional well-being alongside functional outcomes and highlights the psychological as well as physical benefits of pulmonary rehabilitation *(127)*
Georgia	A recent study in Georgia showed that implementing a culturally adapted, structured, 6-week pulmonary rehabilitation programme integrated with patient education is both feasible and beneficial for CRD patients, even in resource-limited settings. Prior to starting the pulmonary rehabilitation intervention, the programme gathered the views of all key stakeholders, including patients, PHC doctors, respiratory physicians and rehabilitation specialists. This approach aimed to tailor existing pulmonary rehabilitation models to meet the needs of local COPD patients, thereby increasing acceptability and adherence to the programme *(128)*. However, further evidence is still needed to address access disparities among different patient groups.
Greece	The EU-funded FRESH AIR programme, a 6-week pulmonary rehabilitation programme in rural Greece, supervised by physiotherapists, nurses and a GP, was found to be necessary, effective and feasible in low-resource settings.
Hungary	Hungary introduced a cardiopulmonary rehabilitation programme at ambulatory level at one of its municipal hospitals. The 6-week pulmonary rehabilitation programme for COPD patients became very popular, achieving a 100% enrolment rate by the end of the course. Specially trained nurses deliver the programme under the supervision of respiratory and cardiology specialists.
United Kingdom	The United Kingdom has implemented and studied the effects of various rehabilitation programmes: • A web-based COPD programme is availablethrough the website of lung health (United Kingdom) (*129)*, where patients exercise and record their progress as well as read educational material. Conventional pulmonary rehabilitation consisted of twice weekly, 2-hourly sessions (an hour for exercise training and an hour for education). An interactive web-based pulmonary rehabilitation programme was shown as feasible and acceptable when compared with conventional pulmonary rehabilitation *(130)*. • A structured home-based pulmonary rehabilitation programme has provided benefits in patients with dyspnoea *(131)*. Further evidence is needed to assess the broader health benefits of standardized home-based rehabilitation programs and to determine whether their effectiveness is at least equivalent to that of supervised center-based rehabilitation programs.

In the EU, inhalers, home ventilators and rehabilitation equipment are standard components of care to enhance adherence, monitoring and rehabilitation programmes. Additionally, specialized home care teams are available to support advanced CRD patients.

However, data on access to these devices in the WHO European Region is limited, and their prescription often correlates with gross domestic product per capita. Home mechanical ventilation prescription and prevalence are associated with the gross domestic product per capita in 24 European countries *(132)*.

Palliative care

Palliative care is an important but underdeveloped component of the cycle of care. Similar to rehabilitation, palliative care aimed on active support to patients to manage each of their symptoms such as breathlessness and fatigue. According to the European Association for Palliative Care, each year, an estimated 4.4 million people in the WHO European Region, including 14 000 children, need palliative care *(134)*. Of these people, 6% have chronic lung diseases. In general, 65% of the population in the Region has no access to palliative care services *(135)*.

WHO states that both rehabilitation and palliative care are essential components of quality health services and should be integrated within health systems using a multiprofessional workforce to achieve UHC. Rehabilitation integrated with palliative care can deliver many benefits for people and health systems but access to interventions is limited by a range of barriers including limited resources, siloed organization of services and attitudes of professionals and funders.

While integrated rehabilitation has been achieved in high-income countries in health services for people with chronic long-term conditions or trauma, it remains under resourced and highly variable within palliative care services. In the WHO European Region, the availability of palliative and hospice care for patients with end-stage CRDs varies significantly by country. While palliative care is generally more established for cancer patients, it is less consistently available for those with other non-cancer conditions such as CRDs.

Countries such as Netherlands (Kingdom of the) and the United Kingdom have more integrated palliative care services that include patients with CRDs, whereas in some countries in the eastern part of the Region palliative care may be less accessible for non-cancer patients, often due to limited resources and a focus on cancer care.

A special WHO policy brief aims to understand how integrating rehabilitation in palliative care services may improve the quality, accessibility, effectiveness and cost-effectiveness of health services for people approaching the end of life. It provides practical and actionable information and recommendations to support health ministers and leaders in health systems planning to integrate rehabilitation into palliative care services *(135)*.

Palliative care aims to address each major physical and psychological symptom that reduces quality of life and optimize function for patients with CRDs and their caregivers *(136)*.

Primary care teams with the support of communities and local authorities can handle most palliative care needs with basic training and resources. But they should be able to consult specialists with advanced palliative care training for complex issues and have resources for the immediate transferral of patients to other levels of care if needed.

For example, one of the common symptoms that would benefit from palliation is long-lasting breathlessness. Respiratory-related symptoms with breathlessness require active management. They are distressing for the patient, carer and health-care professionals. There are multiple causes *(137)*, but it can be actively managed through safe, inexpensive and effective approaches such as breathing control techniques, breathing positioning and relaxation techniques.

Such syndrome-based palliative and end-of-life care approaches can relieve most suffering in inexpensive, safe and effective ways *(138)*. Several country examples are provided in Box 2.15.

Available evidence shows that most people prefer to spend their final days at home, so palliative care and end-of-life care should be provided there, where possible, to respect a person's wishes and reduce hospital overcrowding. Even in high-functioning health systems, many end-of-life patients suffer significant pain, psychological distress and regret, often dying in undesired locations without adequate care *(139,140)*.

People with progressive CRDs, such as COPD or bronchiectasis, and their families, need support at the end of their life, which may otherwise be painful or distressing. Community-based palliative and end-of-life care is suggested as one of the best solutions for the vast majority of patients.

Of course, this requires the involvement of trained professionals to discuss advanced care plans for every possible quality and painless end-of-life care. These plans include topics such as preferred place of death; Do Not Resuscitate decisions/orders; and the use of advance directives or living wills.

Such plans require the engagement of multi- and interdisciplinary teams, as people with COPD for example, tend to die from CVD, heart failure or lung cancer, and their supportive care may be shared or transferred to other groups of health-care professionals. Arrangements should also be put in place so that clinicians at community and district levels can easily and rapidly transfer patients to a higher-level institution when required *(136)*.

Plans and preferences should not be static and must be reviewed and updated regularly as a patient's and their family's circumstances evolve.

To introduce such integrated care models and community-based palliative care, governments should develop national regulations on palliative care supported by proper funding and investment in the training of health professionals. WHO highlights that 83% of the countries in the WHO European Region do not have any special training curricular on palliative care *(141)*.

Box 2.15. Country examples of palliative and end-of-life care

Denmark	In an outpatient hospital setting, Denmark piloted the use of the PRO-Pall tool – a patient-reported outcome measure for general palliative care – to assess the physical, psychosocial and existential needs of patients with COPD. The most frequently reported issues included breathlessness, fatigue, limited mobility and worries related to changing social and family roles. Despite high levels of physical symptom burden, most patients felt their practical and emotional concerns were being addressed, suggesting the tool's usefulness in facilitating early identification of unmet palliative care needs. The study highlighted patient-reported outcome measures such as PRO-Pall as valuable for guiding timely palliative care discussions and ensuring care aligns with patients' broader experiences – not just physical symptoms *(142)*.
Netherlands (Kingdom of the)	Ciro is a specialist centre treating [people with permanent lung diseases, who along with four other centres, provides pulmonary rehabilitation for chronic lung disease patients across of the country. Patients are referred based on specific COPD scores and recent exacerbations. The multidisciplinary team includes various specialists such as respiratory physicians, nurses, physiotherapists and psychologists. A palliative care team is integrated to offer early access to palliative medicine and rehabilitation for severe cases *(143)*.
United Kingdom	St Christopher's Hospice in London offers inpatient, outpatient and home-based specialist rehabilitative care. Initially providing physiotherapy and occupational therapy, the hospice later added speech and language therapy and dietetics.
Germany, Poland and United Kingdom	There are various breathlessness service models implemented in different countries across the Region. Country examples vary from nurse-led services to multidisciplinary team approaches targeting breathlessness in advanced diseases. These services improve breathlessness management and enable earlier palliative care access, especially for patients with non-malignant diseases, such as COPD, ILD or pulmonary hypertension who often face barriers to support *(144)*.
The eastern part of the WHO European Region	Mapping of hospice and palliative care services around the world has found that such services are approaching integration in only a few of these countries in the central part of the Region: Hungary, Poland, Romania and Slovenia. There are, however, some promising signs of the development of palliative care in the remaining countries.
EU	New EU-funded research, involving the ERS and Lungs Europe, studies a new palliative intervention in Belgium, Denmark, Hungary, Netherlands (Kingdom of the), Portugal and the United Kingdom *(145)*.

Vignette 5. People's experience of living with CRD

Natalia is 54 years old, living with pulmonary arterial hypertension (PAH) in Bulgaria. She is the President of the Bulgarian Society of patients with pulmonary hypertension PH), Board member of Pulmonary Hypertension Association Europe and European Patient Advocacy group at ERN -Lung.

I was diagnosed with PAH in 2009. After years of managing the condition with medications, my situation worsened and I underwent a double lung transplant in 2016. While the transplant gave me a second chance at life, it has come with its own set of challenges, including lifelong medication and careful monitoring.

Living with PAH before my transplant deeply affected every aspect of my life. I experienced severe fatigue, shortness of breath and constant fear of worsening symptoms. Physical exertion and altitude were major triggers for my symptoms. Even simple activities like climbing stairs could leave me breathless. Social activities and even daily tasks became almost impossible. After the transplant, while my quality of life has improved, I now face the physical and emotional demands of recovery, immunosuppressive therapy and regular follow-ups. I must avoid exposure to infections, crowded places and unregulated environments, as my immune system is suppressed. Staying vigilant about my overall health is crucial.

While there have been improvements in awareness and support for people with chronic lung conditions in my country, I actually have to access three different health-care systems to manage my condition. I receive care in Bulgaria, I received specialized treatment for my PAH in Athens, Greece, for 2 years, and my life-saving transplant was performed in Vienna, Austria. There is a lack of focus and access to specialized care for conditions, like PAH, which results in people needing to travel to other countries to access the treatment they need.

The specialized care I received at the pulmonary hypertension centre in Austria was invaluable. The multidisciplinary team – pulmonologists, cardiologists and transplant specialists – worked together to ensure I had access to the latest treatments and eventually prepared me for my lung transplant. Additionally, post-transplant rehabilitation has been a lifeline, helping me regain physical strength and adjust to life with my new lungs.

Living with PAH and undergoing a double lung transplant has shown me the importance of early intervention, access to specialized care and ongoing support. Policy-makers need to prioritize funding for rare disease research, improve access to life-saving treatments and ensure equitable care for all patients, regardless of where they live. Collaboration at a European level could help standardize care and ensure no patient is left behind."

Natalia Maeva

Models of service delivery

KEY MESSAGE 8

High-quality health systems build trust and deliver superior outcomes. Focus on timeliness, equity, integration and efficiency to ensure quality care at every touchpoint.

The previous sections have described challenges, recent developments and opportunities for enhanced integrated policies, as well as better CRD prevention and management within the cycle of care, illustrated with country examples. The described interventions require delivery at all health system levels starting from the community and primary health centres, progressing through secondary-level facilities and reaching tertiary-level referral centres, before returning to the PHC and community care which also include informal care.

Evidence increasingly highlights the importance of reorienting and redesigning delivery systems towards chronic disease care, including CRDs *(146)*. For decades, experts have called on countries to transform service delivery models from single occasional contacts for acute events to long-term regular care, to strengthen PHC and address the needs of people by redesigning the services from curative to preventive.

There are many successful initiatives on asthma and allergies, on COPD management models, on integrated approaches for the diagnosis of TB and CRDs, on measures tackling the tobacco epidemic and addressing indoor pollution. There is evidence and good practice on community engagement and self-management programmes in different country contexts. However, people across the Region experience challenges with access to care, fragmentation, difficulties in navigation, unequal and sometimes unaffordable care *(147–149)*.

Additionally, health systems face rising demand and needs for holistic services in response to the growing burden of multiple clinical conditions, combined with new calls to respond to intertwined crises impacting health, all while struggling with significant human resource, infrastructure and funding constraints. Constructing effective and comprehensive service delivery models that respond to these challenges is a very complex task.

This section will provide more insights into the key principles of well-functioning health-care models for CRD service delivery, organization and coordination across the levels of care, with stakeholder engagement outside the health sector at population level.

Since the late 1990s, many countries have been implementing different chronic care models on NCDs, including CRDs. The most familiar are: the Chronic Care Model with several modifications, Improving Chronic Illness Care, Innovative Care for Chronic Conditions *(150)*, Stanford model, Transitional Care Model *(151)*, specific groups or disease management programmes *(152)* population-based models such as Kaiser Permanente, the Veterans Health Administration and the Basque country model *(153)*.

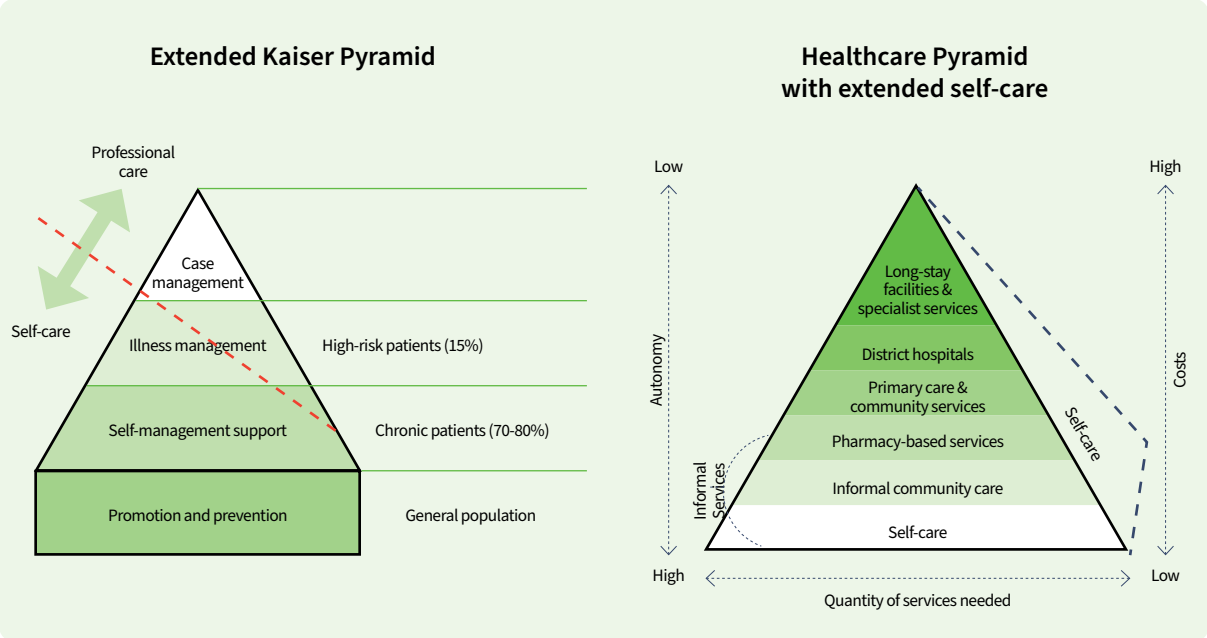
Each country can decide which model or approach to choose, adapt and implement based on its specific country context, available human and financial resources, and current health system organization. However, there are key principles built on evidence and collective country experiences that can help to find the best solutions for responding to people's needs and which can lead to better individual, population and system outcomes. The collectively agreed intent is to build person-centred and integrated service delivery.

In 2015, the WHO *global strategy on people-centred and integrated health services* interim report was published to provide a conceptual framework, definitions and core principles for person-centred integrated service delivery *(154)*. Person-centredness and integrated care delivery are cornerstones for achieving trust and driving transformation toward resilient health system, Both conceptual approaches are described as follows:

- **People-centred health services** are an approach to care that consciously adopts the perspectives of individuals, families and communities, and sees them as participants as well as beneficiaries of trusted health systems that respond to their needs and preferences in humane and holistic ways. People-centred care requires that people have the education and support they need to make decisions and participate in their own care. It is organized around the health needs and expectations of people rather than diseases.
- **Integrated health services** are health services that are managed and delivered in a way that ensures people receive a continuum of health promotion, disease prevention, diagnosis, treatment, disease management, rehabilitation and palliative care services, at the different levels and sites of care within the health system, and according to their needs throughout their life course.

Active engagement of different health professionals and balanced distribution of roles and responsibilities in CRD management could be driven by a modified Kaiser Permanente's population-based approach and the WHO service delivery pyramid with self-management, distributed by levels of care (Fig. 2.6).

Fig. 2.6. Distribution of care by type of interventions and between the levels of care



Sources: WHO, 2016 (*153)*; WHO, 2019 *(155).*

For chronic conditions, there are two specific priority lines each health system should consider in building efficient service delivery models to ensure the access to the right care, at the right time, in the right place, by the right team:

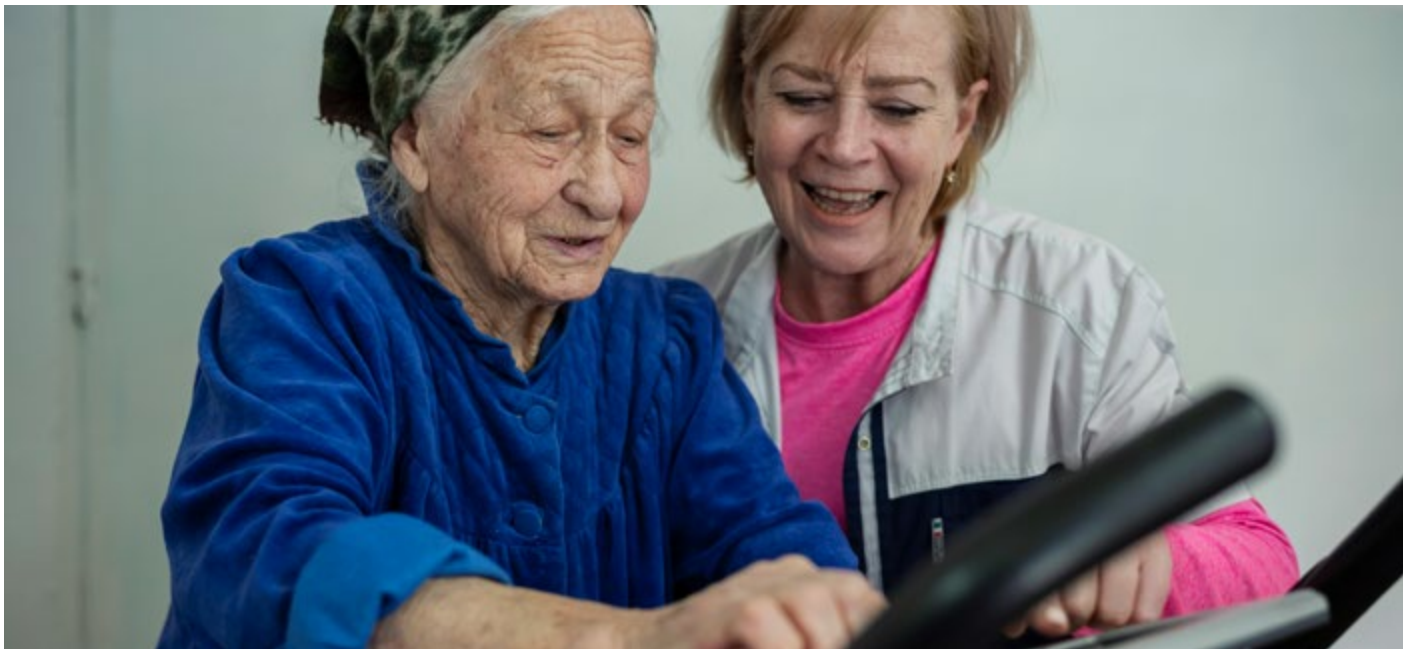
- **Population health** with comprehensive health promotion, vulnerability reduction, risk stratification and high-risk management approaches and early disease detection where strong primary health care plays the key leadership and coordination role and facilitates multisectoral collaboration, community engagement and interdisciplinary teamwork.
- **Individual health** with strong primary care as the first contact for people with CRDs, managing the most common and mild conditions. As mentioned above family doctors should have the possibility of receiving

support from specialists. Where a referral is needed systems need to be in place for referrals to specialist care and management of individuals with complex needs such as multimorbidity, hard-to-control asthma and COPD, and rare CRD conditions. PHC teams are in the best position for care coordination and follow-up. PHC teams may be able to offer the individual continuity of care and care closer to home following a specialist's intervention and recommendations. Multidisciplinary and interprofessional collaboration within the teams and between levels of care is key in managing any CRDs.

Enhanced and expanded PHC teams

As illustrated in Fig. 2.6, 70–80% of care including diagnosis of the most common CRDs, supported self-management, prevention and health protection can be provided in PHC. The family physician and the primary care team are the key health-care professionals and may be sufficient for most people with asthma.

In some countries family physicians are not allowed to make a final diagnosis of COPD or asthma or initiate prescriptions and should refer to specialists. At the same time, due to the low priority of CRDs at national level, very often indicators of COPD and asthma are not included in the PHC performance frameworks, or supported by specific training courses, and there is a lack of provision of required equipment and of accountability of PHC in this area. As a result, PHC is not motivated to take responsibility for the detection and management of CRDs.



To initiate the transformation to patient-centred care and optimize health outcomes and quality of life for people living with CRDs, some countries have introduced hubs within PHC with multidisciplinary teams and diagnostic and management capacity. The multidisciplinary team can provide care and self-management support through all stages of the disease, engaging other professionals, if necessary, for example, to provide rehabilitation, non-invasive ventilation or ambulatory oxygen.

Some countries are testing different models and approaches to bring those services to community level to address patients' needs closer to community. As an example, Ireland is implementing a National framework for the integrated prevention and management of chronic diseases 2020–2025 which includes the establishment of the regional hub for priority chronic conditions, including CRDs *(156)*. The findings from numerous studies

collectively support the adoption of two strategic approaches to strengthen PHC in the community-based prevention and management of diagnosed cardiovascular and chronic lung conditions *(157)*: task-sharing by assigning health-care management and prevention tasks within the multidisciplinary team or community, such as pharmacists and nurses and strengthening self-management with or without support from family or community-based peers.

The first strategic approach on task-shifting requires considerable changes in organizational structure, the expansion of competencies and skills and the involvement of wider health professionals.

Across the Region, the composition of PHC teams varies considerably. In most countries, a core team consist of a family doctors and nurses sometimes with a midwife and a few narrow specialist physicians included to provide support to the core team such as paediatricians or obstetricians/gynaecologists.

Other countries expand the PHC teams by including allied health professionals such as physiotherapists, dieticians/nutritionists, psychologists, osteopaths/kinesiologists, social workers, dentists, occupational therapists within the PHC teams or at community level.

There are several examples of primary care team composition before and after the COVID-19 pandemic in the WHO country vignettes and NCD good practices *(1586,159)*, and publications by Organisation for Economic Co-operation and Development (OECD) *(160)* and others.

Navigation in such complex service delivery systems is quite challenging. Where available, family practitioners play the role of coordinating the patients, but some countries have introduced a new role of care coordinator or case manager for a general navigation role or for coordination of a specific condition, for example coordinator for patients with COPD with the most severe or complex needs. Usually, a specially trained nurse or community worker takes this responsibility. Some models also consider the introduction of a coordinator or case management role in both PHC and in hospitals.

Nowadays, the role of digital technologies in the navigation and provision of services in remote areas and individual homes or community care is increasing. In parallel, countries are working on regulating and introducing security measures and addressing challenges with digital and health literacy among patients and professionals and on reducing the inequity gaps in using such technologies.

Country examples on the changing roles and responsibilities of teams at PHC and community levels for NCDs and specifically on CRDs are provided in Box 2.16.

Box 2.16. Country examples of models of primary and community care

Croatia	The Croatian Health Insurance Fund, in response to the rising burden of NCDs, implemented an innovative specialized e-panel software known as **primary care panels**, which was pilot-tested and subsequently adopted nationwide.
Finland	**The Finish integrated life-course approach** to health has proven highly effective, largely due to the efforts of public health nurses. These nurses play a crucial role in managing and delivering high-quality public health services across various sectors, including maternal and child health-care clinics and school health-care services. By focusing on social and cognitive skills, habits and coping strategies acquired in early childhood and adolescence, this approach addresses the root causes of NCDs and promotes overall health.
Portugal	**In Portugal, a network of spirometry tests** has been integrated into PHC Centres through the National Programme for Respiratory Diseases. This initiative provides health centres with spirometry devices, enabling family doctors to diagnose COPD at an early stage. Nearly 50% of COPD diagnoses in PHC are made using spirometry. Patients with advanced disease stages (GOLD stages 3 and 4) are referred for hospital care, while those with earlier stages (GOLD stages 1 and 2) are managed within PHC. Since 2024, the restructuring of the National Health Service into Local Health Units – which encompass both hospitals and multiple affiliated health centres within the same geographic area – aims to enhance care integration, with a focus on patient-centred treatment. This new structure allows simple cases to remain under PHC management, while only complex cases require hospital follow-up *(161)*.
Spain	In the late 1990s, **the Canary Islands** in Spain reorganized nursing work in PHC due to an ageing population and an increased number of chronic conditions, introducing a liaison nurse, to enhance home care services. This role expanded across Spain and was renamed *Enfermera Gestora de Casos*, or [Nurse Case Manager], inspiring other autonomous communities such as Catalonia, Andalusia and the Valencian Community to adopt the model *(162)*. In the 2000s, **Andalusia** expanded this model to include care plans and social prescribing for those with a disability, older adults and support for vulnerable individuals. **Valencia** focused on the role of Nurse Case Managers in home-based hospital care, with PHC Community Nurse Case Managers covering homes and Hospital Nurse Case Managers managing acute and chronic cases at home-based hospital units. **The Basque Country** adapted the role of Nurse Case Managers to two roles: the Hospital Liaison Nurse Case Manager and the Advanced Skills Nurse Manager. One of the roles of the registered nurse experienced in respiratory diseases and in regular contact with the pneumologist who supervised the programme was visiting patients with COPD at home after earlier hospital discharge to give instructions and check compliance with treatment. This led to a reduction in hospital readmission within 30 days of discharge rates and high patient satisfaction.

Box 2.16. Contd.

Sweden	Västerbotten County in southern Lapland is one of the most sparsely populated areas in Sweden with long distances to travel. The region implemented an effective model which integrates face-to-face, digital and mobile delivery of enhanced **PHC services in the remote rural area** *(163).* Today, southern Lapland offers remote doctor consultations for primary care, emergency care, rehabilitation and elderly care with local nurses to care for chronically ill patients and ensure better continuity of care. Over 40 telemedicine applications are in use, such as rehabilitation and emergency care services connected to Umeå University Hospital. The region also has eight virtual community rooms in rural areas, where people can check their health metrics and have video consultations with health-care professionals. These rooms help design technology for the elderly. With the latest drone technology, southern Lapland is also testing and evaluating, at a small scale, remote-controlled delivery of medicines and laboratory samples from PHC clinics and cottage hospitals to patients.
United Kingdom (Scotland)	In Scotland, **the House of Care framework** *(164)* was introduced to support individuals with chronic conditions; it was initially tested on diabetes, then elaborated to heart failure, other CVD, COPD, complex multimorbidity, frail elderly and other long-term conditions. This initiative brought together multidisciplinary teams, including primary care practitioners, social care workers and community health professionals, to deliver comprehensive care. Practitioners underwent training to adopt a person-centred approach, enhancing their leadership skills and promoting supported self-management. This training also improved health literacy for both patients and staff, fostering strong connections with local community resources.
Belgium, Bulgaria, Germany, Greece, Malta, Netherlands (Kingdom of the), Türkiye, Ukraine and United Kingdom (England)	Over 2 decades, many countries in Europe have implemented and studied the **role of community pharmacists** in the prevention, management and monitoring of CRDs. Some of the services provided include: smoking cessation advice, education and advice about information technology and inhaler selection and checking, provision of support and awareness of symptoms in case of exacerbations and general lifestyle, compliance with maintenance therapy, and reconsideration of treatment regimens *(165–167).* Studies reported that pharmacist-led interventions can improve suboptimal medication treatment and medication adherence and can improve inhalation technique in adults with COPD and asthma *(168)*. Furthermore, community pharmacies can contribute to greening medical deserts by reaching out to underserved populations to bring not only pharmaceutical services but also pharmacy care for the prevention and treatment of CRDs closer to people *(169)*.
Spain and United Kingdom	**Social Prescribing** *(170)* is a powerful, proven community mechanism to improve the physical, emotional and mental well-being of adults by connecting them to non-medical community-based sources of support. Spain and the United Kingdom are introducing social prescribing to support the vulnerable and address inequalities issues.

Strong specialized care

Strengthening PHC is crucial. At the same time, targeted, efficient, high-quality and person-centred specialized services are equally important to meet the needs of people with specific and complex issues, comorbidities and rare diseases. To achieve harmonized health systems, hospitals must also transform their governance, organizational structures and operations, and strengthen integration with the PHC level.

Hospitals across the Region face increasing challenges, including rising patient volumes, long waiting lists, the need to reduce hospital stays, managing complicated cases, capacity and resources constraints, and the growing demand of high-tech diagnostic and life-saving treatment technologies. Traditional inpatient models often struggle to meet these demands efficiently, leading many counties to transform specialist and hospital organizational modalities.

Over the past three decades, health systems in the WHO European Region have reduced curative care beds and implemented cost-containment measures, shifting towards more patient-centred and integrated care systems due to demographic changes, new appearing technologies or a shortage of health workers.

Nonetheless, hospital care in some countries consumes a significant proportion of total health expenditure. For example, in 2021, hospital expenditure ranged from 26% in Germany to over 46% in Croatia, and, in 2022, in Armenia 43.7%, of overall health spending *(171)*.

Despite substantial progress in recent reforms, Belarus has the second-highest rate of hospital beds per population in the WHO European Region – in 2019, 9.69 hospital beds per 1000 population – after Monaco – followed by Bulgaria and Germany which had 7.9–7.8 hospital beds per 1000 population in 2021; this is significantly higher than the EU average of 4.8 beds per 1000. Denmark and Finland have reduced bed numbers by more than 40% over the same period, and the lowest rate of 2.05 per 1000 beds was achieved in Sweden in 2020 *(172)*.

In the transformation of the hospital sector, person-centredness and decentralization of specialized services delivered closer to patients' homes with a community-based approach are crucial drivers. Multidisciplinary and interprofessional case management is a key principle, where generalists, specialists and other health professionals work closely together, organized by an agreed individual patient management plan.

There are increasing evidence and successful country examples on implementing one-day hospitalization programmes, virtual wards, hospitals at home and community-based rehabilitation models.

Many countries implement regionalization programmes across all levels of specialist health care, with clear roles, responsibilities, functions and packages of services supported by strong communication channels within and between the levels of care, ultimately improving the quality of life and outcomes for patients. Several countries in the western part of the Region are trying to design and implement a "Spoke-Hub-Node" approach of connected specialist care centres at local, regional and central levels.

A Spoke-Hub-Node model represents an integrated, patient-centred organization of care, whereby patients move between the levels of care as guided by disease complexity and risk of adverse outcomes. This model facilitates a person-centred approach by allowing care to be received as close to home as possible, with less complex care being provided in the community and more complex care requiring visits or a shared care approach with a more centralized and specialized centre of practice or programme.

Led by the Member States, WHO developed a future vision of a more efficient and effective hospital sector within the whole health-care system, where resources are balanced to allow for the development of PHC, long-term care and other important services *(173)*.

In CRD management, countries set several priority objectives: to reduce hospitalization rates and burden by managing ambulatory-sensitive conditions and unplanned hospitalizations at the outpatient level; reducing the length of hospital stays; and preventing 30-day readmissions after hospital discharge. There are rich country experiences in the Region that have succeeded in reducing such hospitalizations for asthma and COPD such as in Denmark, Finland, Netherlands (Kingdom of the), Portugal, Spain and Sweden *(174)*.

Unfortunately, there are very limited publications on successful country experiences in reorganizing secondary and tertiary health care with better quality and outcomes for other CRDs.

Examples of models of specialized health care can be found in Box 2.17.

Box 2.17. Country examples of models of specialized health care

Denmark	In Denmark, **a cross-sectoral lung team** model was evaluated in two randomized controlled trials for patients with severe COPD. The first study found no significant differences in well-being, quality of life or mental health compared to usual care, but patients in the cross-sectoral lung team group showed a slight improvement in symptom burden *(175)*. A second trial focused on patients with frequent exacerbations and showed that affiliation to the cross-sectoral lung team significantly reduced hospitalizations and shortened hospital stays, with no increase in adverse events. The model, which included 24/7 access to care and home treatment options, was found to be safe, feasible and effective in reducing acute care needs while supporting integrated, person-centred care *(176)*.
Ireland	**The Community Virtual Ward** *(177)* initiative by Beaumont Hospital and the Community Healthcare Organisation in Dublin involved two nursing teams: a specialist respiratory team based at Beaumont Hospital and a Community Intervention Nursing team. The respiratory team provided clinical oversight and governance, while the Community Intervention team - a nurse-led team- delivered enhanced care to patients with COPD and asthma in the community. This integrated care model ensured comprehensive support through collaboration between hospital and community services. Ireland is implementing a **Hub-Spoke strategic approach** to priority chronic conditions, including COPD and asthma *(156)*. In this approach, GPs provide comprehensive multidisciplinary care supported by community respiratory teams enabling the vision of a pathway offering patient-centred end-to-end care, shifting care out of hospitals and closer to people's homes.
Portugal	**Person-centred integrated care hospital approach for COPD** Although Portugal has one of the lowest hospitalization rates for CRDs among OECD countries, Unidade Local de Saúde (ULS) de Coimbra de Coimbra is advancing care with a patient-centred innovation on digital clinical pathways for COPD and asthma. Building on success in remotely monitoring severe COPD cases, this initiative aims to create a scalable, personalized care model. A multidisciplinary team designed the pathway to ensure seamless coordination between primary and specialized care, supported by an integrated information technology system for real-time communication. Currently serving 580 patients, the programme plans to expand to over 24 000 by the end of the year. This transformative approach emphasizes early intervention, patient empowerment and standardized best practices to deliver more integrated and sustainable respiratory care.
Spain	In 2006, Catalonia launched its first **Hospital-at-Home programme** to provide acute care at home, aiming to improve patient experiences, enhance population health and reduce health-care costs. The Hospital-at-Home team, including registered nurses, physicians, specialists and case managers met regularly, with nurses visiting and assessing patients daily. Key health parameters were monitored and transferred via a special app. Interventions included regular tests, intravenous and nebulized treatments, and oxygen therapy. Patients could be transferred back to the hospital for further diagnostics or emergencies. Despite home-based care, the hospital retained clinical, financial and legal responsibility for the patient *(178)*.
Multi-country	In Europe, **sleep apnoea diagnosis and management** rely predominantly on trained somnologists or pulmonologists with specific expertise in this area. Sleep apnoea is highly prevalent in most of the countries of the WHO European Region, but there is limited access to sleep centres leading to substantial waiting times and delays to appropriate life-saving treatment *(179,180)*. Care pathways that integrate the use of home sleep apnoea testing, virtual consultations and telemonitoring of patients on continuous positive airway pressure therapy are increasingly utilized and facilitate patient-tailored management with faster access to diagnosis and treatment; this will likely improve patient outcomes *(181)*.

Integrated care system and pathways

All countries include the development and implementation of international or national guidelines and protocols in their national programmes. Implementation processes usually include design or adaptation, training and testing of assessment components before wider implementation. However, very often the process lacks a practical description of guideline implementation in a real-life context. Effective implementation of clinical guidelines with patients at the centre in practice requires harmonized team efforts in the design of patient journeys within a very complicated health-care system and beyond, ideally with the engagement of the real patients or carers in the whole process.

To support integrated care models and more effective guideline implementation, countries should introduce integrated care system and integrated care pathway approaches. Simple and clear protocols and algorithms have been shown to support better implementation of the clinical guidelines *(182)*.

Integrated care pathways *(183)* (also known as clinical and referral pathways, coordinated care pathways or care maps) are structured care plans that outline the essential steps, roles and responsibilities of each team member in managing patients with a particular clinical condition in a specific context. The pathways also describe the expected clinical progression of the patient with the timing and sequence of each task *(184,185)*.

In the past decades, many countries in the WHO European Region have faced the issue of developing and implementing an integrated pathway for specific chronic conditions in patients with multimorbidity, especially in middle-age (40–64) and elder population (65 and over), including frailty. Denmark, Norway and Spain are among the countries suggesting integrated disease-specific models of care and pathways at hospital level, but joint unified pathways for multimorbidity and frailty management at PHC and community levels.

The impact of frailty is increasingly recognized by respiratory professionals. Frailty assessment of people with COPD may aid risk stratification and guide interventions. Service options include expanding frailty services, typically set up for older people, to include those under 65 who meet the frailty criteria, or to incorporate frailty services such as rehabilitation and nutritional interventions into COPD services. Future research is needed to determine the best ways to measure and monitor frailty, as well as the best interventions.

Country examples of integrated care systems and pathways development and implementation processes are provided in Box 2.18.

Box 2.18. Country examples of integrated care systems and pathways development and implementation processes

Netherlands (Kingdom of the)	The Lung Alliance Netherlands developed and tested a patient-focused ***National care pathway for lung attack with hospital admission****: better care for patients with COPD* in 2020 *(186)*. A Rotterdam team of researchers designed **an innovative diagnostic pathway for COPD and asthma** *(187)*. Holistic care models were developed for capturing both physiological measurements and other factors affecting quality of life, such as functional limitations, comorbidities and symptoms.
United Kingdom	The British Thoracic Society, the National Institute for Health and Care Excellence and the Scottish Intercollegiate Guidelines Network published ***Asthma pathway*** **recommendations and resources** on diagnosing, monitoring and managing asthma in adults, young people and children *(188)*.
United Kingdom (England)	In England, **patients' pathway in COPD** care usually starts in primary care *(189)*. GPs and practice nurses (although not always only dedicated to COPD) provide preventive care, diagnostics, treatment and follow-up care in stable and acute phases (exacerbations) of the disease. As early as in the early 2000s, 86% of patients stated that their GP was the health professional they went to for the management of their COPD, and only 14% received care from a respiratory physician.
Denmark and Norway	In both countries, the national governments have established **models for Patient Pathway Programmes** *(190)* for cross-sectoral care to supplement the already established pathway descriptions at hospital level. In Denmark this is a generic model; in Norway the national government started with the implementation of pathways for cancer care. The regions and municipalities in both countries have subsequently developed pathway descriptions for a range of cross-sectoral conditions including diabetes, COPD, heart conditions, back and lower back conditions, dementia, schizophrenia, cancer rehabilitation and brain damage.

Other chronic respiratory conditions/diseases and comorbidities

While asthma and COPD are the most common CRDs, other chronic respiratory conditions contribute significantly to the burden of respiratory health through increased health-care utilization, morbidity and mortality *(191)*.

Many patients with lesser-known respiratory conditions face significant delays in diagnosis due to a lack of awareness among non-specialist health-care providers *(192)*. In addition, young people transitioning from paediatric to adult health care often feel lost, especially if their condition lacks dedicated adult services. To address this, professionals and patient advocacy groups are working to raise awareness and improve recognition, advocating for better care options *(193)*.

Referral to specialist care is essential for diagnosing and managing less common respiratory conditions such as ILDs, CF, bronchiectasis and pulmonary hypertension, which require new treatment approaches and updated guidelines, particularly for cases that do not respond to standard therapies.

European Reference Network on Rare Respiratory Diseases (ERN-LUNG), a European Reference Network (ERN), has been established to build a clinical care network for all rare diseases of the respiratory system *(194)*. This cross-border network spans 18 countries in Europe to provide rare disease clinicians with a centralized platform across borders to share knowledge and experiences with the objectives of improving patients' access to diagnosis, care and treatment, establishing rare disease databases and developing clinical guidelines.

Sleep apnoea

Sleep apnoea is estimated to affect 1 billion people worldwide and is often linked with other CRDs and related conditions *(195)*. Evidence suggests that delivering sleep diagnostic and therapy services at home may improve efficacy and reduce the costs associated with obstructive sleep apnoea management. The use of telemedicine for adjusting positive airway pressure treatment and conducting follow-ups to enhance treatment compliance by identifying and addressing issues early and offering teleconsultations all seem to hold promise for better management of obstructive sleep apnoea *(196)*. While in-lab polysomnography is the gold standard for diagnosing obstructive sleep apnoea, it is costly and time-consuming. Home sleep apnoea tests offer a more accessible and cost-effective alternative, utilizing advanced, non-invasive devices for easier multi-night diagnosis and management of sleep-disordered breathing that a significant proportion of patients may benefit from *(197)*. However, an evidence-based approach to these home-based services is crucial for enhancing patient compliance and treatment outcomes, as it has a potential to reduce societal burden.

ILDs

ILDs is an umbrella term for a wide group of rare respiratory conditions, including idiopathic pulmonary fibrosis. Diagnosis of ILDs is often complicated and delayed, with many patients misdiagnosed. Multidisciplinary teams are essential for accurate diagnosis *(198)*, involving specialists such as pulmonologists, radiologists, pathologists and sometimes rheumatologists or geneticists. ILDs require specialized care, which is provided by centres of expertise. These centres ensure timely diagnoses and appropriate treatments. Diagnosing idiopathic pulmonary fibrosis, a common ILD, can take an average of 7–8 months, often leading to misdiagnosis. Treatment options include antifibrotic medicinesand non-pharmacological therapies, highlighting the importance of specialized care. Early referral to specialist centres is crucial for improving outcomes. To facilitate early referrals, health systems should focus on training primary care physicians, establishing clear referral pathways and empowering patients with education. Successful examples include national ILD specialized centres in Germany *(199)* and the United Kingdom *(200)*.

Bronchiectasis

A major European guideline has been published to guide bronchiectasis care *(2019)*. Research indicates significant differences in treatment practices across Europe, with a higher prevalence of airway clearance techniques in northern and some western European countries. However, only half of the people with bronchiectasis in Europe use airway clearance management. Use and access to devices, mucoactive medicines and specialist chest physiotherapy appears to be limited in many European countries *(202)*. Thus, variations in interventions may reflect local availabilities and preferences rather than evidence-based practices.

CF

Neonatal screening for CF is crucial for early diagnosis and intervention, enabling early implementation of essential treatments such as physiotherapy and nutritional support. Recent advancements in expensive yet effective therapies have significantly improved quality of life for many patients, fostering hope for a better future *(203)*. However, before introducing neonatal screening, countries must assess factors such as the incidence rate of CF, resource availability for diagnostic tests, follow-up efficiency, workforce capability and access to evidence-based guidelines and treatments. Advocacy for increased accessibility, affordability and health-care innovation is vital at both global and regional level. The WHO considers CF a major concern among NCDs, highlighting the importance of ongoing efforts to address paediatric chronic conditions in its health agenda. Additionally, there

is a global movement to enhance access to innovative CF therapies, underscoring the necessity for collaboration among health-care professionals and stakeholders to ensure equitable treatment.

In conclusion, addressing less common respiratory conditions in the WHO European Region requires a comprehensive and multidisciplinary approach *(204)*. By integrating primary and secondary care, emphasizing self-management, leveraging innovative technologies and tailoring interventions to cultural contexts, health-care systems can improve outcomes, reduce hospital admissions and enhance the quality of life for patients. Ongoing research and collaboration are essential for advancing care delivery models for ILD, bronchiectasis and other CRDs *(205)*.

Comorbidities

Major comorbidities associated with CRDs include CVD (such as hypertension and heart failure), metabolic syndrome, diabetes, anxiety and depression. These conditions can complicate management and worsen patient outcomes, necessitating a holistic approach to treatment.

Depression and anxiety are common yet often underdiagnosed in patients with CRDs, particularly COPD. These mental health issues worsen quality of life, lead to poor treatment adherence and increase hospitalizations and health-care costs. Structured cognitive behavioural therapy can be effective in addressing these problems and integrating psychologists into respiratory teams can enhance patient outcomes. Integrated care models increasingly call for mental health support as part of comprehensive CRD care. Successful examples in the WHO European Region include Germany's integrated care models that emphasize collaboration between respiratory and mental health services and the United Kingdom's NHS programmes that provide mental health support for respiratory patients. Referrals to mental health services are crucial for those with severe symptoms and smoking cessation remains a vital component of care. On the other hand, breathing problems and anxiety and depression are also closely connected to CRDs *(206),* and improving respiratory health will also improve mental health. Countries in the WHO European Region can improve the management of CRDs and their comorbidities by implementing integrated care models with multidisciplinary teams, standardized screening protocols for conditions such as CVD and diabetes, and patient education programmes. Successful examples include the Chronic Care Model in Netherlands (Kingdom of the) *(207)*, Germany's Disease Management Programmes *(208)*, and Scotland's (United Kingdom) Breathing Space initiative *(209)*, which collectively enhance patient outcomes through comprehensive care approaches.

Vignette 5. People's experience of living with CRD

Jean-Michel is 65 years old, living with Idiopathic Pulmonary Fibrosis in France. He is the President of l'Association Fibroses Pulmonaires France [Pulmonary Fibrosis Association France] and former Secretary of the European Pulmonary Fibrosis Federation.

I live with shortness of breath, particularly during physical activity but also with simple daily movements that are becoming increasingly difficult to carry out – for example, climbing the stairs and taking the shopping out of the car. As my body struggles to get enough oxygen, I feel fatigue, weakness and reduced stamina. If I do want to engage in any physical activity, I now require supplemental oxygen to maintain adequate oxygen levels in the blood.

This has had a big impact on my psychological state of mind. I often feel anxious and frustrated and uncertain about the future. This not only puts strain on me, but also on my family. Shortness of breath also directly impacts intimacy in relationships as sexual relations feel challenging.

My illness forced me to stop working as the stress and anxiety prevented me from playing my role of manager effectively. It also reduced my quality of life and stopped me travelling too far as I need to be close to my hospital. I know there is no cure and I live in constant fear of triggering exacerbations, which can be fatal in 50% of cases.

There are many factors that can cause these exacerbations. These include breathing polluted air, second-hand smoke, respiratory infections such as colds and flu, anxiety and depression, temperature and humidity extremes and side-effects of certain medications. We know that chronic respiratory conditions often have their origins in early life and they are multifactorial, often with strong links to environmental factors. Often people are unaware of how they can minimize these risks and are therefore left unable to take proper care of their health. More needs to be done to raise awareness of the risks and tackle them at the policy level.

Additionally, we need to create better health-care pathways and standardize this across Europe. Research and innovation need promoting as these areas are also deficient, partly due to a lack of recognition by health-care professionals in general, and also to the low level of public funding allocated to respiratory research projects.

Idiopathic pulmonary fibrosis is a devastating disease with far-reaching consequences, but with increased research, earlier diagnosis, improved treatment access and better patient support systems, we can make a real difference in the lives of those affected. By prioritizing chronic respiratory conditions, in national and European health agendas, policy-makers can ensure that the necessary steps are taken to improve care, reduce the burden of the disease and ultimately enhance the lives of patients and their families.

Jean-Michel Fourrier

Enabling factors

Empowered people and communities

There has been a seismic shift over the last 10–15 years in the level of engagement of patients and people with a lived of experience of their chronic condition in health care.

Empowering individuals, families and communities to optimize their health, enables them to act as advocates of policies that promote and protect health and well-being, as co-developers of health and social services, and as self-carers and caregivers.

In 2023, WHO launched a *framework for meaningful engagement of people living with noncommunicable diseases, mental health and neurological conditions (210)*. This technical product was designed together with a representative group of people with lived experience and built on evidence and guidance from academia and civil society, emphasizing participatory approaches and the principles of meaningful engagement in global public health. This framework aims to support WHO and Member States in co-creation and enhancement of policies, programmes and services by involving individuals with lived experience as partners with the approach "Nothing for us, without us".

The WHO European Region boasts a wealth of experience in engaging patient, youth and civil society organizations. National patient organizations and Regional European umbrella groups have been at the forefront, championing advancements for respiratory patients across the Region Their advocacy efforts have significantly shaped policies and initiatives, ensuring that the needs and voices of respiratory patients are heard and addressed.

- The European Lung Foundation brings together a network of respiratory patient organizations and individual patients with CRDs. It works in partnership with the ERS to ensure that patients are involved in all aspects of ERS' work and to ensure that CRD patient voices are heard *(211)*.
- The DIG_IT survey by the European Federation of Allergy and Airways Diseases Patients' Associations gathered insights from asthma and COPD patients across Europe about the future of digital health. Nearly a thousand patients from Belgium, Czechia, Ireland, Norway and Spain shared their needs, perceptions and experiences with digital technologies in their health-care journey. The corresponding report highlights patient voices from diverse countries, ensuring that digital health innovations are shaped by those who use them *(212)*.
- The ERN-LUNG is a network of European health-care providers dedicated to ensuring and promoting excellence in care and research for the benefit of patients affected by rare respiratory diseases. Patients are at the centre of ERN-LUNG and work in partnership via a Patient Advisory Group, with patient representatives from across Europe *(213)*.
- The Dutch organization Longfonds runs a training programme for people living with CRDs to become expert assessors of research proposals that Longfonds is asked to fund *(214)*. In addition, the Lung Alliance Netherlands – a federative cooperation of organizations – is involved in prevention and the care of people with a chronic lung disease in Netherlands (Kingdom of the). Lung Alliance Netherlands is committed to optimal prevention and treatment of chronic lung diseases and does this in cooperation with 34 member organizations, comprising lung care professionals, patient associations and health-care organizations, among others *(215)*.
- Asthma + Lung UK champions equity by leveraging data from its patient passport programme and other funded research to highlight disparities in care for people with CRDs, particularly those stemming from poor housing and uneven smoking rates. The organization has established five key stress tests to hold the British government accountable over the next 6 years, aiming to address these inequalities and improve lung health as part of the broader goal to level up the United Kingdom by 2030 *(216)*.

Evidence is growing to demonstrate the impact of people with lived experience. Powerful examples include:

- expressing strong and united voices to help reduce risk factors for CRDs such as tobacco smoke, air pollution and occupational hazards *(217)*;
- generating evidence-based decision-making processes *(218)*, ensuring that they have the latest evidence-based information to help with self-management of their conditions *(219)*;
- defining research priorities which will have an impact on their lives *(220)*, and co-designing and participating in clinical trials and health systems *(221)*; and
- advocating for change at all levels *(222)*, including advocacy and support for clean air legislation in all related sectors (energy production, industry, agriculture, transport and heating).

However, there are still challenges, including:

- sustaining funding and organizational support, particularly for people living with multimorbidity and frailty;
- ensuring an equal seat at the table with policy-makers and support at community level;
- improving knowledge and skills to represent the voice of the people at political dialogues, generating evidence-based recommendations to support informed policies and strategies for health systems strengthening and people-centred care; and
- ensuring that the voice of the patient remains unbiased when sources of funding may come from industry which can introduce conflicts of interest.

Empowered and capable workforce

The WHO European Region is grappling with significant challenges, particularly in the aftermath of the COVID-19 pandemic. These include personnel shortages, difficulties in recruitment and retention, the migration of skilled workers and unattractive working conditions. Additionally, there is limited access to continuing professional development opportunities, skills mismatches, a decline in generalism despite its increasing importance for comprehensive care, and an uneven distribution of health-care workers between urban and rural areas. These issues are further exacerbated by inadequate data and analytical capacity, poor governance and management, a lack of strategic planning and insufficient investment in the health workforce (including, for retention – higher salaries, incentives etc) *(223)*.

The integrated care models for chronic conditions highlighted above necessitate a fully capable health-care workforce that is properly staffed, appropriately skilled, motivated and empowered. Strong leadership and effective governance are essential to guide and sustain these efforts, ensuring that systems are aligned and responsive to evolving needs. Innovation is also crucial to ensure these models are effective and sustainable. By fostering a supportive environment and investing in continuous professional development, we can build a resilient health-care system capable of addressing the complex needs of patients with chronic conditions.

The *Framework for action on the health and care workforce in the WHO European Region 2023–2030* provides strategic guidance to countries in addressing the challenges mentioned above. It includes five strategic pillars: retain and recruit, build supply, optimize performance, plan and invest *(224)*.

In terms of CRD as one of the groups of chronic conditions, skill-mix innovations can support the implementation of integrated care for people with chronic conditions and multimorbidity. Such innovative approaches, well demonstrated in the previous section on models of care, can be summarized in line with the WHO policy brief by the European Observatory on Health Systems and Policies *(225)*.

- **Establishment of teamwork and collaboration in multiprofessional teams:** Guiding coordination of efforts and aligning goals through strong leadership and a clear, shared vision. This approach enables different professions family physicians, therapists, respiratory specialists, pulmonologists, nurses, social workers, community health workers, psychologists, nutritionists and front desk staff as well as housing staff) to work together across sectoral boundaries to organize and coordinate joint care and link health and care services.
- **Sharing of tasks and roles:** To achieve a new division of work and more effective use of existing human resources, such as the examples provided earlier in the report of nurses and sometimes pharmacists taking on CRD prevention, patient education on self-management, using inhalers, monitoring health status and treatment adherence, taking a leading role in home care and coordinating processes in close collaboration with physicians. The shift of asthma and COPD management from narrow specialists to GPs, PHC and specialist respiratory nurses.
- **Relocation of care to other settings:** Country examples are provided above on nurse-led clinics, hospitals at home, outpatient pulmonary rehabilitation programmes or establishing chronic condition management hubs and spoke centres to release acute care units and hospitals, establishing community palliative care services.
- **Introduction of dedicated prevention roles in primary care and community engagement:** With nurses, pharmacists, community health workers or volunteers fostering health literacy, offering advice and counselling, such as on tobacco cessation, indoor pollution measures and promoting healthy lifestyles.
- **Empowerment of patients and caregivers:** Educators, community health workers, informal community volunteers who provide information and training to strengthen patients' self-management and support behavioural change.

- **Introduction of care coordination role:** Introduction of case managers and patient navigator roles and delegation of this role, in the majority of country cases, to nurses at PHC, community or hospital level who are responsible for developing shared care plans and monitoring patient health and well-being.

Investment is needed in both respiratory specialists and generalists who are confident in diagnosing and managing CRDs to support quality services at PHC level and balance demands on the hospital sector. Equitable access and health security require a workforce that is available to all citizens, particularly those at higher risk.

Recruitment and retention in remote and rural areas often lag behind urban areas, necessitating monitoring and strategic planning. All countries experience the effects of a failure in health labour markets, which result in maldistribution and misalignment of the workforce *(226)*.

Initiatives such as rotations for family physician trainees and social benefit packages for rural health providers, as seen in Kazakhstan, along with benefits and public scholarship quotas for entering medical schools and colleges, contribute to strengthening the rural health workforce. Retention strategies are most effective when there is a bundle of initiatives covering education, regulation, incentives and professional and personal support mechanisms, such as career development opportunities, safe working conditions, and family accommodation *(190).*

Opportunities to use growing technologies and digitalization can significantly support better access to care, especially in remote areas. However, smart protective strategies and digital literacy issues should be addressed for such innovations.

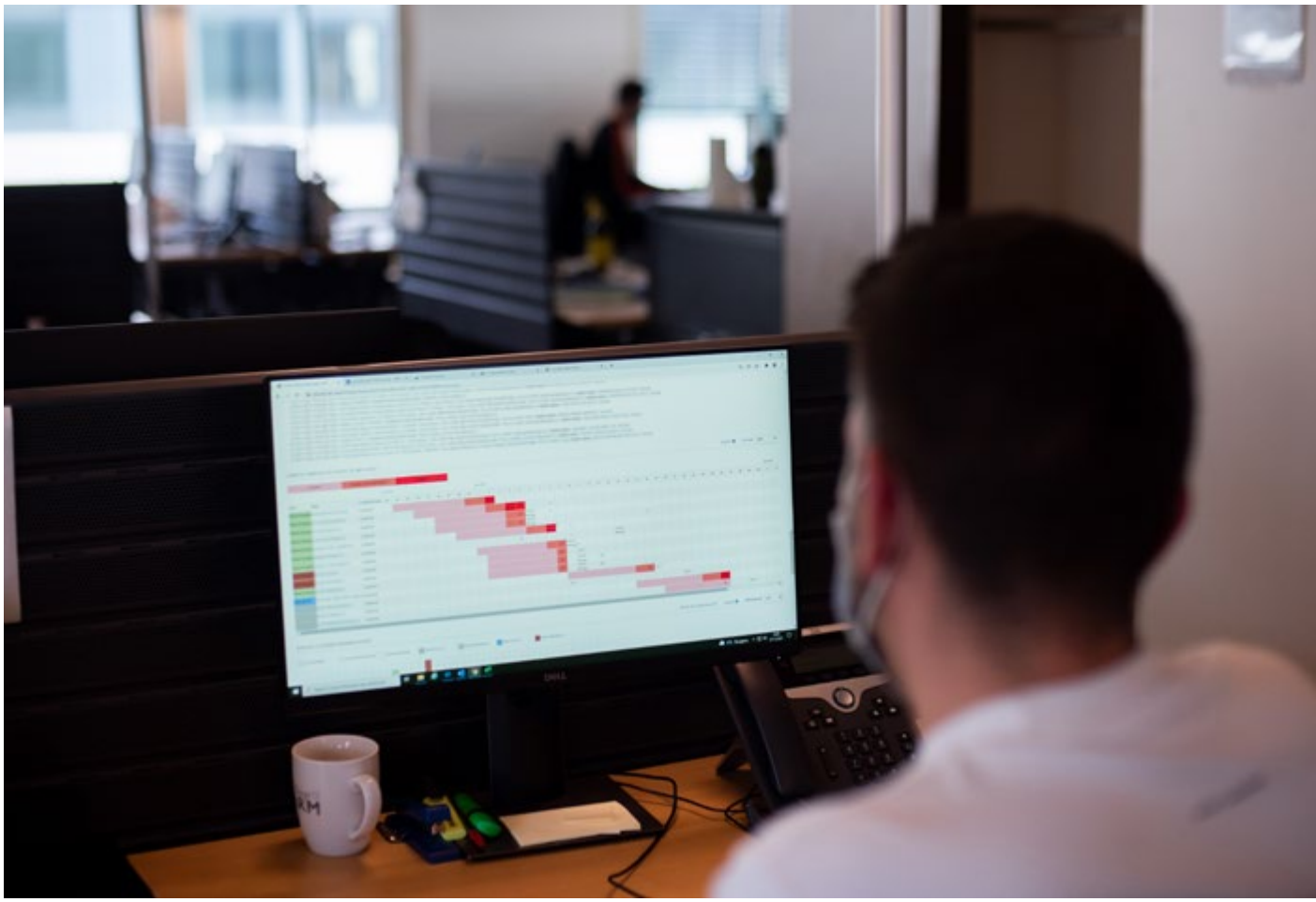
In the eastern part of the Region, there is a lack of other health professionals or limited experience in integrating **new professionals into primary care and community levels**. However, central Asian countries are gradually introducing health professionals into PHC teams, such as the introduction of social workers and psychologists in Kazakhstan; or **expanding the skills and roles of existing health providers**, such as family nurses with independent consultations and/or patronage nurses with stronger capacities in managing chronic diseases in Kyrgyzstan and Uzbekistan.

Ensuring the quality and safety of provided services, through an adequately planned and designed pre-service education system, supported by continuing professional education, is essential for building teaching and learning capacity and delivering lifelong education.

The medical education system and allied professional and health worker training programmes should be based on country/government health strategies underpinned by a strategic and integrated approach to human resources for health governance, planning and education; this should be underpinned by political commitment and appropriate financial and educational resources. Thorough analysis of the current situation can provide more insights into the current debates around respiratory specialists and the future needs for pulmonologists, respiratory therapists, specialized nurses and other health and non-health professionals, their future roles and skill mix.

Experiential learning, regularly reinforced and tailored to learning needs, improves adherence to protocols and guidelines. Communication skills, crucial for addressing multimorbidity and supporting behavioural change, should be emphasized in health professional curricula. Treating tobacco dependence should be a mandatory element in all undergraduate programmes. Many free resources are available that can be adapted to local contexts.

Evidence demonstrates that the most effective implementation of skill-mix innovations occurs when it is integrated into a comprehensive system-wide process, encompassing changes at macro (system), meso (organizational) and micro (professional and patient) levels.



QI and information systems

"Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction, and skilful execution." – William A. Foster

Ensuring effective, efficient, people-centred, timely, equitable, quality and safe service provision by well-trained health workers requires robust and evolving quality assurance and continuous QI mechanisms. QI mechanisms should be supported by a strong HIS linked to monitoring and evaluation mechanisms.

There are various tools, standards and frameworks for quality monitoring and evaluation, but they follow these strategic principles:

- A culture of continuous QI should be a core component for every person involved in the process. This principle is supported by the Plan-Do-Study-Act cycle of QI *(227)*.
- People-centredness can only be achieved by engaging people in care planning, addressing their needs and designing a service delivery system to achieve better patient outcomes.
- Data-driven decision-making can lead to QI. Health-care organizations can enhance outcomes by utilizing patient and performance data to identify inefficiencies, recognize trends and make informed decisions. A data-driven approach helps eliminate defects and variability in processes.
- QI cannot occur in isolation. Successful initiatives require collaboration across various teams and individual professionals. Teams that work together to address quality gaps are more likely to achieve sustainable changes.

To achieve clinical effectiveness and reduce variabilities in quality and practice, countries can introduce **clinical guidelines and protocols**. Earlier we discussed the implications of quality guidelines and clinical protocols.

Sets of **quality standards and performance indicators** support progress monitoring of a guideline's implementation and benchmark progress between teams, facilities and geographic areas.

To support countries in monitoring service delivery processes, WHO has developed an NCD facility-based monitoring guidance document *(228)*. It includes a framework and sets of relevant, valid and feasible standardized indicators to strengthen monitoring for priority NCDs by leveraging existing national HISs, particularly routine health facility reporting systems and health facility survey systems.

For CRDs, essentially asthma and COPD, cross-cutting indicators are also included in the guidance supported by baseline values and targets for each indicator. Fig. 2.7 highlights both core (blue triangles) and optional (orange bullet points) indicators for these conditions.

Fig. 2.7. Overview of the recommended indicators for asthma and COPD, and cross-cutting indicators

ASTHMA AND CHRONIC OBSTRUCTIVE PULMONARY DISEASES

INPUTS/PROCESSES	OUTPUTS	OUTCOMES
System capacity and management ▸ Availability of asthma core medicines ▸ Availability of COPD core medicines ● Availability of peak flow meter and mouthpiece	**Early detection and diagnosis** ● Asthma diagnosis using peak flow measurement ● COPD diagnosis using peak flow measurement **Treatment** ● Treatment among people with asthma ● Treatment among people with COPD	**Disease control** ▸ Asthma control ▸ COPD control ● Emergency visit among people with asthma ● Emergency visit among people with COPD

CROSS-CUTTING

INPUTS/PROCESSES	OUTPUTS	OUTCOMES
System capacity and management ● Availability of trained staff ● Completeness and timeliness of reporting by health facilities ● Facilities receiving supervisory visit	**Early detection and diagnosis** ● Loss to follow-up **Treatment** ● Loss to follow-up **Complication assessment** ● Loss to follow-up	**Disease control**

Source: WHO, 2022 *(228)*.

In continuous QI, **clinical audits and supportive supervision mechanisms** are used by many countries. These approaches help health-care organizations to identify gaps and improve care delivery. Benchmarking allows performance against peer institutions to be measured.

Several countries in the WHO European Region are recognized for their leadership in QI, including advanced clinical audits and supportive supervision such as Netherlands (Kingdom of the), Sweden and the United Kingdom. Also, Czechia, Estonia, Lithuania and Poland have made significant strides in QI, clinical audits and supportive

supervision. eastern Europe and central Asian countries also have experience in introducing continuous QI programmes in different clinical areas (Box 2.19).

Box 2.19. Country example of quality of care

United Kingdom	As a country example, the British National Institute for Health and Care Excellence provides primary care indicators through the Quality and Outcomes Framework in England, linked to financial incentives for PHC. These indicators are regularly updated based on clinician consultations and performance assessments from the National Asthma and COPD Audit. The indicators focus on accurate disease registers, smoking status records, annual reviews, personalized asthma action plans and pulmonary rehabilitation referrals for eligible COPD patients *(229)*.

Another key outcome that should be measured is **patient safety and satisfaction**. By prioritizing the reduction of medical errors and enhancing care coordination, continuous QI fosters safer health-care settings. Efforts to minimize adverse events, such as hospital-acquired infections, or polypharmacy and non-evidence-based treatments, are two examples of QI in practice.

Patient satisfaction surveys and continuous patient feedback loops provide valuable insights into the quality of care provided from a customer point of view. Health-care organizations should regularly collect and analyse patient feedback to identify areas for improvement.

Continuous QI should be also driven by motivated health providers where value-based care applies. Incentives for the team of health providers based on patient outcomes rather than volume of care should also be considered. A combination of clinical and patient outcomes with patient satisfaction scores are the key indicators of the effectiveness of a programme.

Well-designed **Electronic Health Records and HISs** are vital for QI, as they centralize patient data, making it easier for health-care providers to monitor long-term progress and outcomes and implement data-driven interventions. Additionally, electronic health records enhance communication between health-care providers, reducing the risk of errors and improving continuity of care.

Moreover, countries with well-designed HISs introduce **predictive analysis for prevention of medical errors**. Predictive analytics enables health-care providers to identify patients at risk of complications or likelihood of adverse events and potential outcomes *(230, 231)*. By analysing historical data and patient health records, predictive tools assist clinicians in intervening before issues escalate. More details and examples of some innovative digital solutions will be provided in the next chapter of this report.

Unfortunately, the WHO European Region is divided by inequality in HISs. Countries in the western part of the Region have well-designed HISs, while the eastern part relies on paper-based patient records with limited HISs. However, there are opportunities for all countries to learn from each other, leapfrog and advance in HIS implementation. Countries in the east such as Kazakhstan, Kyrgyzstan and the Republic of Moldova are rapidly progressing in their implementation of national electronic health records and an HIS.

WHO provides support to countries and has developed a Toolkit for Routine Health Information Systems data *(232)*. It has also established a Strategic Partners' Initiative for Data and Digital Health *(233)*.

Improving health-care quality is an ongoing process that requires dedication to patient-centred care, informed decision-making through data and teamwork across the health-care landscape. By adopting effective QI methodologies, countries and health-care institutions can boost patient outcomes, reduce costs and waste, and elevate the overall standard of care. The future of health care hinges on a steadfast commitment to QI and can profoundly impact patient outcomes and efficient health systems.

Addressing issues with access and affordability of NCD/CRD and other essential services before any crisis can support timely and effective response when crisis strikes.

Building CRD-resilient health systems: ready for the future

Currently, the WHO European Region faces an era of persistent permacrisis –multiple intertwined crises such as pandemics and outbreaks, armed conflicts, natural disasters and other hazards. At the same time, climate change and long-lasting environmental effects such as global warming and air pollution, along with migration and refugee flows, political instability and polarization, demographic shifts, urbanization, and the rising threat of mis- and disinformation.

These challenges amplify the burden on the governments and health systems already struggling with preventing and managing chronic conditions (communicable diseases, NCDs and mental health), dealing with antimicrobial resistance, vaccination coverage, reducing inequalities and protecting vulnerable population throughout the life course.

The current evidence demonstrates the best approaches for countries in the development of national preparedness, response and recovery plans.

Two major questions can support countries in building strong, agile and resilient health systems:

1. Who are the most vulnerable during any type of emergencies and long-lasting events?

People with:

- low health resources – young and elderly population groups;
- low power and material resources – socioeconomically deprived population groups; and
- pre-existing chronic conditions and high-risk groups (including gender-based risks and multiple risk factors) – people living with NCDs, including CRDs, and also those at high risk of NCDs.

Each country should know who these people are, and where and how to find them in times of emergencies. Strong information systems and additional vulnerability assessment tools can be used before, during and after a crisis. This information can help countries to develop a vulnerability matrix before a crisis, and to develop potential scenarios and estimate potential costs.

Addressing issues with access and affordability of NCD/CRD and other essential services before any crisis can support timely and effective response when crisis strikes.

2. What should each country do?

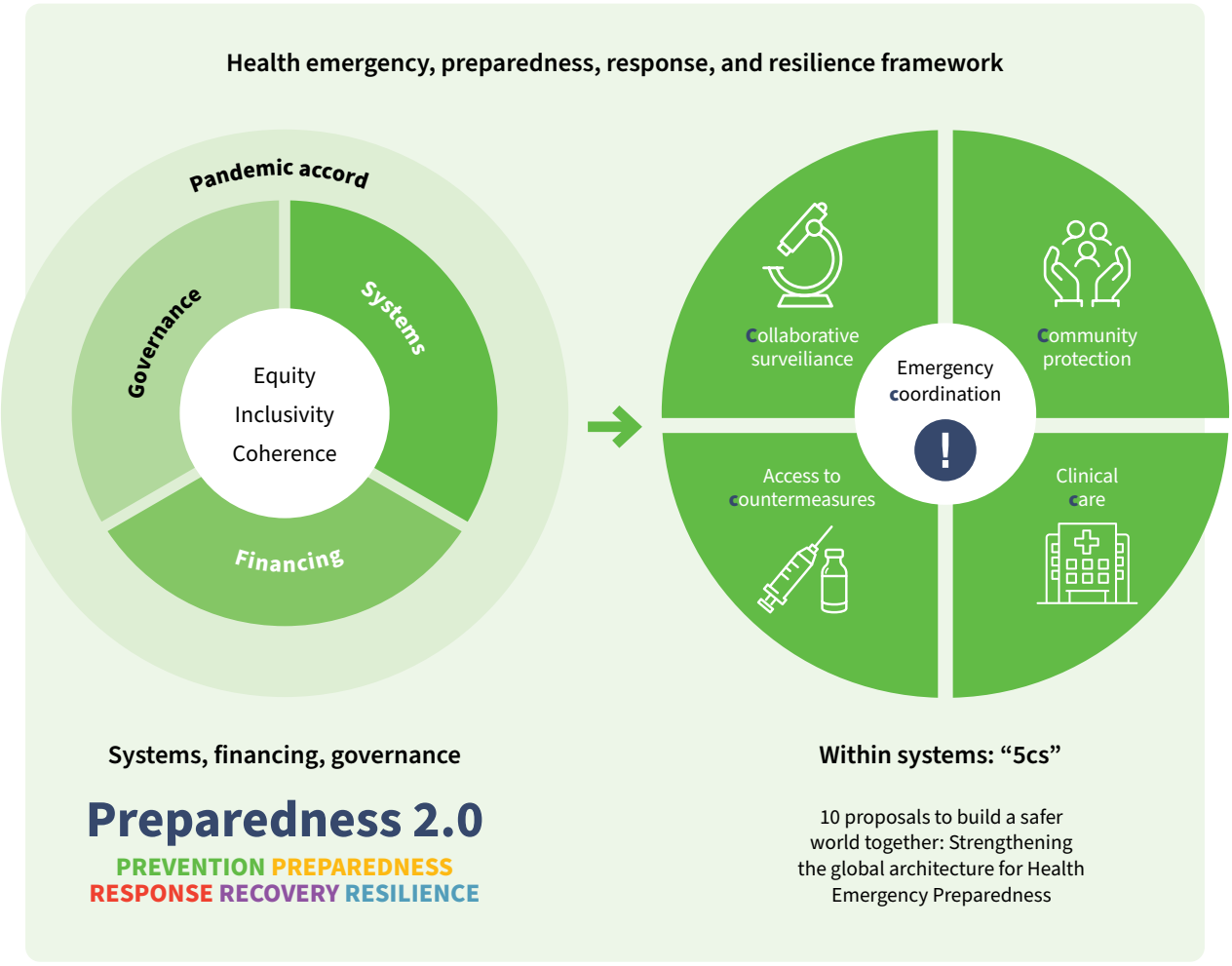
WHO has developed a regional *Strategy and action plan on health emergency preparedness, response and resilience in the WHO European Region (Preparedness 2.0).,* based on the 5C's approach (Fig. 2.8) *(234).*

Each country should plan to introduce an integrated dual-track approach:

- to ensure timely and effective acute response; and
- to ensure the continuity of care during emergencies, focusing on interventions that foster inclusive, resilient health systems.

A rapid review conducted during the COVID-19 pandemic highlighted the importance of respiratory conditions in the availability of hospital beds *(235)*. Data from the NHS in England (United Kingdom) in 2019 on preventable hospital admissions suggested that eight conditions accounted for three quarters of the total cases of preventable hospitalizations caused by ambulatory care-sensitive conditions, four of which were respiratory (influenza, pneumonia, COPD and asthma). Additionally, the highest rate of admissions was due to influenza and pneumonia, which also had the second-highest length of stay. COPD is the most common cause of preventable readmissions, accounting for 19% of the total.

Fig. 2.8. Health emergency, preparedness, response and resiliencefframework



Source: WHO, 2022 *(234).*

Similarly, in Netherlands (Kingdom of the), COPD was also one of the three main reasons for hospitalization. Therefore, prevention and management in the community setting may improve facility resilience by supporting hospitals in coping with excess demand due to pandemics such as COVID-19 and ensuring the safety and well-being of patients.

Unfortunately, there are very limited publications on other types of emergencies and long-lasting events and responses for CRDs. More research and publications are required to evaluate the magnitude of service disruption, challenges in access to essential medicines and the real needs of people living with CRDs in all types of hazards.

Building on existing knowledge, experience and lessons learned, countries should unite and collectively strive to foster an inclusive, safer, healthier and more agile and resilient future for all, despite the persistent multiple crisis challenges the Region faces.

Strengthening surveillance systems and data for impact

NCD surveillance systems are essential for monitoring and managing the burden of NCDs at country, regional and global levels. These systems aim to collect, analyse and disseminate data on key risk factors and health outcomes related to NCDs including CRDs and support the utilization of data and information to influence decision-making processes and changes.

The primary goals and objectives of NCD surveillance systems include:

- **early detection:** identifying trends and emerging patterns in NCD prevalence, risk factors and determinants to enable timely interventions;
- **monitoring progress:** tracking the effectiveness of public health policies and programmes aimed at reducing NCDs;
- **resource allocation:** informing the allocation of resources to areas with the highest need based on data-driven insights;
- **policy development:** supporting the creation of evidence-based policies to improve health outcomes; and
- **public awareness:** raising awareness about NCDs and their risk factors to promote healthier lifestyles.

Countries experience a number of challenges along the whole process: at the stage of data collection, analysis, reporting and utilization.

There is a huge variability in the WHO European Region in relation to the national policies and surveillance systems in place, the different levels of HISs, the different levels of national capacity, the variety of tools and approaches available and the lack of proper utilization of findings and its impact on the decision-making process.

WHO provides continuous support to countries in implementing NCD surveillance systems *(236)* through capacity-building, provision of guidance and methodologies, strengthening HISs and the conduction of surveys starting from preparation, data collection, analysis till policy development and implementation.

Recommended methodologies include:

- routine collection of data via existing HISs or national questionnaires, such as DHIS2 metadata package *(237)* or NCD country capacity surveys;
- wider population-based surveys, such as the WHO STEPwise approach to NCD risk factor surveillance survey for the adult population;
- facility-based surveys such as the Harmonized Health Facility Survey) or Health Behaviour among School-aged Children ;
- topic-specific tools such as Global Youth Tobacco Survey and the Childhood Obesity Surveillance Initiative; and
- WHO NCD facility-based monitoring guidance.

Tobacco is covered in several surveys, but unfortunately, CRDs are included in only a few of the above-mentioned methodologies (country capacity surveys, the Harmonized Health Facility Survey and facility-based NCD monitoring framework). Potential opportunities can be considered to include COPD and asthma in population-based and setting-based surveys.

There are national and regional challenges in implementing surveillance systems.

Large population-based epidemiological surveys usually require both human and financial resources, solid methodology and capacity, which are often lacking, notably in the eastern part of the Region.

Key policy issues remain around access to data in disease registries, quality and intercountry comparability of data. Access must maintain confidentiality, while enabling secure use and linkage across borders. This is actively being addressed, for example, the EU's European Health Data Space *(238)* aims to introduce a common framework for the use and exchange of electronic health data across the EU.

A further challenge is methodology and understanding if and how data collected directly from patients (via application of telehealth systems) can be used to inform the burden of disease and health care. Many people living with CRDs are not aware that they are affected by CRDs, especially in countries with weaker health systems or communication strategies. Therefore, it is important to consider measurement of lung function/ lung function tests in health examination surveys, especially in settings with high prevalence and/or weaker health systems *(239,240)*.

Numerous initiatives exist to address chronic CRDs; however, coordination among key organizations hosting databases is essential to streamline and enhance the effectiveness of these efforts.. These organizations can align their databases and share methodology, as is already taking place between WHO and GBD/Institute of Health Metrics and Evaluation. One of the potential areas to agree on is disaggregation of data for key CRDs; Eurostat provides data on respiratory conditions, but not on CRDs. Very often data reported by countries is not comparable with others due to different methodological approaches.

Key international initiatives maintaining databases for CRDs are:

- **European Centre for Disease Prevention and Control:** hosts a surveillance programme for communicable diseases, including tools for outbreak preparedness and research.
- **GBD Study:** employs sophisticated statistical models to analyse global data on CRDs, considering risk factors such as smoking and air pollution.
- **OECD:** provides comprehensive data and analysis on health systems performance and policies among its member countries.
- **The British Clinical Practice Research Datalink:** collects fully coded patient electronic health records from GP practices using the Vision® or EMIS® software systems.
- **the WHO European Observatory on Health Systems and Policies:** regularly gathers and analyses data on various health indicators, including the incidence, prevalence and mortality of CRDs.
- **WHO GHO and Global Health Estimates:** WHO's comprehensive platform for health-related statistics across its 194 Member States.

As mentioned above, there are many population- or setting-based surveys on general health. However, very few of these include questions and measurement for CRDs. Discussions for considering CRD inclusion could be initiated.

To ensure comparability of data between countries, NCD and CRD surveillance systems should be supported by internationally recognized surveys with standardized methodology. There are **wider internationally recognized population-based surveys:**

- **European Health Interview Survey:** covers CRDs, their risk factors, determinants and health system response.
- **WHO Country Capacity Surveys:** assess health system responses to CRDs and other conditions.
- **WHO STEPs Survey:**is a standardized method developed by WHO for collecting, analysing and disseminating data on key NCD risk factors.
- **WHO Health Behaviour in School-aged Children:** an international, multicentre research project which targets the determinants of health and well-being among adolescents aged 11, 13 and 15 years old to inform national and international health promotion policies.

There are many topical data platforms on similar topics, such as on asthma: Global Asthma Network, International Study of Asthma and Allergies in Childhood, European Community Respiratory Health Survey and AIR Survey. Joining efforts and collaboration could be considered.

In addition to the wider surveys, there are topic-specific sources and surveys which can help to obtain deeper information related to specific condition, there are some of them listed below:

- **AIR Surveys:** highlight international variations in asthma management and identifies gaps in care.
- **Air Quality and Health Database, WHO:** monitors air quality and its impact on health, including CRDs.
- **Behavioral Risk Factor Surveillance System:** in the United States of America, collects data on health-related risk behaviours, chronic health conditions and use of preventive services.
- **Collaboration In COPD exacerbations** a network of centres creating a registry of patients with hospitalized COPD exacerbations.
- **Global Asthma Network**: collects data on asthma in both children and adults.
- **International Study of Asthma and Allergies in Childhood:** provides data on the distribution and burden of asthma in children globally.
- **European Community Respiratory Health Survey:** focuses on asthma in adults.
- **European Sleep Apnoea Database:** contains data from over 40 000 patients with varying severities of obstructive sleep apnoea across many European countries.
- **European Multicentre Bronchiectasis Audit and Research Collaboration:** a European multicentre registry for non-CF bronchiectasis to improve quality of care and research.
- **WHO, Global Youth Tobacco Survey:** a school-based survey designed to enhance the capacity of countries to monitor tobacco use among young people aged 13 to 15 years old.
- **WHO, Global Adult Tobacco Survey:** a nationally representative household survey that collects data on adult tobacco use and key tobacco control measures and is part of the Global Tobacco Surveillance System.
- **WHO, European Childhood Obesity Surveillance Initiative:** a unique system that has been monitoring trends in overweight and obesity among primary school-aged children for over a decade.

With this brief overview of existing resources, it is important to combine efforts for CRD surveillance and policy impact.

Key messages to international organizations and governments to strengthen country capacity in CRD research and surveillance are as follows:

- Investments in long-term population-based surveys and research are required for detailed phenotyping and early disease detection for CRDs.
- Implementation research and evaluation of natural experiments can help accelerate health system transformation.
- Joined-up efforts on bringing the research community, health providers and policy-makers together can help translate CRD surveillance and research findings into clinical solutions for disease prevention and personalized treatments and then into policy decisions.
- Validation of interventions and strong monitoring systems can help measure robust processes to test public health practices and policies, and to measure outcomes.

Emerging call for global CRD targets

Even though CRDs are included in the priority groups of NCDs, there are only two global targets related to CRDs.

- SDG 3.4 – Reduce by one third premature mortality from noncommunicable diseases through prevention and treatment and promote mental health and well-being.
- An 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major noncommunicable diseases in both public and private facilities by 2025.

There are some arguments that this is not enough for countries to prioritize CRDs.

CRD contribution to premature mortality from NCDs is relatively small, but at the same time their contribution to the burden and quality of life of people living with CRDs is not well reflected in those two targets.

As with other chronic diseases, this report clearly demonstrates the underestimated prevalence and potential mortality due to CRDs linked to weak health system prioritization, diagnostic capability and reporting systems. The contribution of CRDs to other NCDs and to all-cause mortality is considerable. With an ageing population in the Region and globally, it is forecast that the death rates due to COPD will rise.

There are sets of global targets adopted for other groups of priority NCDs, except CRDs. Those targets support country prioritization, measuring progress and benchmarking. For example, there are five Global Diabetes Targets *(241)*, three global targets on hypertension, specific targets for several types of cancers and three targets on AIDS *(242).* Majority of those targets dedicated to coverage with diagnostics, treatment and control.

Similar to other chronic conditions, COPD and asthma have challenges with detection, with treatment coverage and with control. Countries can consider adoption of similar targets for COPD and asthma to ensure advocacy, implementation and progress monitoring art country, regional and global level.

This proposal, supported by the provided arguments, could be considered during consultations with stakeholders and during the preparation process for the Fourth High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs and Mental Health in September 2025.

Countries experience a number of challenges along the whole process: at the stage of data collection, analysis, reporting and utilization.

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Building research capabilities, developing the necessary tools and fostering collaboration across regions will drive innovation in health andand early prevention.

Chapter 3

Advancing research and innovation in CRDs

The CRD burden encompasses significant health challenges globally and within the WHO European Region. While this report has focused on asthma and COPD as the most prevalent areas of CRD, future efforts are needed to focus not only on these two conditions but also on the wider spectrum of CRDs.

Fostering research and innovation in CRD is crucial to improving health outcomes and to mitigating the societal and economic impact of CRD. Central to this is ensuring the accessibility of research findings. When new innovations have been established as effective, these findings need to be communicated in an accessible format to policy-makers to enable action.

As described in the previous chapters, there has been a chronic issue of lack of political will and prioritization of CRDs in countries, which has led to a lack of resources and a decrease in investments for research and innovation in CRDs. There has not been a medical breakthrough in CRD for at least last 3 decades *(1)*.

In this chapter, we highlight current developments and opportunities in CRD research and innovation, focusing on health information and research challenges, while emphasizing areas for action.

Advancing research: strategic enhancements for policy impact

KEY MESSAGE 9

Adequate funding can strengthen research capacities and enhance surveillance systems, leading to impactful decision-making and accelerated research, especially in emergency situations.

KEY MESSAGE 10

Building research capabilities, developing the necessary tools and fostering collaboration across regions will drive innovation in health and early prevention.

Strengthening research capacities

To effectively address CRD, it is imperative to enhance research capacities and surveillance systems within the WHO European Region *(2)*. Adequate funding and regional cooperation are essential to bolster research capacity, develop innovative tools and cultivate a supportive environment for CRD research. Collaboration across borders can facilitate knowledge exchange, resource sharing and the development of harmonized research methodologies. Moreover, robust information and surveillance systems are paramount for informed decision-making in CRD management and prevention.

By leveraging advanced data analytics and digital technologies, such systems can provide real-time insights into disease patterns, risk factors and intervention outcomes, enabling policy-makers to implement evidence-based strategies efficiently. Additionally, there is a pressing need for fast-track research mechanisms to address CRD emergencies promptly, such as outbreaks or sudden increases in disease prevalence. By streamlining

research processes and mobilizing resources swiftly, these mechanisms can accelerate the development of effective interventions and mitigate the impact of CRD crises.

Cross-region cooperation is also needed to tackle rare diseases, where often patients can wait years for a diagnosis and then struggle to access any approved treatments for their condition. The International Rare Diseases Research Consortium is one example of a global collaborative initiative; launched in 2011 by the European Commission and the United States' National Institutes of Health, it is working to tackle rare diseases through research. The European Reference Networks are also cross-border systems that bring together European hospital centres of expertise and reference to tackle rare, low prevalence and complex diseases and conditions requiring highly specialized health care *(3)*. Furthermore, the European Clinical Research Infrastructure Network, is a not-for-profit organization that supports the conduct of multinational clinical trials in Europe, which can be a facilitator of clinical research and a QI and harmonization tool *(4)*.

Europe sits comfortably at the top of the pyramid of research capacity in CRDs. The EU and the United Kingdom are home to several of the best universities in the world delivering teaching and conducting research with global impact in respiratory medicine, biomedical sciences and epidemiology. However, this is not the case in other parts of the WHO European Region, where research capacity is limited.

Following the 2011 Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases *(5)*, in 2012, the World Health Assembly endorsed a new health goal, "25 by 25", which focused on a reduction of premature deaths from CRDs and other NCDs of 25% by the year 2025 *(6)*. This was updated by the targets contained in the SDGs *(7)*. Despite these initiatives, there has not been a major effort since to improve CRD surveillance, which happens only on a local basis and with limited coordination.

Creating a transformative and inclusive health ecosystem

Transformative action is required from states, the health sector and the entire respiratory community in the WHO European Region to foster innovation and create an inclusive health ecosystem. This entails embracing emerging technologies, such as digital health solutions and precision medicine, to revolutionize CRD diagnosis, treatment and management. To effectively harness innovations and emerging technologies, there should be a horizon-scanning function that anticipates these innovations and prepares for their adoption.

By harnessing the full potential of innovations, including AI and wearable devices, health-care providers can personalize care, optimize treatment outcomes and empower patients in managing their respiratory health. Furthermore, ensuring equitable access to innovative interventions is paramount to addressing disparities in the CRD burden across populations.

Collaborative efforts are needed to overcome barriers to access, including affordability, geographical remoteness and disparities in health-care infrastructure. By prioritizing inclusivity and sustainability in health innovation, stakeholders can drive meaningful progress towards achieving UHC, improving health outcomes and building resilient health systems for the future *(8)*.

Advancing research and innovation in CRD requires concerted action and collaboration across multiple stakeholders. By strengthening research capacities, enhancing surveillance systems and fostering an inclusive health ecosystem, the WHO European Region can mitigate the impact of CRDs, improve health outcomes and promote health equity for all.

Vignette 5. People's experience of living with CRD

Kjeld is 50 years old, living with asthma in Norway and is the former Chair of the European Lung Foundation.

It is difficult to underestimate the impact that my condition has had on my life. Being able to breathe is the precondition for human life, and if you struggle severely with that all your thoughts and decision-making becomes focused on how to keep breathing.

You plan to avoid risk factors for example, by staying in controlled environments, which affects socializing. You choose not to challenge your physique, because it risks exacerbations. In short, life is defined by restrictions.

I am pleased to see steps being taken to mitigate these risk factors, such as air pollution directives. Policy-makers have come a long way in reducing the negative impact of living with a CRD, but the problem is evolving all the time. It needs exponentially more attention and political will to create wider change, for example in relation to climate change. Being out of breath – or even worse, breathing air that makes you sick – is one of the scariest things to be faced with. It needs to be treated as such.

The digitization of society has brought many benefits, for example, online appointments and symptom management. This has allowed me to manage my own health and extend what I feel able to do. I am lucky that I have had access to this technology and there have been several influential institutions in my country that have positively benefited my health situation. I know this is not the case for everyone and we must seek to challenge this inequity.

I see AI playing an integral role in health care in the future by allowing more personalized treatments, better forecasting of exacerbations for lung conditions, the discovery of new treatments, and ultimately, through all of this, better outcomes for individuals. However, it must be done with people and equity in mind and we must seek to develop separate and specific uses for the technology, that all countries can learn from. We also must not forget the human-to-human component within health. Often the patient–doctor relationship is a crucial motivating factor for people taking steps to look after and manage their health. This motivation could decrease if we see an overuse of technology in a clinical setting.

Living with a long-term condition is about much more than just alleviating symptoms. Solutions must be created to fit an individual's own life situation with a focus on creating possibilities for all people to live meaningful lives with trust in our institutions.

Kjeld Hansen

Transformative innovations: enhancing prevention and care

KEY MESSAGE 11

Technology exists and is available today that will help with early prevention, diagnosis and care. A focus is needed on robust validation and implementation to ensure evidence-based quality care.

Digital health and AI within patient pathways

Digital technology can contribute to accessible, efficient and patient-centred health care, for the benefit of asthma, COPD and other chronic respiratory patients *(9)*. There are several examples across healthcare:

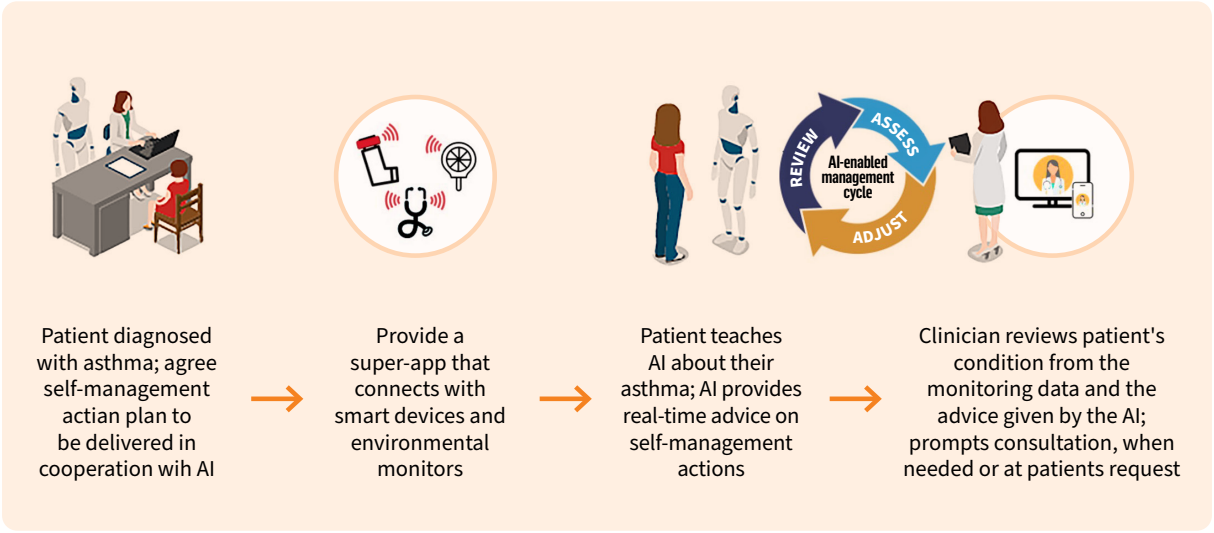
- **Personalized care:** Emerging technologies such as precision medicine and AI can tailor treatment plans to individual patient profiles, support self-management and improve outcomes and efficiency in care delivery (Fig. 3.1) *(10)*.
- **Diagnosis and screening:** AI also informs clinical diagnosis. It can be used to support the diagnosis of fibrotic disease, aid with interpreting pulmonary function testing results, contribute to the diagnosis of COPD and evaluate images within screening programmes, such as for lung cancer. The impact of screening programmes needs to be evaluated with these results, both successes and failures, being shared across regions. Research should focus on the individual benefits versus risks, along with the economic outcomes, universality and sustainability.
- **Remote monitoring:** Home monitoring devices, such as smart inhalers, digital spirometers, remote monitoring system of continuous positive airway pressure therapy/non-invasive ventilation machines, enable clinicians to track respiratory disease progress, tailor care and monitor treatment. These devices can increase engagement and allow patients to keep better track of their symptoms. In asthma, digital technologies (especially smart inhalers) can promote medication adherence, improve control and reduce hospital admissions *(11).* It allows clinicians to make timely adjustments to treatment plans, reducing hospital visits and improving patient satisfaction. One example of these is the Mobile Airways Sentinel Network application (known as the MASK-air app) which has supported displaced Ukrainian patients and health-care professionals in the management of rhinitis and asthma *(12)*.
- **Telemedicine:** Remote consultations facilitate access to specialist care, especially for patients in remote or underserved areas, ensuring timely interventions and reducing the burden on health-care facilities. It also provides environmental benefits by reducing the need to travel.

Central to all these advancements should be robust validation. One example of this has been an American Thoracic Society statement, which describes a framework for validating respiratory home-based monitoring *(13)*. Remote monitoring and telemedicine are being promoted as safe and effective alternatives. However, this is an emerging field that requires further research to establish optimal delivery methods, content and duration. With an ageing population, the demand for rehabilitation services for individuals over 50 with CRDs is expected to increase. Developing tele-rehabilitation models presents a promising solution to expand access to these services, provided that digital literacy and equitable access are ensured.

All innovation should be responsible and underpinned by the foundational concept of evidence-based medicine. Evaluation should also precede implementation and it is important to assess, evaluate and validate digital health and AI interventions in various settings and populations *(14)*.

The data generated by this digital transformation can be used to monitor respiratory health events, identify disease triggers and target health-care resources.

Fig. 3.1. An AI-enabled patient journey and management cycle



Note: The figure is partially created in ICOGRAMS.
Super-app: Super application.
Source: Pinnock et al *(10)*.

There has been variable progress on embedding new technologies in the 53 countries of the WHO European Region. This reflects the diversity of the implementation context, which requires policies to ensure population access to stable internet coverage, clarity over reimbursement for health-care services *(15)*, and practical and transparent approaches to device regulation and security of data.

Digital health can contribute to UHC by providing cost-effective accessible care, but it raises societal concerns about exacerbating inequities as those most in need may be those least able to access or use essential technology *(16)*.

With positive evidence to support digital respiratory care, the focus is now shifting to strategies to bring these advances into routine clinical care, in a sustainable way, for all country settings *(17)*.

Interoperable connected systems

Developing interoperable systems that integrate digital health solutions into routine clinical care can allow for seamless patient management. The challenge will be to build these systems around the patient who may have complex disease or multimorbidity. Fig. 3.2 outlines a possible vision of how this could look in the future.

Fig. 3.2 shows on the left, the traditional referral pathway as the patient attends a clinic, may be referred to a hospital for tests or treatment and discharged home. Promising digital innovations (teleconsultations, online information, social fora, applications and reminders) are available but typically stand alone. Primary care and hospitals use electronic health records but interoperability with different sectors or with patients is limited.

On the right of Fig. 3.2 is a vision of an interconnected system in which AI-supported self-management advice and clinical decision support is informed by a fully interoperable system. AI can use data from all these sources to tailor information provision and health promotion, monitor disease and environmental status and alert to

increased risk, detect attacks and advise self-management actions, deliver home-based treatments (such as rehabilitation, hospital-at-home, psychological treatments) and provide social support and monitoring.

Fig. 3.2. Vision of a connected future

CDSS: A clinical decision support system (CDSS).
Source: Reproduced with consent from Pinnock et al *(17)*.

To implement this vision, appropriate training of the health workforce would be a necessary initial step. It is also important to ensure that digital health initiatives address societal concerns in the population, such as inequities in technology access and use. This can be done through policies promoting stable internet coverage and clear health-care service reimbursement. Maintaining trust in the patient–professional relationship is also key, as digital health advances have been found to both strengthen and weaken patient–provider relationships, depending on factors such as confidence in technology and patient empowerment *(18)*.

Trust has been found to be of foundational importance, influenced by multiple clinical, social, communication and technological variables offering strategies for supporting clinicians to learn consultation skills for a digital era.

A further area to address is the transition from paediatric to adult services. Many chronic respiratory conditions begin in childhood but the path for moving through the health system to adult services is complex, with large variance from country to country and even from hospital to hospital within a country. Patients often report arriving in adult services and having to begin the process of care again with no clean transfer of a care plan *(19)*. This is particularly the case for rare conditions, which do not fit within one specific area of medicine.

By providing interconnected systems, we can overcome some of these challenges.

Collaborative research and innovation platforms

There are various organisations, funding bodies and alliances that collaborate on research and drive innovation platforms.

The ERS is a leading organization in the field of respiratory health in Europe and beyond. It fosters collaboration among respiratory professionals from all over Europe and beyond. The ERS organizes the annual ERS Congress,

the largest respiratory meeting globally, which serves as a platform for exchanging the latest research and clinical practices. It also actively funds clinical research collaborations *(20)*. The European Lung Foundation, works alongside the ERS to bring together patients, the public and respiratory professionals to improve lung health in Europe and is involved in many research projects. Working in collaboration is essential to foster innovation.

EU4Health has a substantial budget of €5.1 billion for 2021–2027, and focuses on building resilient health systems, promoting health and preventing diseases *(20)*. It has a stream of funding for CRDs included as part the Healthier Together initiative *(20)*. This includes a Joint Action on Respiratory Diseases which will be a collaboration between EU Member States *(21)*.

Horizon Europe is the EU's key funding programme for research and innovation with a budget of around €95.5 billion for 2021–2027 *(22)*. An example of Horizon Europe funding is the Innovative Health Initiative, a key European partnership aimed at fostering collaboration between the public and private sectors to improve health outcomes through innovation and has great potential to fund research on CRDs *(23)*. The EU-funded Unbiased biomarkers for the prediction of respiratory disease outcomes project demonstrated major success and steps forward in severe asthma *(24)*. Horizon Europe funding presents many opportunities for CRD research, although respiratory health must compete with many other priorities contained in the programme and reflected in the EU's overall health policy priorities.

Research collaborations in the east of the Region are limited; one notable exception has been the United States Agency for International Development (USAID) Health Care Improvement Project which funded actions on COPD in Georgia *(25)*.

The Global Alliance against Chronic Respiratory Diseases is a collaborative initiative under WHO. The initiative focuses on reducing the global burden of CRDs such as asthma and COPD and facilitating cross-country research collaborations. However, the initiative currently has no budget to support research *(26)*.

Connecting the dots: linking the research agenda to broader European challenges

Health workforce

There is a need for enhanced research capacity and surveillance systems, which necessitates a well-trained health workforce adept in using new technologies and methodologies. This can be achieved by:

- **Training and education:** Investing in training programmes for health-care professionals to develop digital literacy and critical thinking skills, and ensuring they can effectively utilize AI, digital health tools and new research methodologies. There are some examples of nongovernmental and pan-European commitment to respiratory medicine education. The ERS HERMES examinations are standardized assessments developed by the ERS to evaluate the knowledge and expertise of medical professionals in adult and paediatric respiratory medicine. HERMES allows for regional cooperation as professionals share their knowledge and best practice between colleagues and across borders *(27)*.
- **Resource allocation:** By leveraging advanced data analytics, health-care providers can better allocate resources, ensuring that health-care professionals are deployed where they are most needed and improving overall system efficiency.
- **Collaboration and knowledge sharing:** Regional cooperation and knowledge exchange can help standardize best practices and innovative solutions across the WHO European Region, ensuring all health-care workers have access to the latest advancements in CRD management. The ERS and the European Lung Foundation collaborate on a number of EU-funded projects that look at unmet medical and societal needs in the respiratory field. The projects address different aspects in the translational process and how observations in the clinic, laboratory or community turn into interventions that improve the health of individuals and the public.

Economic diversity

The WHO European Region's economic diversity, with gross domestic product per capita ranging from €1500 to €240 000, presents unique challenges and opportunities. These include:

- **Equitable access:** Ensuring equitable access to innovative CRD treatments and technologies is paramount. This involves addressing economic disparities by subsidising health-care costs in lower-income regions and investing in infrastructure to support digital health.
- **Funding and support:** Adequate funding is crucial to support research and implementation of new technologies. Wealthier countries can lead in innovation and share best practices and resources with economically diverse regions, fostering a collaborative environment. One example of this is the Global Lung Initiative, which brings together physiologists, respirologists, epidemiologists and statisticians from a range of countries to improve how lung function tests are interpreted. It provides a calculator and spirometry equation tools that are freely available online and uses observed differences in lung function between populations and between racial and ethnicity groups to make them widely applicable in different settings.
- **Economic impact:** By reducing the burden of CRDs through effective prevention and management strategies, countries can alleviate the economic strain on health-care systems, increase workforce productivity and improve overall economic stability.

Unlocking potential: exploring opportunities for progress

As this chapter outlines, there are wide-ranging opportunities to foster research and enhance collaboration. These opportunities exist now, and the challenge is to make them available and open to all, promoting them widely across the WHO European Region. By triggering collaboration between all stakeholders, the opportunities can be maximized in a number of fields as presented below.

Novel medicines platforms

Novel medicines platforms can provide the infrastructure to support medicine discovery. This has been seen with Innovative Medicines Initiative and the WHO's Novel Medicines Platform (NMP). Both aim to foster collaboration across borders and enhance the sharing of best practice.

The WHO NMP is a unique multistakeholder platform that fosters dialogue and collaboration, enabling stakeholders to jointly propose and implement concrete actions to enhance patient access to novel medicines in the WHO European Region. To date, the NMP has been joined by 51 Member States and 49 non-state actors, including representatives from the pharmaceutical industry and other partner organizations such as the European Commission, the OECD and the EMA. Four working groups have been established, focusing on enhancing transparency, promoting solidarity, ensuring the sustainability of health-care systems and improving access to both existing and novel antimicrobials. The creation of the NMP was directly informed by the Oslo Medicines Initiative (OMI), launched in 2020 by the WHO Regional Office for Europe in collaboration with the Norwegian Ministry of Health and Care Services and the Norwegian Medicines Agency. Grounded in the principles of solidarity, transparency and sustainability, the OMI has sought to clarify the roles and responsibilities of public and private sectors in ensuring equitable access to effective, high-cost medicines. Through extensive multistakeholder dialogue, the OMI has identified practical solutions to address rising medicine costs and the resulting inequities in access – challenges that threaten progress toward UHC. The conclusions of the OMI culminated in a mandate from the WHO Regional Committee for Europe to establish the NMP as a formal platform for ongoing collaboration, with the goal of improving affordable and equitable access to novel medicines in the Region *(28)*.

Digital health platforms

New digital platforms can harness advances in technology to improve care. The ERS felt this was a core need and supported the establishment of the CONNECT clinical research collaboration *(29)*. The project will develop a wide multidisciplinary network focused on implementing digital respiratory health care in order to bridge the gap between disease/location-focused digital initiatives, and sustainable, equitable, connected implementation of digital health care in routine clinical respiratory practice within regional (and global) health-care systems.

Innovation strategies

There are more established clinical research collaborations within the ERS that are working to enhance collaboration and harness innovation strategies. SHARP is a further example of a collaboration taking steps to improve research and surveillance as it builds analysis platforms for individual national severe asthma registries around the world.

This chapter outlines the wide-ranging opportunities for fostering research and innovation within the field of CRD and offers examples of where effective implementation of these strategies is already delivering positive results. As digital developments progress and deliver change, there is a need to ensure that equity is at the forefront of the design and planning stages of clinical implementation so that all countries have the ability to resource these innovations. It is also crucial to consider the spread of opportunities available as many of these effective strategies may require less infrastructure but are still able to deliver improved health outcomes.

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1 All references were accessed on 18 May 2025.

Different countries adopt various approaches to developing national CRD policies and programmes. Most countries take a STEPwise approach, addressing one or two respiratory conditions at a time.

Annexes

Annex 1

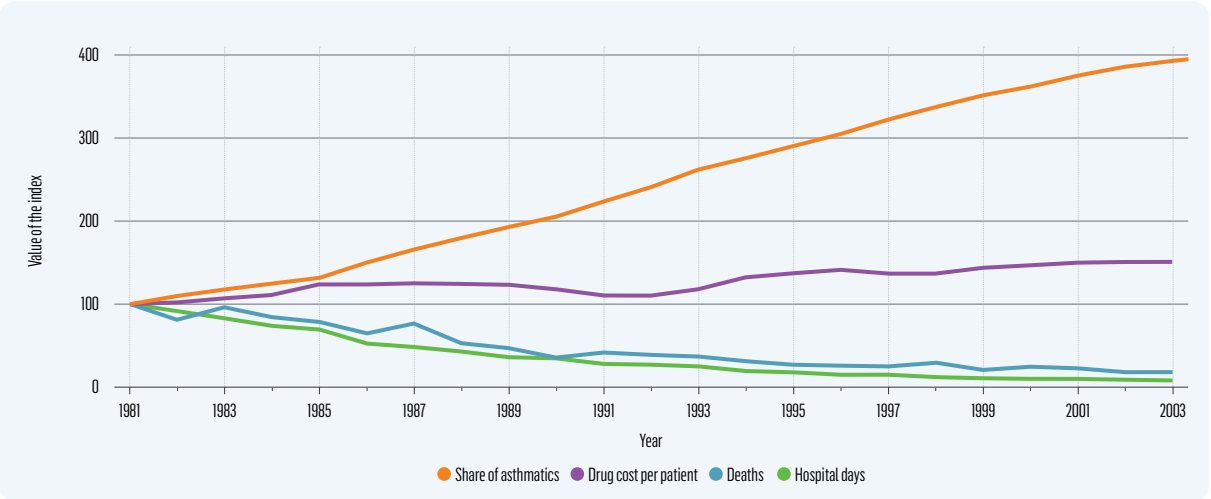
The Finnish Lung Health Programmes

The Finnish Lung Health Programmes encompass a series of six long-term, national, respiratory programmes conducted in Finland over the past 30 years: Asthma Programme 1994–2004, chronic obstructive pulmonary disease (COPD) Programme 1998–2007, Anti-smoking campaigns and Allergy Programme (encompassing asthma) 2008–2018, Tuberculosis Programme 2013 (updated 2020) and Sleep apnoea Programme 2002–2012 *(1)*. These programmes tackled the chronic respiratory diseases (CRDs) of public health importance in a country with a population of 5.5 million inhabitants, a fertility rate of 1.5 children per woman, and 12.7 years of educational attainment in 2019.

A nationwide and systematic lung health policy was implemented, including stakeholders committed to better management across the CRD pathway: patients, lay public, health-care professionals and public health officers. The focus was not only on management of CRDs but also on risk factors, such as tobacco smoking, and wider protective factors.

By 2006, just a decade after the implementation of various respiratory programmes, the first real-world data had already indicated that the burden of respiratory diseases was largely reduced both for patients and, overall, for society, with major reductions in mortality and hospital days, for example for asthma (Fig. A1.1) *(2)*. In the Asthma Programme, a paradigm shift was introduced by early intervention and first-line treatment with anti-inflammatory inhaled corticosteroids instead of regular use of bronchodilators ($\beta_2$agonists). In the Allergy Programme, the paradigm shift was the change from avoidance to immune tolerance and allergy health *(3)*. Along with the biodiversity hypothesis of health, nature deficiency was acknowledged, and patients and citizens were encouraged to increase physical activity and contacts with wider nature, i.e., acquire immune protective factors *(4,5)*. Stark reductions in smoking rates *(6)*, food allergy diets in children and occupational allergies were observed during the programme.

Fig. A1.1. Decreased mortality and hospital days in respiratory diseases: a real-world data



Source: Haantela et al *(2)*.

At clinical practice level, most of the work and education related to the Programmes was introduced into the routine activities of clinicians and administrators keeping cost low. With improved awareness, the number of patients increased, but their disease was better controlled. This resulted in major savings both in direct and especially in the indirect health-care costs along with improved patient performance and working capacity.

At the Asthma Programme's inception, 20% of the patients with asthma had severe or uncontrolled symptoms: by 2016 it was down to 2.5% *(7)*. The first 13 years of the 21st century saw a drop of 46% in the number of asthma-related visits to the emergency room, and an even sharper drop among children *(8)*. During the last 10 years, no asthma-related deaths in children have been registered in Finland. The success of the programme was associated with huge cost reductions; in 1993, asthma was costing the equivalent of €330 million per annum. By 2013, Finland had reduced the yearly costs to €191 million *(7)*. These changes occurred alongside better awareness of asthma with a steep rise in the number of patients receiving regular medication: from 135 000 in 1993 to 256 000 in 2015. A steady increase was also observed in the prevalence of physician-diagnosed asthma, from 6.5% in 1996 to 10.0% in 2006. During the successive Allergy Programme 2008–2018 (including asthma), the cost savings continued; the cumulative 10-year savings were €1.2 billion, while the investment for the education of health-care professionals and information of the lay public was €2 million *(9)*. Simultaneously, a programme for COPD was launched and implemented at the national level, also with impressive results *(10)*.

Overall, from the 1990s to present day, all abovementioned Programmes have achieved similar health and economic outcomes and have substantially contributed to reducing the burden of CRDs at national level (Fig. A 1.2) *(11)*.

Fig. A1.2. National programmes implemented in Finland since the 1990s and their impact on reducing the burden of CRDs

Source: Haantela et al *(2)*.

Multistakeholder collaboration and leadership were one of the key elements of each implemented Programme. These Lung Health Programmes were implemented by the Finnish Lung Health Association, a professional nongovernmental organization with respiratory disease and allergy specialists. Patient organizations and pharmacies played an important role in promoting the changes in practice and increasing awareness with information campaigns, first in asthma and then in the other CRDs. In retrospect, it took time and resilience to succeed. The pioneering efforts against tuberculosis, launched in 1893, were a cornerstone of all these programmes. Altogether, the favourable Finnish experiences for 30 years are not restricted to lung health but can be scaled up to a wide spectrum of noncommunicable diseases. The coronavirus pandemic showed that health safety is a societal priority. Health-care professionals and authorities are in a key position to help integrate public health and environmental care for common goals in the spirit of Planetary Health and One Health *(4,5)*.

The key drivers of success of all six national Programmes can be summarized as follows:

- studying, adoption and implementation of proven paradigm shifts nationwide while encouraging local adaptation and maintaining strategic consistency;
- planning with precision by setting clear, measurable goals and using data to track progress and guide adjustments; and
- engaging stakeholders – public, private and community members – while building ownership to ensure long-term commitment and funding.

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Annex 2

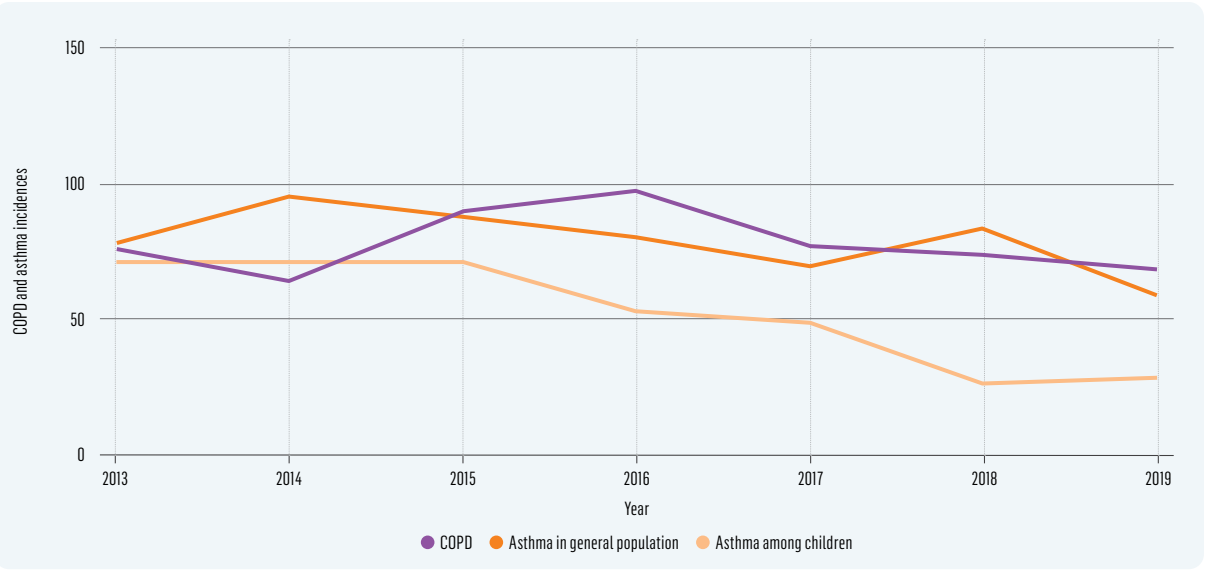
The role of tobacco control policies in addressing CRDs in Georgia

Many countries in the WHO European Region, particularly high-income nations, are strengthening their tobacco control policies in line with the WHO Framework Convention on Tobacco Control and MPOWER strategies, with some adopting clear tobacco endgame strategies *(1)*. However, comprehensive tobacco control measures are recognized as WHO "best buys" and do not require countries substantial financial investment *(2)*. Examples from countries with transitional economies or the relatively newer EU Member States of central Europe demonstrate that smoke-free policies and cessation services are particularly linked to a substantial reduction in the prevalence of chronic respiratory diseases (CRDs) and improved air quality *(3–6)*. The country case study of Georgia, which demonstrates the impact of comprehensive smoke-free policies on the reduction of CRD incidence, is summarized.

Georgia faces one of the highest smoking rates in the WHO European Region, with 27% prevalence among people aged 15 years and older *(7)*. The Global Youth Tobacco Survey 2023 also highlighted concerning levels of tobacco and electronic cigarette use among adolescents (14.0% and 11.3% respectively) *(8)*. It has been estimated that tobacco use in Georgia leads to about 11 400 deaths annually, including 2100 among non-smokers *(9)*.

In 2017, Georgia implemented comprehensive tobacco control legislation, including a smoking ban of all types on tobacco products and electronic nicotine delivery systems in enclosed public places and public transport *(10)*. This led to a decline in respiratory diseases, improved indoor air quality in public places and a reduction in tobacco use prevalence. By 2018, COPD incidence in 2018 had declined by 21% and there had been a 15% reduction in asthma cases by 2019 *(11)*. The decline was more pronounced in children, with a 48% reduction in asthma status by 2019 *(12)* (see Fig. A2.1).

Fig. A2.1. COPD incidence, asthma and asthma status incidence in the general population and among children, 2013–2019



Source: Ministry of Health of Georgia 2020.

The improvement in indoor air quality in public buildings has been an important factor contributing to the decline in CRDs. The air quality in the hospitality sector improved significantly, with particulate matter levels dropping from 1408 to 126 µg/m^3 in 2018 and 117 µg/m^3 in 2019. Public premises, such as governmental and municipal buildings also saw substantial improvement, with air quality improving by 80% (with particulate matter levels from 531 to 112 µg/m^3 in 2018 and 98 µg/m^3 in 2019). Health-care facilities experienced a similar enhancement, with particulate matter levels reducing from 219 to 97–98 µg/m^3 in 2018–2019. Additionally, there was a 30% increase in demand for Quitline services and the mobile application "I quit smoking" during the same time period *(12)*. Prevalence of tobacco use among adults decreased from 31% to 28.2% from 2016 to 2019 *(13,14)*. Significant progress was also made in reducing tobacco promotion before the coronavirus pandemic. However, since then, the tobacco industry has aggressively marketed heated tobacco products and sought to undermine or delay the implementation of effective tobacco control measures, including plain packaging regulations *(15,16)*. Addressing tobacco industry interference is essential to protect these policies and ensure their enforcement.

Georgia's success in tobacco control stems from strong political leadership, legislative reforms, multisectoral collaboration, active civil society involvement and sustainable funding for public campaigns and enforcement. This experience serves as a valuable model for other WHO European Region Member States, emphasizing the need for evidence-based tobacco control policies, integrated cessation services and public awareness of the health risks related to tobacco use and lung health.

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Annex 3

Innovative facilitation of better lung health in the Healthy Hungary Strategy

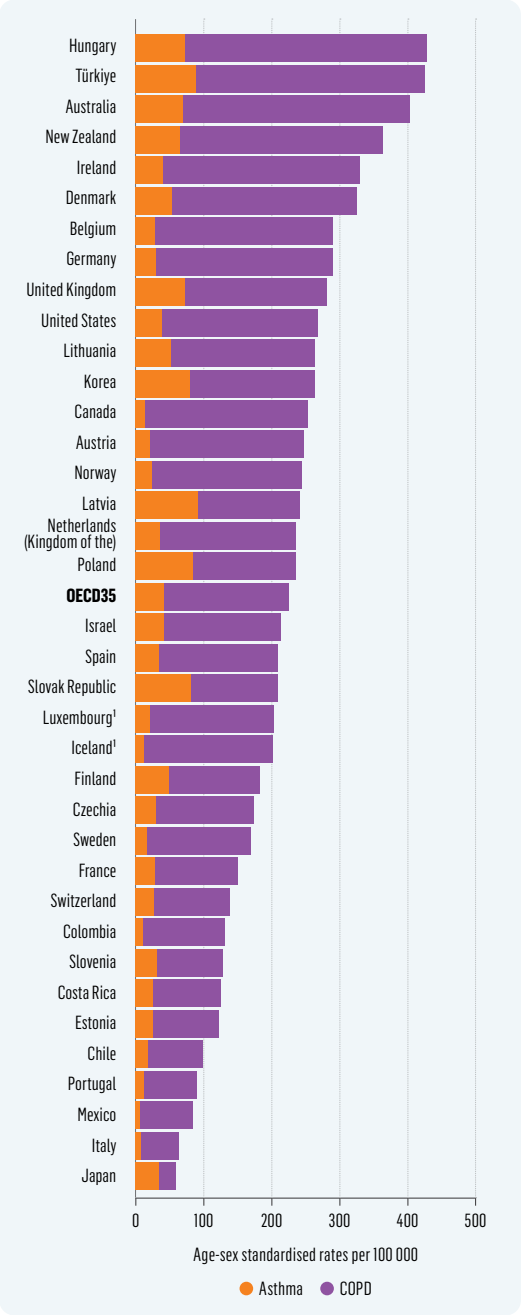
Hungary, a landlocked country in central Europe with a population of 10 million, had an average fertility rate of 1.6 children per woman and 11.5 years of educational attainment in 2021. In 2015, there were 183 800 reported chronic obstructive pulmonary disease (COPD) patients *(1)*, but the actual prevalence is estimated to be at least three times higher, largely due to a history of high tobacco use among both males and females *(2)*.

Primary and ambulatory care serve as essential first-contact providers for respiratory health. Evidence shows that COPD can be effectively managed within high-performing primary care systems, leading to significant reductions in hospital admissions and costs while alleviating individual suffering and population burden. Hungary had one of the highest rates of CRD-related hospital admissions among Organization for Economic Co-operation and Development (OECD) countries, with an age-sex standardized rate of 428 per 100 000 for asthma and COPD in 2017, nearly double the OECD average (Fig. A3.1) *(3)*. In 2021, a sharp decline in hospital admissions was observed across OECD countries, likely due to reduced access to health care and patient hesitancy during the coronavirus disease (COVID-19) pandemic, but exact figures for asthma and COPD care in Hungary are missing.

Hungarian health policy aims to increase healthy life expectancy by prioritizing health promotion and prevention for all. The Healthy Hungary Strategy for 2023–2027 emphasizes the importance of lung health, particularly COPD, alongside cardiovascular and oncological diseases. This has mobilized the health sector at all levels, with central initiatives complemented by smaller pilots.

Since 2014, a national framework of COPD-related quality indicators has been established for primary care, along with nationwide support for early case-finding and diagnosis, including government-funded spirometers for most practices.

Fig. A3.1. Asthma and COPD hospital admissions in adults, 2017 (or nearest year)



Source: OECD Health Statistics 2019.

In collaboration with the Hungarian Government, the Directorate-General for Structural Reform Support of the European Commission and the WHO Regional Office for Europe, advanced COPD patient pathways through complex health system interventions, including bundled payments and clinical governance. A phase 1 COPD bundled payments pilot was launched in four sites, coordinated by the State Secretariat for Health, the Ministry of Interior and the National Koranyi Institute of Pulmonology in Budapest, the leading institution for lung health in Hungary. This initiative builds on a successful tuberculosis pilot that significantly reduced unnecessary hospital admissions, readmissions and the average duration of hospitalizations *(4)*.

The disease-centred pilots focused on three key pillars of the health-care cycle.

- Firstly, they aimed to enhance early COPD diagnosis through spirometry-based case-finding in primary care and improved patient pathway management with pulmonologists.
- Secondly, they targeted outpatient treatment outcomes by strengthening collaboration between pulmonologists in outpatient and inpatient settings to reduce admissions and enhance patient compliance with comprehensive treatment.
- Lastly, the third pillar developed discharge protocols and a post-exacerbation support programme to prevent readmissions and improve patient well-being and satisfaction.

For clinical governance, a continuous feedback system was established between the National Institute and county hospital clinical units, which acted as care coordinators throughout the patient pathway. Several governance tools were developed, including risk assessment training and patient-centred health communication, along with social media resources to inform patients.

The pilot has strengthened professional collaboration, teamwork and patient adherence. A preliminary evaluation by the national working group after 12 months highlighted significant achievements, including reduced hospitalization rates, shorter admissions and improved follow-up therapies. Hospital readmission rates were 1.14 at pilot sites, compared to the national average of 1.25 from 2022 to 2023.

Key lessons from the project include the importance of broader stakeholder engagement, the challenge of allocating sufficient time across care pathways and the value of written algorithms, protocols and educational interventions. Engaging COPD patients, who often have low health literacy, advanced age and disabilities, in digital care solutions was initially difficult but improved through continuous support and feedback. Spirometry-based case-finding also enhanced patient outcomes and engagement in bundled programmes post-discharge. However, the COVID-19 pandemic limited the pilot's ability to assess the interventions' impact on exacerbation rates due to significant drops in COPD hospitalizations during lockdowns. The described project in Hungary demonstrates that bundled payments and a robust clinical governance framework can enhance health-care efficiency and patient outcomes. This COPD pilot has attracted significant professional and policy interest, fostering high-level coordination among insurance authorities and decision-makers, which may lead to scaling successful programmes nationally and integrating these approaches into health policies. Government commitment to investing in noncommunicable disease outcomes supports the EU Joint Action on Chronic Respiratory Diseases *(5)*.

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1 All references were accessed on 11 May 2025.

Annex 4

The Kyrgyzstan respiratory programme: a focus on prevention

Kyrgyzstan is a landlocked, former Soviet Union, lower-middle-income country in central Asia, with 7 million inhabitants. In 2021, the fertility rate was 2.9 children per woman and educational attainment was 11.9 years. Geographically, around half of the country is situated over 3000 m above sea level. Beyond its capital city Bishkek, and some other urban areas, over 80% of households are dependent on individual heating solutions such as coal, wood or dung-fueled stoves *(1)*.

With an age-standardized mortality rate for respiratory conditions of 140 per 100 000 in 2009, the country had the highest mortality rate within the WHO European Region *(2)*. Exposure to smoking, but especially exposure to household air pollution, were associated with high rates of chronic obstructive pulmonary disease (COPD); notably, the prevalence of COPD was 36.7% in highlanders versus 10.4% in lowlanders, with also much higher fine particulate matter (PM2.5) exposure in the former *(3)*.

In 2015, a large prevention programme to reduce the impact of chronic respiratory diseases (CRDs) was started, accelerated by Kyrgyzstan's participation in the European Commission-funded FRESH AIR Horizon 2020 programme. This programme, included in a national programme called "Healthy Heart", uses the Very Brief Advice approach *(4)* for smoking cessation, and is approved by the Ministry of Health. Key prevention strategies included reducing indoor air pollution through awareness-raising programmes, such as a Train the Trainers module which was conducted with health workers, teachers and Village Health Committees in all oblasts[1] of Kyrgyzstan, and provision of clean cookstoves *(5)*. As a result of these first efforts, between 2016 and 2019, the World Bank supported Kyrgyzstan with further technical assistance with high efficiency, low emission cookstoves.

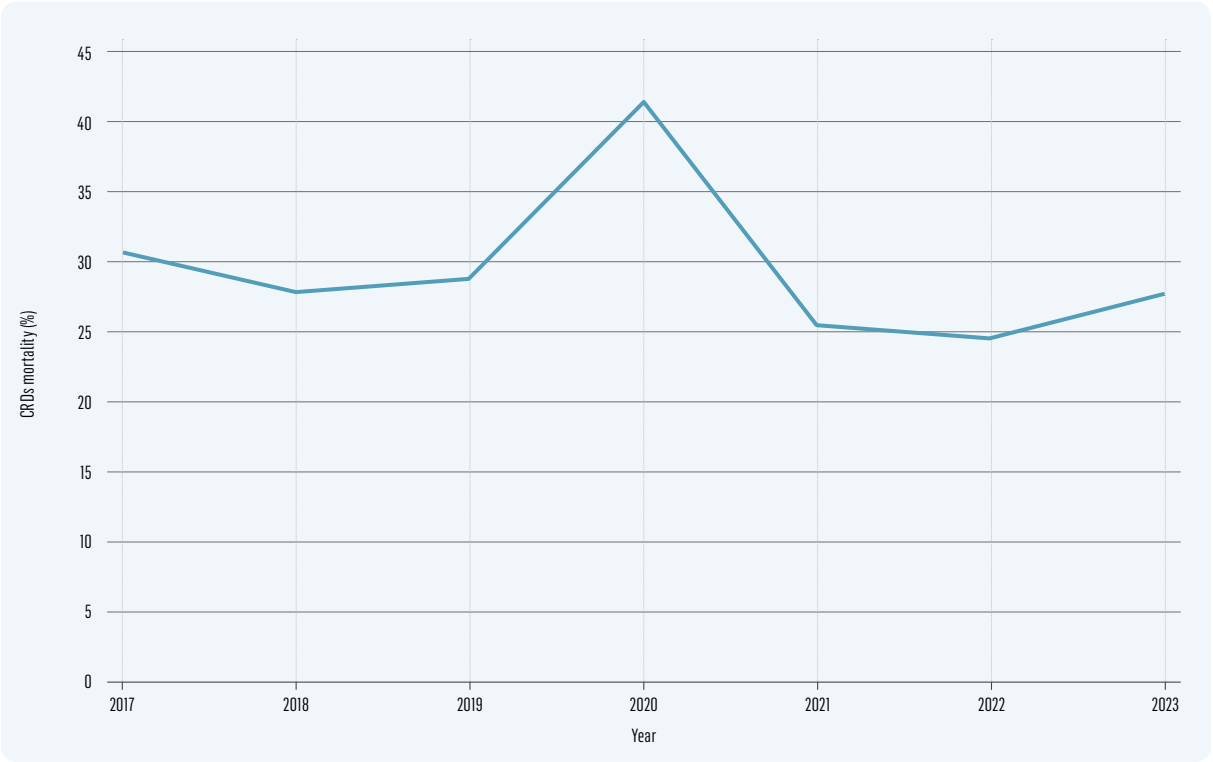
Another clean air initiative, the Bishkek Clean Air Action Plan was funded via the Asian Development Fund, which is currently ongoing *(6)*. Reducing antibiotic overprescribing in children with respiratory complaints was another pillar of the Plan *(7)*, along with pulmonary rehabilitation programmes *(8)*. funded Preliminary results of the COORDINATE programme – initiated in 2022 and funded by the International Centre for Antimicrobial Resistance Solutions – showed that C-reactive protein point-of-care tests decreased unnecessary antibiotic use in children *(9)*.

A team of pulmonologists in Kyrgyzstan has developed a pulmonary rehabilitation programme based on the FRESH AIR experience, which has been submitted for approval to the Ministry of Health and, once approved, it will be included in the national health programme and used at all levels of health care in Kyrgyzstan. This programme will be supported by the Ministry of Health and will be free of charge for patients. Another Kyrgyz programme has been focusing on pulmonary hypertension at high altitude, in a collaboration with a research team from Switzerland *(10)*.

Over the last decade, respiratory outcomes have been improving steadily with a decreased CRD mortality rate being observed. Between 2017 and 2022, this decreased from 33.1 to 24.4 per 100 000 populations (Fig. 1) *(11)*.

1 An oblast is a primary administrative division, akin to a province or region.

Fig. A4.1. Mortality trends from CRDs in Kyrgyzstan, 2017–2022



Source: Center for Electronic Health under the Ministry of Health of the Kyrgyz Republic *(11).*

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2 All references were accessed on 11 May 2025.

Annex 5

The Portuguese National Programme for Respiratory Diseases

The Portuguese National Programme for Respiratory Diseases (PNPRD) is a priority national health initiative launched in 2012 by the Ministry of Health with the goal of reducing the burden of chronic respiratory diseases (CRDs). From inception, PNPRD aligned with WHO's Action Plan for the Global Strategy for the Prevention and Control of NCDs 2013–2030 and the Global Alliance against Chronic Respiratory Diseases *(1–4)*. The mission of the PNPRD is to promote health and improve the quality of life for patients with CRDs, excluding lung cancer, which is managed by a separate national programme.

As of 2022, Portugal had a population of 10.35 million, a fertility rate of 1.4 children per woman and a life expectancy of 81.7 years. Additionally, Portugal is the second fastest-ageing country in Europe, after Italy *(5,6)*. In 2021, Portugal's per capita health spending was €2630, over one third below the EU average *(7)*. Despite encompassing all CRDs, the PNPRD focus is on asthma and chronic obstructive pulmonary disease (COPD). In Portugal, asthma prevalence is 6.8% and COPD prevalence is 14.2% in those 40 years and older *(8–10)*.

The primary objectives of PNPRD are to reduce mortality from CRDs (particularly in those under 70 years old) and decrease potentially avoidable respiratory hospitalizations through ambulatory preventive or treatment interventions. Specific objectives include increasing diagnostic capacity for asthma and COPD in the primary health care (PHC) setting, increasing accessibility to diagnostic tools such as spirometry in PHC, and promoting care delivery, good practices and respiratory health literacy. The programme includes scientific advisors selected for their recognized expertise, who play a crucial role in developing clinical guidelines and associated training activities. Its action plan is grounded in national epidemiological evidence and follows a health model centred on the individual, with PHC physicians acting as the gatekeepers of the National Health Service (NHS).

The target population of the PNPRD includes all Portuguese citizens of all ages, who can benefit from primary, secondary and tertiary prevention. It includes health-care professionals and students, who benefit from educational and training programmes in respiratory medicine; PHC physicians, pulmonologists, allergists, paediatricians, internal medicine and rehabilitation physicians, nurses, cardio-pulmonologists, physiotherapists and other health-care professionals, are among the actors considered.

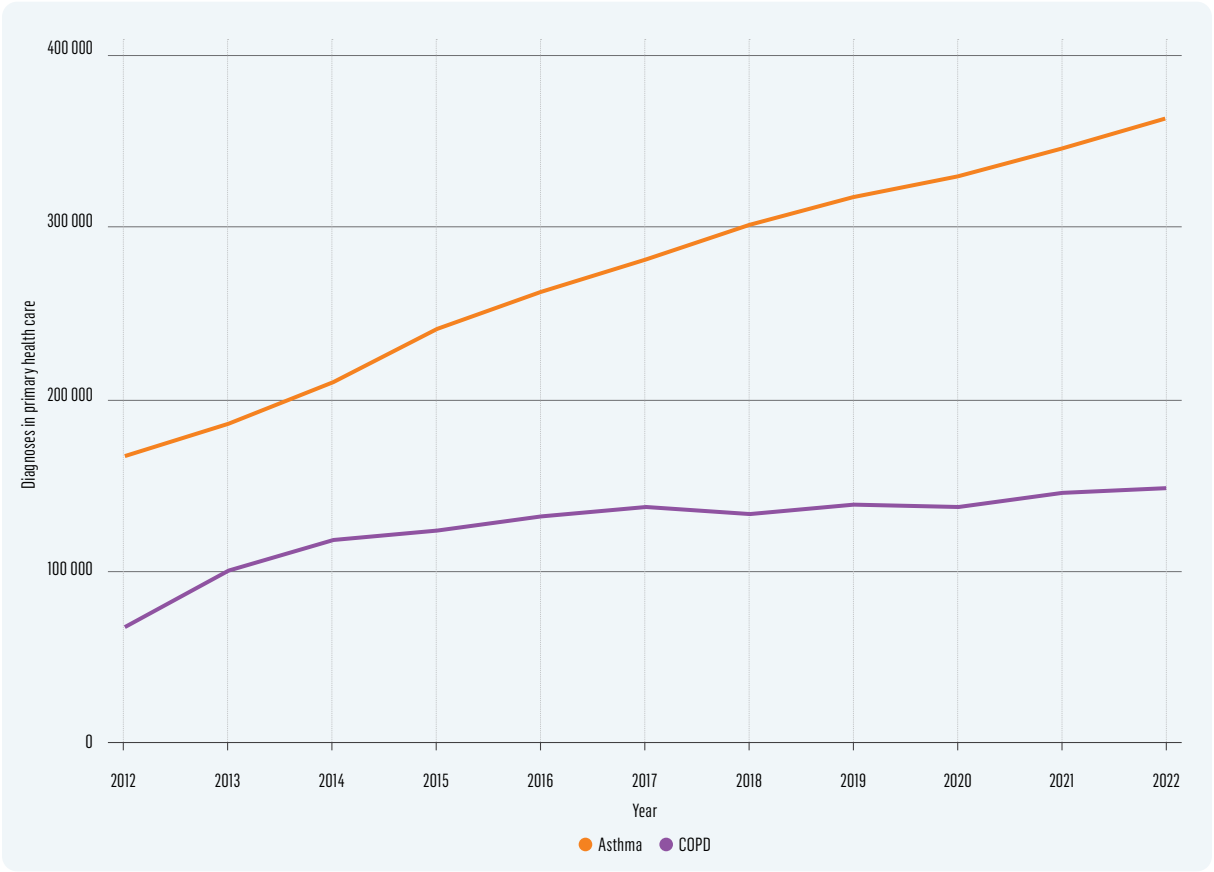
Primary prevention focuses on smoking and vaccination. The prevention and control of smoking are supported by a separate national priority programme, which coordinates with and receives support from the PNPRD. Since the creation of a National Programme for Smoking Prevention and Tobacco Control in 2012 *(11),* smoking prevalence in Portugal has decreased from 20% (2014) to 17% (2019). Tobacco cessation services in the NHS are free of charge and offered at primary and secondary care levels, as well as in rehabilitation centres *(12,13)*. Regarding vaccination, the PNPRD participates in developing guidelines and national awareness campaigns. Since 2012, influenza vaccination has been provided free of charge to people over 65 years old (over 60 since 2023), to all COPD patients and to other respiratory risk groups. Since 2015, pneumococcal vaccination has been included in the national vaccination plan and adult priority risk groups have been defined for free or

reimbursed vaccination. Immunization levels are usually very high in Portugal, historically attributed to educational initiatives and the ease of access to vaccines included in national immunization programmes, which are free for all NHS users. Although the influenza vaccine is not part of the national immunization programme, it has benefited from these successful efforts. More recently, the co-administration of the coronavirus disease (COVID-19) and influenza vaccines along with their free administration in pharmacies over the past year, has further boosted vaccination rates.

For secondary prevention, the PNPRD launched a core set of mandatory respiratory guidelines, accompanied by trainings to ensure early diagnosis in PHC and the appropriate prescription of effective medications. During the COVID-19 pandemic, new guidelines were developed and implemented nationwide. Increasing the reimbursement to 69% for anti-asthmatic medicines has been a priority since 2012, as well as total reimbursement of home oxygen and ventilation therapies.

The development of key programme indicators has been a cornerstone for planning, monitoring and evaluation. Programme adaptations are made at both national and local levels based on annual evaluations. A set of quality respiratory indicators has been established and is monitored in PHC practices (e.g., influenza vaccination rate, number of asthma and COPD diagnoses, adequate treatment with a previous asthma/COPD diagnosis). Financial incentives are provided to these practices when the goals are achieved. The accessibility of asthma and COPD diagnosis in PHC has consistently increased, rising by 115% and 112%, respectively (Fig. A5.1). Concurrently, influenza vaccination coverage among individuals over 65 years old has seen a steady rise, from 44.9% in 2012 to 76% in 2022, surpassing the WHO target of 75% vaccination coverage in 2023 *(141–15)*. This vaccination rate was significantly higher than the Organisation for Economic Co-operation and Development (OECD) average of approximately 49% in the years preceding the pandemic *(15)*.

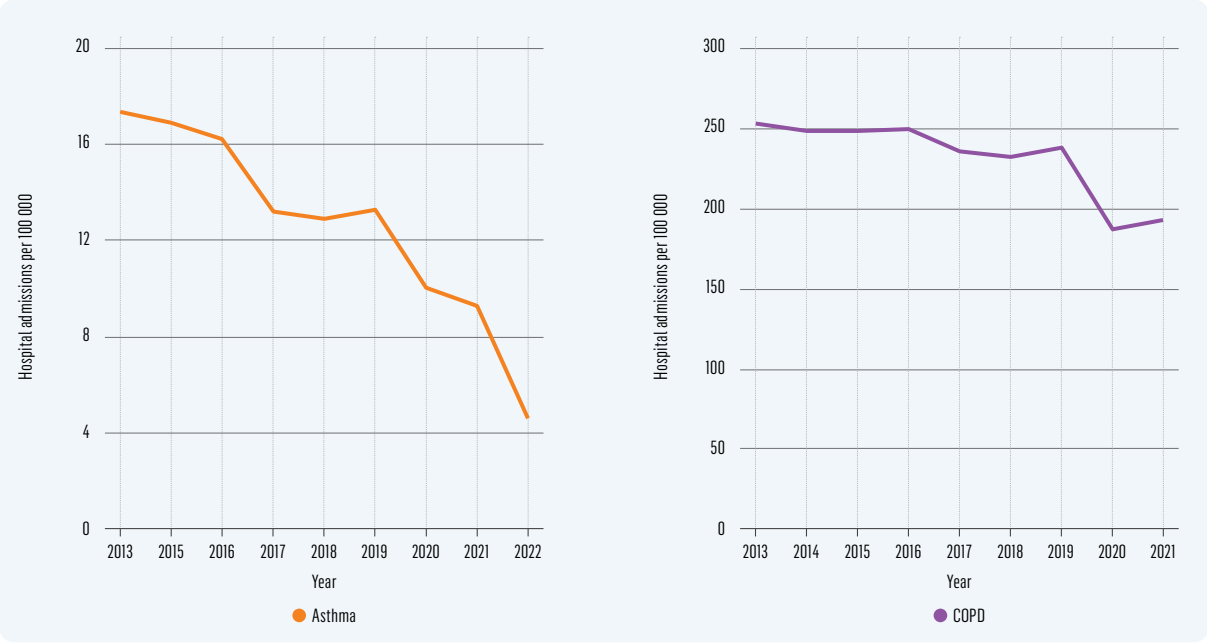
Fig. A5.1. Trends in the number of asthma and COPD diagnoses in PHC in Portugal, 2012–2022



Source: Portuguese Directorate General of Health, 2023 *(17)*.

Additionally, hospital admission rates for asthma and COPD in Portugal have been declining over time (Fig. A5.2) and are among the lowest in the EU *(7,16)*. Among EU countries Portugal ranks just after Italy in having the fewest hospital admissions for these conditions, indicating effective management of asthma and COPD in outpatient settings *(7)*. From 2012 to 2020 a consistent decrease in respiratory mortality has been observed for both people under and over 70 years old, reflecting improvements in health care, early diagnosis and effective management of respiratory conditions *(7)*. Overall, from 2012 to date, the main goals of the PNPRD have been achieved, thanks to the many stakeholders that have played a crucial role in the programme, namely: scientific societies and researchers who have provided essential scientific support and helped disseminate the programme to target audiences. Patient associations are included in the consultative committee to ensure a patient-centred approach and they participate in meetings with parliamentary groups to identify needs and strategies for improving health-care access and quality.

Fig. A5.2. Trends in hospital admissions age–sex standardized rate per 100 000 in Portugal 2012–2022 for asthma (over 15 years old) and COPD



Source: Portuguese Directorate General of Health, 2023 *(17)*.

The general lessons that can be extracted from our programme are based on several key factors *(17)*:

- **Organization of the NHS:** The establishment of family health units in 2007, staffed by multiprofessional teams with general practitioners serving as gatekeepers, has been crucial.
- **Government involvement:** Active government participation in programme implementation and health policy development has been essential.
- **National strategies:** Defining strategies and guidelines for national implementation has provided clear direction and consistency.
- **Respiratory disease surveillance:** Creating a national respiratory disease surveillance system with specific monitoring indicators and targets has enhanced disease management, particularly at the PHC setting.
- **PHC physician engagement:** Increasing the involvement of PHC physicians in managing chronic conditions has improved patient outcomes.
- **Incentives for PHC practices:** Providing incentives to PHC practices for achieving outcome goals has encouraged high performance and quality care.
- **Involvement of patient associations**: Ensuring the patient-centred approach of the programme.

Since 2014, Portugal has been implementing different digital initiatives such as telemonitoring, reaching coverage of more than 2000 patients. Despite being one of the OECD countries with the fewest hospitalizations for CRDs, to further strengthen the health system response, more recently, the Unidade Local de Saúde [local health unit] (ULS)[1] de Coimbra introduced another initiative on digital pathways. **Digital clinical pathways** for COPD and asthma are a patient-centred innovation, that underscores Portugal's commitment to enhancing health-care management for CRDs and improving patient outcomes. Building on previous successes in the **remote monitoring of severe COPD patients**, this effort aims to establish a comprehensive and scalable model of care tailored to the needs of individuals with COPD and asthma.

Central to this initiative is a **multidisciplinary team** that collaboratively designed the digital clinical pathway, with a strong emphasis on ensuring **seamless continuity of care** across both primary and specialized services. The **integrated information technologies system** facilitates real-time coordination among various health-care levels, enabling timely responses to patient needs. Currently serving 580 chronic respiratory patients, the initiative aims to expand its reach to over 24 000 individuals by the end of the year, reflecting ULS de Coimbra's strategic vision for a more responsive and sustainable health system. This transformative approach prioritizes early intervention, patient empowerment and the implementation of standardized best practices, ultimately fostering a more integrated and patient-centred model of respiratory care.

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1 ULS: Unidade Local de Saúde [local health unit].
2 All references were accessed on 11 May 2025.

Annex 6

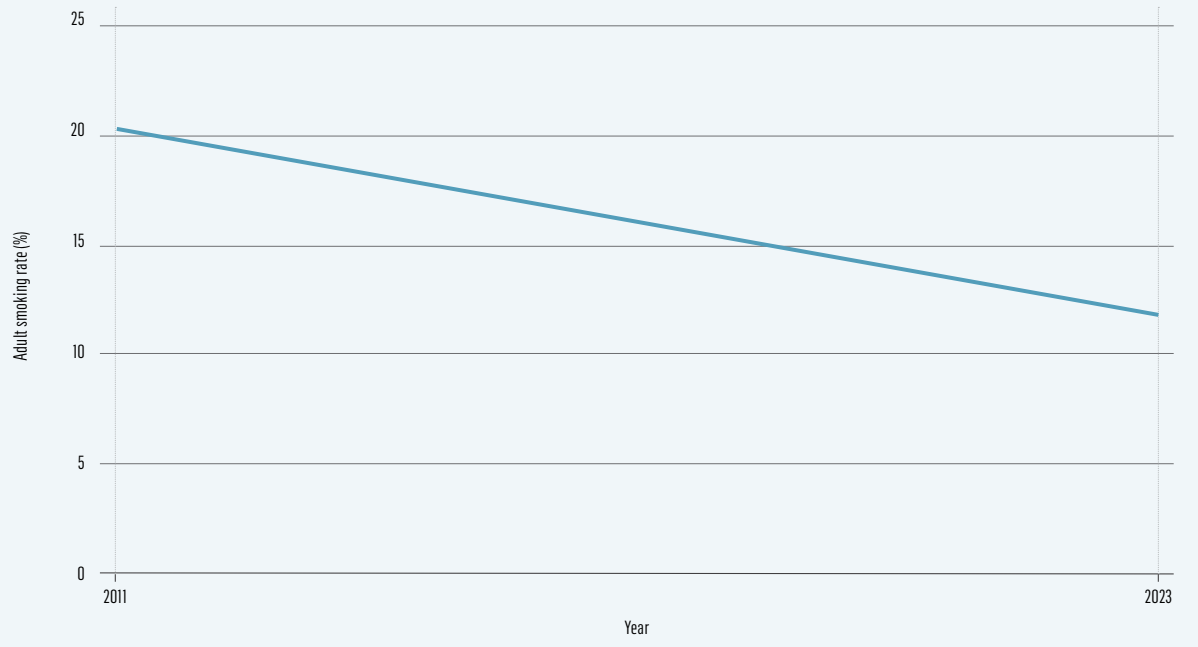
Addressing CRDs in the United Kingdom

The National Health Service (NHS) in the United Kingdom is designed to provide free health-care access based on clinical need rather than the ability to pay, ensuring that all residents, regardless of socioeconomic status, receive necessary care. Public funding accounts for approximately 80% of total health expenditure, shielding citizens from the financial burdens associated with illness and keeping out-of-pocket payments minimal. However, there are relatively low levels of health-care professionals, beds and equipment compared to other high-income countries and relatively high levels of income inequality.

Chronic respiratory diseases (CRDs), including asthma and chronic obstructive pulmonary disease (COPD), present significant public health challenges *(1)*. In response, the four national governments of the United Kingdom have developed frameworks aimed at enhancing service delivery and improving equitable access and health outcomes.

In Northern Ireland (United Kingdom), the integration of NHS and social care services establishes a model for comprehensive care. Meanwhile, efforts are ongoing in England, Scotland and Wales (United Kingdom) to enhance cross-sectoral partnerships, aiming to improve overall health and well-being in local populations. A key component of these efforts is the public health goal of achieving a smoke-free generation by 2030. The adult smoking rate has declined significantly, from 20.2% in 2011 to 11.9% in 2023, reflecting progress in tackling one of the primary risk factors for CRDs (see Fig. A6.1).

Fig. A6.1. Adult smoking rate trend in the United Kingdom from 2011 to 2023



Source: Adult smoking habits in the United Kingdom: 2023 *(2)*.

The United Kingdom's multifaceted approach to service delivery for CRDs exemplifies a commitment to equitable and effective health care. Key elements of this are presented below:

- **Integrated care systems**: England (United Kingdom) is promoting integrated care systems that unite local health and care organizations. These place-based partnerships aim to reduce fragmentation, enhance prevention and address health inequalities, which are critical for managing chronic conditions like CRDs. Part of their goal is referral optimization *(3,4)*.
- **Strong role of primary care**: Primary care is essential in diagnosing and managing asthma and COPD and managing multimorbidity, which is common in CRDs. Family physicians, as part of multidisciplinary teams including nurses, pharmacists and physiotherapists, collaborate to deliver comprehensive care over the life course. Innovative initiatives like the Respiratory Pharmacist Independent Prescriber programme further enhance access to treatment *(5)*.
- **Education and training**: Continuous professional development in respiratory health is supported by academic institutions and organizations such as the Primary Care Respiratory Society. These initiatives improve clinical skills in multidisciplinary teams, facilitate the implementation of national guidelines and strengthen disease prevention efforts *(6)*.
- **Quality improvement initiatives**: Robust quality assessment programmes are employed that utilize anonymized patient data *(7)*. Additional clinical decision support and population management software supports primary care professionals to use information appropriately and link patients to respected information resources *(8)*. Audits and clinical decision support tools enable primary and secondary care to evaluate their performance against national benchmarks, ensuring continuous quality improvement for respiratory care *(9)*. New initiatives, such as the Medical Examiner scheme, aim to enhance death coding accuracy, which may address the under-coding of tobacco dependence and COPD as causes of death *(10)*.
- **Incentive programmes**: The British National Institute for Health and Care Excellence uses audit data to update indicators for asthma and COPD management through the Quality and Outcomes Framework. These indicators are linked to financial incentives *(11)*. Current indicators encourage primary care providers to maintain accurate asthma and COPD disease electronic registers, monitor smoking status, ensure structured annual patient reviews and action plans and referrals to rehabilitation *(12)*.
- **Digital health integration**: The adoption of digital tools and data sharing is on the rise, blended with in-person care, with initiatives like Hospital at Home aiming to manage respiratory diseases outside traditional hospital settings. Properly planned, with appropriate training investment and universal adoption, they have the potential to reduce admissions and help reduce pressure on the NHS during peak periods *(13)*.
- **Addressing inequalities**: Acknowledging the impact of income inequality on health outcomes, the United Kingdom is implementing risk stratification approaches including atlases of care to identify high-risk individuals and tailor interventions to meet their specific needs. This localized focus is essential for effectively managing CRDs *(14)*.
- **Multimorbidity management**: Family medicine is structured to handle multimorbidity effectively. Programmes are now available to support individuals with clusters of conditions, such as respiratory and mental health issues. Specialized breathlessness services are being tested to integrate cardiovascular, mental health and lung health expertise *(15,16)*.
- **COVID-19 response**: The pandemic exposed vulnerabilities in the United Kingdom's systems, but the rapid vaccination rollout reduced death rates and improved economic recovery, showcasing the resilience of the health-care framework *(17)*.

The United Kingdom is positioned to make significant strides in enhancing health outcomes for individuals affected by CRDs through data analysis, leveraging integrated care models, strengthening primary care capabilities, embracing quality improvement initiatives and digital innovations including investment in evaluation. As the country progresses toward a smoke-free future and addresses underlying health inequalities, it sets a valuable example for other countries facing similar challenges.

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