ECONOMIST IMPACT

Health drives wealth: the economic impact of health inclusivity

Findings from the third phase of the Health Inclusivity Index

Supported by HALEON

Contents

About this report

This report is based on the findings of the third phase of the *Health Inclusivity Index*, a multi-phase project developed by Economist Impact, and supported by Haleon, to assess health inclusivity in 40 countries spanning regions and income levels globally. This research and analysis proceeded from the view that all members of society should have equal and unrestricted opportunities for accessing good physical, mental and social health, and wellbeing. The first phase of the Health Inclusivity Index, launched in 2022, gauged country-level efforts at ensuring these opportunities through national policies and key healthcare infrastructure. The second phase sought to assess whether inclusive health policies are translating into lived experience at the community level. In this, the third phase of the Index, we seek to understand the health and economic impacts of improving health inclusivity among underserved populations.

This white paper presents the findings from the research conducted in Phase 3 of the Index. Drawing on in-depth economic modelling, desk research and expert interviews, this paper focuses on health inclusivity across four key underserved groups: people with low health literacy, people on low incomes, women, and people aged 50 and over. In addition to focusing on the challenges posed to health inclusivity, the report provides detailed analysis of the economic, health and social benefits of tackling health inclusivity challenges specific to these groups in the 40 countries covered by the Index. The report and research are supported by Haleon.

We are grateful to the following experts for providing valuable insight into the topics covered in this report (listed alphabetically):

- **Kristina Åkesson,** professor of orthopaedics, Lund University; senior consultant in orthopedics, Skåne University Hospital, Sweden
- **Ty Beal,** head of food systems data and analytics, Global Alliance for Improved Nutrition, United States
- **Iain Chapple,** professor of periodontology and consultant in restorative dentistry, Birmingham NIHR Biomedical Research Centre in Inflammation and Periodontal Research Group, the University of Birmingham, United Kingdom
- **Mary Foong-Fong Chong,** programme director of master of public health, Saw Swee Hock School of Public Health, National University of Singapore, Singapore
- **Vanessa De la Cruz-Góngora,** professor of nutrition and ageing, The School of Public Health of Mexico (ESPM), Mexico
- **Manuel Antonio Espinoza,** associate professor of health economics, School of Public Health, The University of Hong Kong, Hong Kong
- **Andy Gray,** senior lecturer in the Division of Pharmacology, University of KwaZulu-Natal, South Africa
- **Mickaël Hiligsmann,** associate professor in health economics and health technology assessment,

CAPHRI Care and Public Health Research Institute, Maastricht University, The Netherlands

- **Anil Markandya,** director, The Basque Centre for Climate Change, Spain
- **Orkan Okan,** assistant professor, Technical University of Munich; head, WHO Collaborating Centre for Health Literacy; president, International Health Literacy Association; president, The European Public Health Association Health Literacy Section, Germany
- **Paula Carvaho Pereda,** professor in economics, Department of Economics, University of São Paulo, Brazil
- **Helena Ribeiro,** professor of environmental health, University of São Paulo; Member of Global One Health Academy, NC State University, Climate Change and Health Disparities Research Group, Brazil
- **Chris Vernazza,** head of school (interim) & professor of oral health services, School of Dental Sciences, Newcastle University, United Kingdom

This programme was led by Amanda Stucke. The research was led by Gerard Dunleavy, with inputs from Gabriele Bowen, Shivangi Jain, Deni Portl, Emily Tiemann, Alicia White, Alcir Santos Neto, Julia Maciel de Rodrigues and Radha Raghupathy. Programme design was led by Ben Willers, and this report was written by Paul Tucker and edited by Gerard Dunleavy, Amanda Stucke, Alicia White and Maria Ronald.

Economist Impact bears sole responsibility for the content of this report. The findings and views expressed in the report do not necessarily reflect the views of the sponsor or the experts who kindly gave their time to advise us.

Foreword

'Health drives wealth' describes the huge economic potential that could be unlocked by healthier populations. But the saying also works the other way around—wealth drives health. One of the keys to better health and wellbeing is investing in an inclusive approach to health for populations that are habitually underserved. The concept of health inclusivity aligns closely with the principles I championed during the formulation of the World Health Organization's Ottawa Charter for Health Promotion in 1986. The Charter reframed health as more than the absence of disease, and provided a blueprint for a broader societal approach to health promotion.

The research presented here on the health and economic impact of health inclusivity is a timely and critical contribution to the discourse on how societies can better serve populations that face systemic barriers to achieving good health. These barriers, rooted in social, economic, and structural inequities, undermine not only individual well-being but also the collective prosperity of nations. The groups highlighted in this research, people with low health literacy, lower-income populations, women, and individuals over the age of 50, show that a significant portion of the population is affected by extensive and mutually reinforcing health inequities.

The ultimate objective of health inclusivity is to reach everyone, regardless of their circumstances. When we consider this, we tend to think of challenges faced by lower-income groups and undocumented migrants, yet there are many other population segments whose health needs are currently underserved. For example, conditions such as anaemia and osteoporosis among women cost economies billions in healthcare and lost productivity, as do musculoskeletal conditions in older adults. Nevertheless, most countries have yet to offer comprehensive national programmes that tackle micronutrient deficiency or encourage better bone health.

Of all the issues this report examines, health literacy is one of the most significant. As you will discover, a relatively modest increase in health literacy in countries' populations has the capacity to deliver huge economic and health gains. The greater ability to self-care leads to better health, resulting in less medication use, fewer visits

to healthcare facilities, and an increase in productivity and wellbeing. Improving health literacy requires a collaborative Health in All Policies approach between sectors—such as education, health and digital—together with targeted strategies to tackle the growing prevalence of health dis- and misinformation.

Perhaps the most important achievement of this report is to equip health policymakers and stakeholders with a roadmap for action based around three clear concepts. **People and Community Empowerment** focuses on the importance of championing health literacy to empower individuals. **Inclusive Health Systems** encourages nations to identify population groups that experience structural and financial barriers to health and find ways to address them. Finally, **Health in Society** targets the relationship between health and its many underlying determinants, such as air pollution and food insecurity.

Although this report focuses on the significant economic benefits of inclusive health, we must remember one of the earliest incarnations of our simple phrase, that 'the greatest wealth is health.' As public health practitioners, our role is to provide everyone with a supportive environment and the tools to achieve the best life possible, for themselves and their family. Health is a fundamental human right, and the first and most important step to ensuring this right is available to all is by acting to improve health inclusivity.

Professor Ilona Kickbusch
Founding Director and Chair of the Global Health Centre at the Graduate Institute of International and Development Studies in Geneva

Executive summary

Imagine a world where everyone can access the care, knowledge and resources they need to be healthy, regardless of their circumstances. Health inclusivity is the bridge to make this vision a reality. It not only significantly improves people's lives, it also strengthens societies, fuels economies and unlocks human potential for countries that embrace and deliver it. This potential—and the urgent need for more to be done to realise it—was the reason that Economist Impact, with support from Haleon, launched the Health Inclusivity Index. A project of unprecedented scope and ambition, the Health Inclusivity Index was designed to generate new evidence and insight to drive greater action on health inclusivity around the world.

Health inclusivity is the process of removing personal, social, cultural and political barriers that prevent individuals and communities from experiencing good physical and mental health.

In its first phase, launched in 2022, the Health Inclusivity Index assessed country-level efforts to achieve health inclusivity, with a focus on national policies and key healthcare infrastructure. It provided the first ever benchmark of the 'state of health inclusivity' across 40 countries. In Phase 1, we found that there is much work to be done, but that people tend to live longer and better in countries that prioritise health inclusivity.[1] The second phase, launched in 2023, surveyed 42,000 people in the same 40 countries to determine whether national-level health policies were actually leading to more inclusive health systems at the community level, highlighting the significant gap between policy and practice. We found that over 60% of people surveyed had experienced barriers to accessing health care.[2]

Now in its third phase, the focus of the Index turns to exploring the health and economic impact of health inclusivity. In particular, we look at four groups of people who tend to have difficulty accessing healthcare or who suffer disproportionately from certain conditions: people with low health literacy, lower-income groups, women, and people over the age of 50. These specific populations face barriers to achieving good health due to a combination of social, economic, and systemic factors. Low health literacy can limit a person's ability to understand medical information, navigate health systems, and make informed decisions, leading to poorer health outcomes.

Health inclusivity is the process of removing personal, social, cultural and political barriers that prevent individuals and communities from experiencing good physical and mental health.

Those on low incomes face health challenges such as limited access to nutritious food, healthcare, and safe living environments, which can lead to higher rates of chronic illness, mental health issues, and overall poorer health outcomes. Women may encounter gender-based disparities in healthcare access, treatment, and research, particularly in areas like reproductive health and support with chronic disease. Similarly, people aged 50 and over often face age-related biases and may have more complex health needs, which are sometimes overlooked or inadequately addressed by healthcare systems. Together, these overlapping barriers can lead to significant health inequities if not actively addressed through inclusive, targeted policies and practices.

We undertook a data-driven deep-dive into the health and economic impacts that could be delivered in the 40 countries of the Index by improving health inclusivity in seven different topic areas relevant to these groups. These topics were specifically selected as we have good evidence and tools to address them, but limited access to these tools contributes to the barriers the focus populations for this study face. Specifically, we quantified the impact of:

- Improving the ability of those with **low health literacy** to obtain and use health information and services effectively;
- Improving access to oral care for **lower-income groups**;
- Improving access to clean air for people of **lower-income groups**;
- Reducing micronutrient deficiencies (with a focus on anaemia) in **women**;
- Reducing the recurrence of two key musculoskeletal conditions—low back pain and neck pain—and the onset of knee osteoarthritis and rheumatoid arthritis in **women** and people aged 50 and over; and
- Reducing fragility fractures among **people aged 50 and over**.

We uncovered several important findings in each of these areas that capture the economic impact of a more inclusive approach to health across the 40 countries studied:

People with low health literacy:

- Annual healthcare costs are nearly three times higher for individuals with low health literacy due to higher use of healthcare services, including emergency care.
- Reducing the proportion of people reporting low health literacy by 25% could result in annual healthcare savings of US$303bn across the 40 Index countries. These savings could boost economies by an average of 0.4% of GDP.

Lower-income groups:

Tooth decay

- Inadequate preventive dental care, and subsequent higher disease prevalence, means that treatment costs are 50% higher for people on low incomes across the 40 countries studied.
- Targeted oral health promotion reduces lifetime dental costs for the lowest-income group by an average of US$12,488 per person across the 40 countries of the Index, with the US experiencing the greatest saving of US$43,106 per person.
- Adults miss 3.1bn work hours per year due to tooth decay, resulting in an annual economic loss of US$34.7bn across the 40 Index countries.

Gum disease

- Gum disease is linked to an increased risk of diabetes. Diabetes-related healthcare costs among people with gum disease cost Index countries US$1trn per decade.
- Diabetes-related healthcare costs for people with gum disease are 50% higher for low-income groups as compared to higher-income groups.
- By seeking professional periodontal care and maintaining good oral hygiene at home, 57m people with gum disease could avoid developing type 2 diabetes, potentially boosting economies by US$181bn over ten years through reduced healthcare costs and increased productivity.

Air pollution

- Reducing air pollution in line with World Health Organization's (WHO) target levels could prevent 4.5m deaths from lung cancer, ischaemic heart disease, chronic obstructive pulmonary disease (COPD), stroke and asthma annually.
- Meeting the WHO targets could save US$101bn per year across the 40 Index countries via reduced mortality, lower healthcare costs and increased productivity. Achieving the WHO targets could deliver a 64% greater economic benefit for the lowest-income group as compared to the highest.
- The economies of the United States of America, India and China could save US$5bn, US$12bn and US$53bn, respectively.

US$303bn

A 25% decrease in low health literacy would save Index countries US$303bn in annual healthcare costs

US$181bn

Reducing the risk of developing type 2 diabetes as a result of improved oral health care would save Index countries US$181bn over ten years

US$101bn

Reaching World Health Organization target levels of air quality across the Index countries would result in an annual economic benefit of US$101bn

Women:

Micronutrient deficiencies

- Nearly three-quarters of the countries studied are experiencing an increase in anaemia prevalence among women of reproductive age.
- Reducing anaemia among women of reproductive age by 50% by 2030—a target of Sustainable Development Goal 2 (SDG 2, "End Hunger")—could yield an annual dividend of US$48bn for Index countries.
- No country is on track to achieve the SDG 2 goal. Given the higher prevalence of anaemia in low- and middle-income countries (LMICs), these nations stand to benefit the most from taking action to reduce anaemia.

Musculoskeletal conditions (low back pain, neck pain, knee osteoarthritis, rheumatoid arthritis)

- Worldwide, women have a higher prevalence of low back pain, neck pain, knee osteoarthritis and rheumatoid arthritis than men.[3]
- Across the 40 countries studied, the burden of these musculoskeletal conditions among women costs economies US$120bn in healthcare costs and reduced productivity each year.
- Increasing access to, and uptake of, measures to prevent the onset or recurrence of these conditions in women, via exercise and education could save economies US$51bn. It could also result in 69m additional workdays being available to women and, therefore, the global economy.

People aged 50 and over:

Musculoskeletal conditions

- The total annual economic cost of four of the most common musculoskeletal conditions in older people (low back pain, neck pain, knee osteoarthritis, rheumatoid arthritis) is US$121bn per year across the Index countries.
- Increasing access to, and uptake of, prevention, such as partaking in regular physical activity and smoking cessation, could save economies over US$50bn per year through reduced healthcare costs and increased productivity among older people.
- Low back pain is the most common musculoskeletal condition among people aged 50 and over. Improving access to care to reduce the recurrence of low back pain through exercise and educational programmes could save nearly US$34bn each year.

Osteoporosis

- Half of women over 50 and 20% of men over 50 will experience an osteoporotic fracture.[4]
- Hip and spinal fractures among people aged 50 and over cost Index countries US$141bn per year in premature mortality, healthcare costs and reduced productivity.
- Promoting bone health to reduce osteoporosis and related fractures across our study countries could yield US$31bn annually through reductions in premature deaths and healthcare costs and by yielding productivity gains.

Prioritising health inclusivity improves health outcomes, increases productivity, and saves governments and health services significant sums of money. Yet actionable approaches that are vital to realise these savings are currently lacking, often due to barriers caused by a combination of social, economic and systemic factors. The evidence has led us to **three key calls to action** to help policymakers drive health inclusion:

1. People and Community Empowerment: Take a public health approach to inclusive health literacy

Low levels of health literacy affect every topic area, condition and population group covered in this report. Health literacy enables prevention and self-care; it helps people to be more aware of health challenges and how to detect them; and it helps people to understand how health systems work, what services are available and most appropriate to specific issues, and how to access and navigate them. Policymakers must prioritise inclusive health literacy as a strategic tool to equip people to make informed decisions about their health and wellbeing. A health literate population enjoys better health and fuller lives, reducing the burden on health services and unlocking significant amounts of social and economic potential.

2. Inclusive Health Systems: Ensure access to care for all

Policymakers must ensure that appropriate, necessary and quality care (both prevention and management) is accessible and available to all. Avoidable morbidity and mortality impose major costs for individuals, their families, society and economies. Yet, a major factor affecting all underserved populations covered in this report is the barriers to access. Challenges in access are at the heart of what it means to be underserved by health services—as are poorer outcomes and more time lived with illness—a less-well population results in a less dynamic, less cohesive and less productive society.

3. Health in Society: Make health inclusion a crosscutting imperative

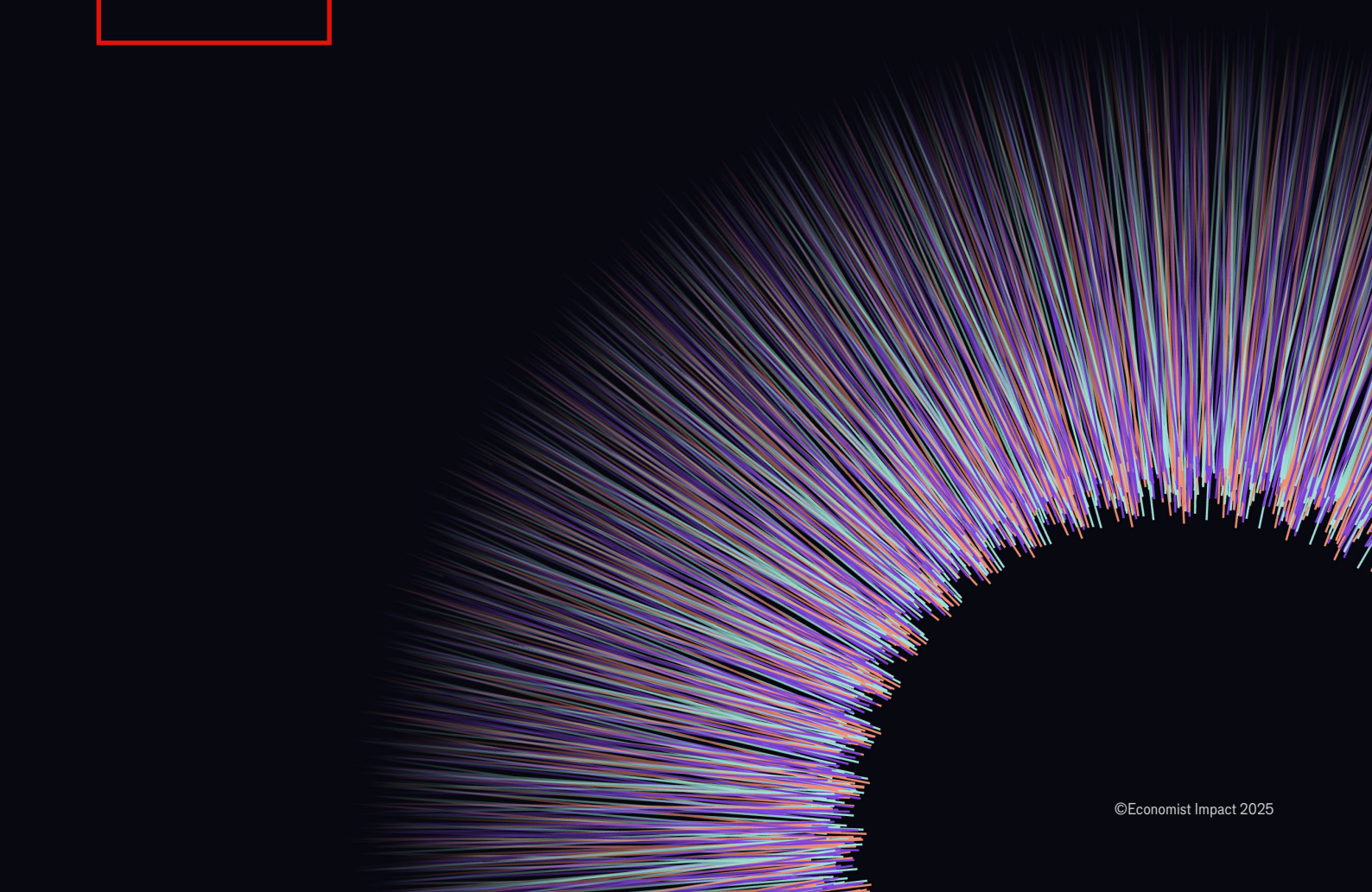
Inclusive health is grounded in the social determinants of health. In this sense, it is a multisectoral issue. Policymakers must advocate for, and implement, health inclusivity beyond the health sector. For example, addressing the link between food insecurity and micronutrient deficiencies requires collaboration between agriculture, trade, and health departments. Inclusive health provides benefits that reach far beyond the health service and the health of individuals; equally, it can only achieve its true potential if embedded in policies around education, finance, social care, housing and urban planning, employment, food and agriculture, and environment, among others.

Investing in inclusive health means stronger, healthier communities and a more prosperous future for all—it is imperative that countries act now to capitalise on the significant health and economic benefits offered by health inclusivity.

The evidence has led us to three key calls to action to help policymakers drive health inclusion:

1. People and Community Empowerment: Take a public health approach to inclusive health literacy
2. Inclusive Health Systems: Ensure access to care for all
3. Health in Society: Make health inclusion a crosscutting imperative

Economist Impact



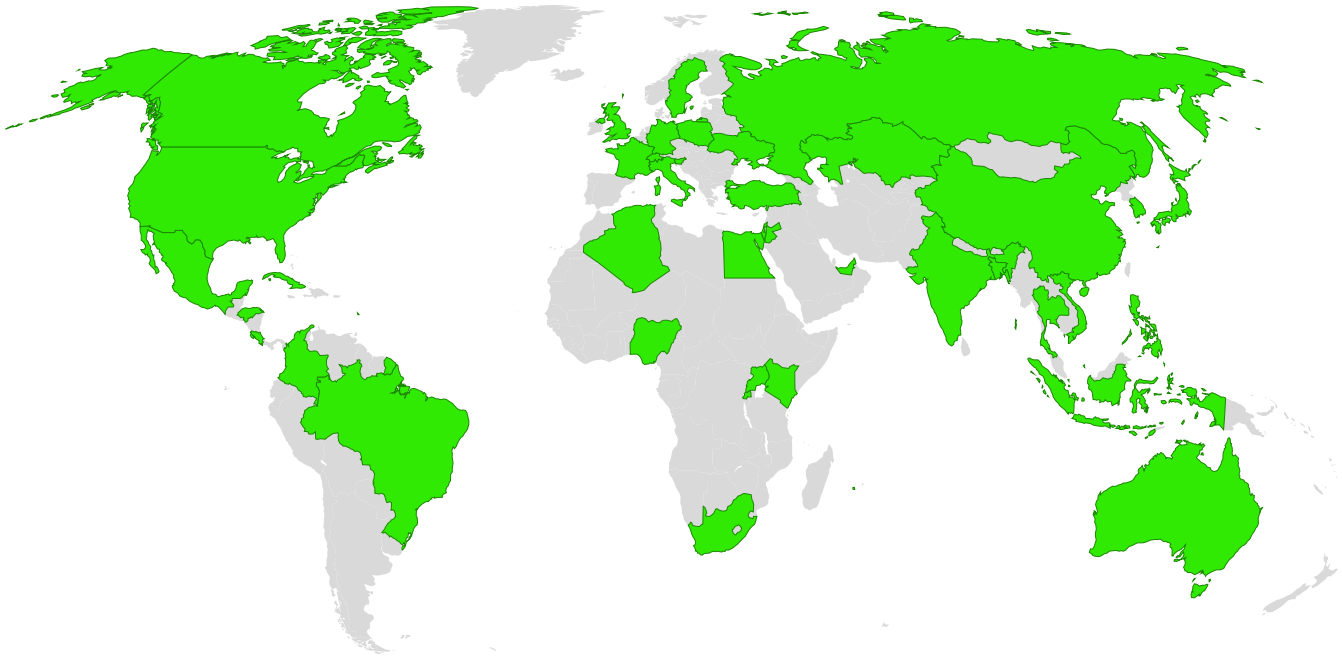
Introduction

Health inclusivity is the process of removing personal, social, cultural and political barriers that prevent individuals and communities from experiencing good physical and mental health. Socioeconomic status, gender, age and level of health literacy are some of the factors that impact the ability of people worldwide to access opportunities and resources for health and wellbeing that are intrinsic to health inclusivity.[5]

The impacts of suboptimal health inclusivity are felt by individuals and economies worldwide in terms of poorer quality of life, lower economic participation, less productivity and higher healthcare costs. This report, part of the third phase of the Health Inclusivity Index, seeks to quantify the economic savings that countries can achieve by implementing policies that make clear, measurable progress on health inclusivity for people with low health literacy, people on low incomes, women, and people aged 50 and over in the 40 countries included in the Index. This makes the case for greater health inclusivity as a way of building stronger economies by achieving better health outcomes for all.

Figure 1: The 40 countries included in the Health Inclusivity Index
The Health Inclusivity Index analyses 40 countries spanning the six WHO regions

Within each region, countries with the largest populations and a variety of income levels were selected. Population and income criteria were established to compare countries facing similar organisational challenges due to their size, and to highlight issues and achievements across different income levels.[2]



Africa	Americas	Eastern Mediterranean	Europe	South-East Asia	Western Pacific
Algeria	Brazil	Egypt	France	Bangladesh	Australia
Kenya	Canada	Jordan	Germany	India	China
Nigeria	Colombia	UAE	Israel	Indonesia	Japan
Rwanda	Costa Rica		Italy	Thailand	Philippines
South Africa	Cuba		Kazakhstan		South Korea
Uganda	Honduras		Poland		Vietnam
	Mexico		Russia		
	United States		Slovenia		
			Sweden		
			Switzerland		
			Turkey		
			Ukraine		
			United Kingdom		

Source: Economist Impact

Health inclusivity and health literacy

Health literacy is a cornerstone of health inclusivity. According to the World Health Organization (WHO), health literacy refers to the ability of individuals to gain access to, understand and use information in ways which promote and maintain good health for themselves, their families and their communities.[6] When it is low, people are less able to access and understand health information, and, therefore, take steps to maintain the health and wellbeing of themselves and their families. When health literacy is high, people can take more control of their own and their family's health through the way they live and care for themselves and how they navigate the health system. Low health literacy is associated with more hospitalisations, greater use of emergency care, decreased use of preventive services, poorer ability to interpret health messaging, poorer health status, higher healthcare costs, and higher mortality.[7,8] Parents' low health literacy is also associated with worse health outcomes for their children.[9,10] Certain population segments face additional barriers around health literacy; these include people facing language barriers (non-native speakers, for example), people with language and learning disabilities, those living with dementia, and communities with low general literacy.[11] Research is ongoing to explore how to best maximise these tools to improve health literacy.

Health inclusivity and lower-income groups

At least half of the world's population (primarily in low- and middle-income countries-LMICs) cannot access essential health services; 1.3bn people spend at least 10% of their household budgets on health expenses, and every year, more than 100m people are pushed into extreme poverty by healthcare costs.[12] While health inclusivity challenges for people on low incomes are most pronounced in low-income regions, disparities in healthcare access and out-of-pocket costs are also prevalent within and between wealthier countries—for example, adults in the United States of America face wider income-related disparities in healthcare affordability than those in other high-income countries.[13] Furthermore, in addition to access and affordability barriers, people with lower incomes are more likely to suffer the consequences of major environmental or occupational challenges to their health, such as air pollution or work-related injuries.[13,14] This is because they have relatively limited access to healthcare, poorer quality housing, occupations with more health risks, residences in areas with higher exposure to pollutants, and a lack of financial resources to prevent or seek treatment for health issues.[13,15]

Health inclusivity and women

Gender, meanwhile, remains a major factor impacting health inclusivity for a host of reasons. Women spend 25% more of their lives in poor health than men, and globally, societal gender norms and biases in healthcare often tend to prioritise the health of men, while downplaying or overlooking the physical and mental health challenges that women face.[16-18] Imbalances in gender roles also mean that women provide the vast majority of unpaid domestic and caregiving work, which can significantly impact their physical and mental health, while simultaneously facing disparities in access to nutritious food and healthcare.[19-22] Women also face a range of disparities and unique challenges linked to sexual and reproductive health. According to UNICEF, a lack of autonomy to make decisions about reproductive healthcare, limited control over financial resources, restricted access to resources or mobility to acquire resources, and power differentials between providers and patients can pose a barrier to sexual and reproductive health.[23]

Health inclusivity and people aged 50 and over

The nature of ageing—biological changes and general wear and tear faced by people's bodies over time—means that health challenges increase as a person gets older, even while many people maintain good health.[24] Health in people aged 50 years and over can also be impacted by factors such as poor diet or social changes, including the inability to work and be active, isolation, and loss of loved ones.[24] As the global population ages, the systematic barriers to health that older people face, including ageism, systems poorly designed to meet complex health needs, transportation and mobility issues, and more, will only become more important. By 2050, the number of adults aged 50 years and over is expected to reach 3.2bn, a 70% rise from 1.9bn in 2022.[25] In addition, older people are increasingly expected to remain active (as workers or carers, for example) to help sustain the global economy.[26]

Across Phases 1 and 2 of the Health Inclusivity Index, we identified a significant gap between policies that impact health inclusivity and the lived experience of people in accessing the information, resources and support needed to achieve good health. This white paper builds on these findings by assessing the impact of taking action to close this gap by improving health inclusivity across the 40 countries covered in the Index. Beyond the obvious health impacts, it presents a unique opportunity to quantify the specific and tangible economic impacts of removing barriers to health for our four key populations of interest. We acknowledge that doing so also incurs costs. While examining the cost of intervention was not the focus of this analysis, we acknowledge the importance of this aspect when implementing the findings and recommendations presented here. We recommend leveraging this analysis to examine cost-benefits in future research.

The core of this phase of research hinges on the health and economic impacts that could be achieved across the 40 countries of the Health Inclusivity Index through defined and actionable improvements in seven scenarios (see Figure 2) spanning the four key factors highlighted above:

- First, it assesses the impacts of improved health literacy across the population.
- Second, it focuses on the potential impact of reducing three contributors to, and outcomes of, health inequality for lower-income groups, namely, poor air quality, tooth decay, and the intersection between poor oral health and type 2 diabetes.
- Third, it assesses the impact of reducing the burden of two key—and interlinked—health challenges that disproportionately impact women: micronutrient deficiencies and musculoskeletal conditions.
- Finally, it assesses the impact of improvements to health inclusivity among adults aged 50 and over, specifically improvements aimed at reducing the burden of musculoskeletal conditions.

By focusing on targeted health issues and underserved populations, this report offers specific, practical examples that demonstrate the clear benefits of health inclusivity. These include better health outcomes, reduced health disparities, lower morbidity and mortality, reduced barriers to productivity, and economic benefits to both health systems and governments. The focus on productivity does not neglect those who are not working (unemployed people and carers, for example) from our analysis—ultimately, a healthier society equals a healthier economy, which, in turn, supports good health and wellbeing, and greater healthcare inclusivity for all.

A healthier society equals a healthier economy, which, in turn, supports good health and wellbeing, and greater healthcare inclusivity for all.

Figure 2: The seven scenarios modelled in Phase 3 of the Health Inclusivity Index

Health literacy

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing the prevalence of low health literacy by 25%	People with low health literacy	• Reduced healthcare costs

Tooth decay

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing the progression of tooth decay by 30%, and in line with the progression rate of the highest-income group	Lower income groups	• Reduced healthcare costs

Gum disease and type 2 diabetes

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing the risk of developing type 2 diabetes among people with gum disease	Lower income groups	• Reduced healthcare costs • Productivity gains

Air pollution ($PM_{2.5}$)

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing annual $PM_{2.5}$ concentration in line with WHO Targets (5 µg/m^3)	Lower income groups	• Averted mortality • Reduced healthcare costs • Productivity gains

Micronutrient deficiency (anaemia)

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing the prevalence of anaemia by 50% by 2030 (in line with SDG 2)	Women (aged 15-49 years)	• Reduced healthcare costs • Productivity gains

Musculoskeletal conditions

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing the incidence or recurrence of musculoskeletal conditions	Older adults (aged 50+ years) Women (aged 15+ years)	• Reduced healthcare costs • Productivity gains

Osteoporosis

SCENARIO ANALYSIS	POPULATION	OUTCOMES
Reducing spinal and hip fractures due to osteoporosis by 30% and 20%, respectively	Older adults (aged 50+ years)	• Averted mortality • Reduced healthcare costs • Productivity gains

Source: Economist Impact

Health inclusivity spotlight: low health literacy

According to the WHO, health literacy is the ability to "access, understand, appraise and use information and services in ways that promote and maintain good health and wellbeing."[6] Partly, health literacy requires people to be able to read information such as health-related leaflets, food labels or dosing instructions (something that many people cannot do owing to low levels of overall literacy). But beyond that, health literacy also relies on the ability of people to access, understand and act on information to promote good health and wellbeing for themselves, their families and communities.[27] In the digital age, this also requires skills to find and critically evaluate health information for its accuracy and quality on the internet or through artificial intelligence (AI).

Health literacy is not just the responsibility of individuals; it requires systemic efforts from healthcare and educational systems to ensure that all individuals have the skills and resources required to enable good health literacy. This process, known as organisational health literacy, aims to help individuals to take control of their health. By treating health literacy as a strategic tool, health, social and education systems, as well as policymakers, can support and equip people to make informed decisions, ultimately improving their overall wellbeing and quality of life, while reducing the burden on overstretched health systems, freeing up capacity and saving cost.

All encompassing: the wide reach of low health literacy

Health literacy is not an isolated risk factor for poor health. It mediates how other determinants impact health. Evidence shows that multiple socio-demographic and socioeconomic factors impact levels of health literacy. These factors include age, education, income, occupation and social status, race and ethnicity, and gender (with evidence suggesting that women have higher health literacy levels than men).[6,28-31] Health literacy, in turn, impacts health-related factors such as outcomes, health-related behaviours, and healthcare utilisation.[32] In short, reduced health literacy is one of the pathways through which socioeconomic disadvantages translate to health disparities. Therefore, implementing strategies to improve health literacy could help reduce overall health inequalities.

While there is some variation to how health literacy is defined and measured,[33] on an individual level, low health literacy manifests as difficulties in comprehending and knowing how to act on health information, how to follow self-care and prevention practices, and in knowing which health services to use and when. This can translate into a range of negative outcomes such as:

- Unhealthy lifestyles and poor health;
- Low use of preventive practices such as vaccinations, screening, and oral and hand hygiene;
- Difficulty taking medicines correctly;
- Increased emergency attendance and hospital admissions;
- Lower productivity; and
- Reduced life expectancy.[32,34]

Certain population segments face additional barriers around health literacy; these include people facing language barriers (non-native speakers, for example), people with language and learning disabilities, those living with dementia, and communities with low general literacy.[11]

Language and cultural context are crucial in promoting health literacy as effective communication must resonate with diverse communities to ensure the message is understood and embraced. Cultural competence in health education allows for tailored approaches that respect local values, increasing the likelihood of positive health outcomes and engagement—Phase 2 of the Index, for instance,

"Traditional beliefs shape health-seeking behaviours, yet health messaging often lacks the cultural sensitivity required to resonate with these views."

Andy Gray, senior lecturer, Division of Pharmacology, University of KwaZulu-Natal, South Africa

highlighted the importance of community-based services in providing culturally appropriate information.[2] Unfortunately, this isn't always the case. For example, in South Africa, health information "is mainly distributed in English, [which is] unsuitable for a multilingual nation, and fails to engage diverse cultural perspectives," says Andy Gray, senior lecturer in the Division of Pharmacology at the University of KwaZulu-Natal. "Traditional beliefs shape health-seeking behaviours, yet health messaging often lacks the cultural sensitivity required to resonate with these views," he adds.

While digital health tools offer numerous opportunities to expand healthcare access, they can also deepen inequalities, particularly for those with low health literacy. These tools require both access to technology and familiarity with digital platforms, which can be barriers for individuals who already face challenges in understanding and managing their health. Older people and those with chronic health conditions are more likely to struggle with digital health literacy.[35] For example, the survey of 42,000 people conducted across the 40 countries for Phase 2 of the Health Inclusivity Index, published in 2024, found that 44% of Gen Z respondents (born in 1997 through 2004) reported being able to use social media to access health information, which is double the 22% rate among the Baby Boomer respondents (born in 1946 through 1964).[36] We also saw issues with skills, affordability and accessibility when using digital services. For example, those on low incomes may exhaust their internet data allocation part way through the month, while those in rural or remote areas are more likely to be faced with poor internet access.[37]

People with lower levels of education often engage less with digital health tools, such as tracking apps for diet and exercise or online communications with healthcare providers.[35] Furthermore, evidence suggests that use of digital health platforms is lower among members of racial and ethnic minority groups, and an urban/rural divide also exists globally.[35,37,38]

There is a lack of comparable data on health literacy levels across countries. To build a picture for this whitepaper, Economist Impact used responses to three health literacy-related survey questions included in the Phase 2 study.[a,2] This enabled us to estimate the prevalence of low health literacy in the 40 Index countries; these data were then used to estimate the economic burden of health literacy in each country.

[a] Using a 5-item Likert scale, with response options ranging from 'strongly disagree' to 'strongly agree', participants were asked:

In your general experience with doctors and other health professionals, do you agree or disagree with the following?
- My health is discussed in a way that I understand (eg, medical terms are explained).
- I have been given advice or information on how to care for my health at home.
- I am able to use the information and advice given to me to manage my own health at home.

Health Inclusivity Index Phase 3 findings: the impacts of enhancing health literacy

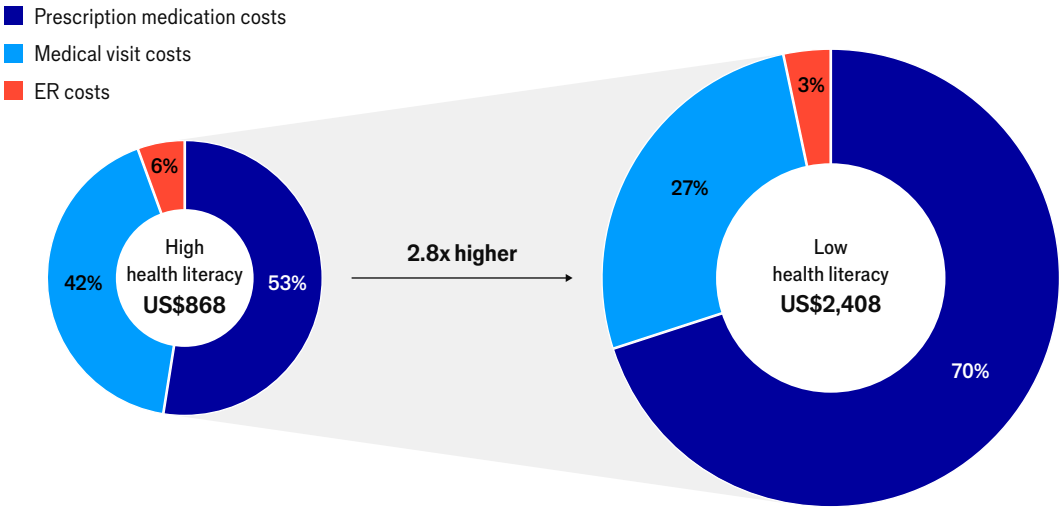
The economic assessment that we conducted across the 40 countries for Phase 3 of the Index shows that the costs of low health literacy are clear, as are the benefits of taking action:

- On average, annual healthcare costs—including doctor visits, prescription medications and emergency room visits—are nearly three times higher (US$2,408 versus US$868) for those with low health literacy than for those with high health literacy (see Figure 3).
- Across the 40 countries studied, reducing low health literacy by 25% could result in healthcare savings of US$303bn annually. Interestingly, the countries' income rankings did not correlate with health literacy levels—many high- and upper-middle-income countries have relatively high levels of low health literacy. Japan, the Index country with the highest prevalence of low health literacy (based on our Phase 2 survey), stands to save US$36bn—or nearly 1% of GDP—by achieving a 25% reduction in low health literacy.
- Reducing the prevalence of low health literacy by 25% could boost economies in the countries studied by an average of 0.4% of GDP through lower healthcare costs alone—further savings could also be likely from reducing the indirect impacts of low health literacy, such as lost productivity arising from work absenteeism (missing work) and presenteeism (working while sick).

Despite these clear benefits, governments are often focused on short-term priorities which are more likely to have an impact within the electoral cycle. This means that governments may hesitate to invest in areas such as health education and prevention-focused public health campaigns, whose benefits are not necessarily immediately visible.

Figure 3: Per-person healthcare costs are nearly three times higher for individuals with low health literacy as compared to those with high health literacy

Healthcare costs per person, per year



Source: Economist Impact

The power of understanding: enhancing inclusivity through improved health literacy

Health literacy can act as a bridge between socioeconomic conditions and overall wellbeing, making it a crucial issue for policymakers. Just as low health literacy can negatively impact health outcomes, behaviours and wellbeing, the opposite is true: enhancing health literacy levels and making health services more accessible could drive better health outcomes.[32]

From a policymaking perspective, investing in health literacy helps to promote access to clear, accurate, appropriate and accessible information for diverse audiences.[27] Physician-based, individual skills-based, organisational and policy-based interventions are needed to help health systems and individuals overcome challenges linked to health literacy. The needs of groups and individuals vary according to prior experiences, literacy levels and communication preferences (digital or in-person, for example). Taking into consideration the diversity of needs is vital to developing appropriate health information and enabling individuals to manage their own health and care —engaging relevant communities and professionals to co-create policy and tools is one way to achieve this.[11]

Health literacy was identified as one of three pillars of health promotion in the 2016 WHO Shanghai Declaration.[39] Yet improving health literacy is not just the work of health systems, and nor do the benefits only manifest in improved healthcare. Improvements to health literacy would support progress towards achieving seven of the UN Sustainable Development Goals (SDGs).[b,27] Improved health literacy could support citizen engagement, inform individual arguments for claims to the right to health, and shape community action and government accountability.[27] By the same token, driving improvements in health literacy requires multisectoral cooperation spanning health systems, education, social care and the media.[27]

The WHO identifies three areas of health literacy that policymakers should seek to address:

- Organisational health literacy: the degree to which health systems enable patients to understand health information, navigate the health system and manage their own health. This can be promoted by improving training for all health system staff and strengthening organisational processes such as communication, informed decision-making, and access to culturally and linguistically appropriate health information and services.
- Professional health literacy: the health literacy of healthcare and education professionals. It can be addressed through regular training for these professionals.
- Personal health literacy: the health literacy of individuals. It can be strengthened by ensuring access to accurate, timely and appropriate health information, as well as implementing health-promoting curricula in schools, universities and adult education; linked to this, community- and population-level assessment guides policy development to strengthen personal health literacy.[6]

Studies show that schools have a crucial role in breaking the health inequalities cycle by promoting health literacy through education.[40] With their broad

[b] SDG 1: No poverty; SDG 2: Zero hunger; SDG 4: Quality education; SDG 8: Decent work and economic growth; SDG 9: Industry, innovation and infrastructure; SDG 10: Reduced inequalities

reach across diverse student populations, schools are uniquely positioned to teach health literacy at a formative age, particularly benefiting those from disadvantaged backgrounds. By fostering an inclusive and supportive learning environment, schools can provide equitable access to health education and help to embed knowledge and practice of healthy habits around food, hygiene and exercise, which would ultimately help to increase health literacy, as well as reduce long-term health disparities. The impact of health literacy education in schools can extend to parents through an increase in awareness of health issues and encouragement of healthier lifestyle choices at home. "Health communication in schools is very important," says Helena Ribeiro, professor of environmental health at the University of São Paulo. "Children often have more education than their parents and can be a point of diffusion for health information within families."

While almost 90% of children attend primary school globally, this decreases to 74% in low-income households, highlighting inequities in school attendance that reduce the reach of school-based health literacy programmes.[41] To truly reduce health disparities, it is essential to ensure that all students have equal access to education and culturally sensitive health literacy programmes, regardless of background or attendance challenges. This emphasises the importance of joined-up strategies and coordinated policymaking between health, education and social care ministries.

Improved health literacy yields more knowledgeable and, thus, healthier societies. Specifically, increases in health literacy levels could result in improved health status, quality of life, health behaviours, use of preventive services and self-care strategies, and specific health-related outcomes across the board. Indeed, improved health literacy contributes to better outcomes across the focus areas in this report. In addition, evidence suggests that health literacy enhances people's ability to access and use community resources that benefit health and wellbeing. All of this will help to increase overall health levels, reduce the strain on overburdened health systems, and increase productivity, yielding major economic benefits. Put simply, better health literacy promotes health inclusivity, improving health and economic outcomes.

Improved health literacy contributes to better outcomes across the focus areas in this report.

Health inclusivity spotlight: lower-income groups

Socioeconomic status is a key social determinant of health, and around the world, people in lower-income communities face a disproportionate share of health challenges. People from lower socioeconomic groups not only experience more frequent illness, but also tend to die younger than those in higher socioeconomic groups. These communities are more exposed to environmental risks, such as air pollution, which increases their chances of developing respiratory and cardiovascular diseases.[42] Social factors like food and housing insecurity, and limited education, further intensify these struggles, creating a cycle of disadvantage that makes it harder for individuals to access the resources and care that they need.

Limited access to quality healthcare leaves low-income communities vulnerable to a range of health issues. Poor oral health is one example of this—financial barriers not only prevent regular dental care but also make it harder for individuals to afford the tools and products needed to practice good oral hygiene. This leads to conditions such as tooth decay, gum disease and tooth loss—which could be prevented with better access to both care and resources. There is also a clear connection between oral disease and a range of common non-communicable diseases (NCDs)—which is partly related to shared risk factors.[43]

"People with low incomes have fewer resources to mitigate the impact or deal with the negative health consequences of climate change and air pollution."

Paula Carvaho Pereda, professor in economics, Department of Economics, University of São Paulo, Brazil

"Often, people of low socioeconomic status and in areas of social deprivation can't afford care, so their attendance rates at dental practices are low."

Iain Chapple, professor of periodontology and consultant in restorative dentistry, Birmingham NIHR Biomedical Research Centre in Inflammation and Periodontal Research Group, the University of Birmingham, United Kingdom

No health without oral health: the far-reaching impact of non-inclusive oral care

Good oral health is a gateway to good overall health. Maintaining healthy teeth, gums and orofacial structures improves overall quality of life while simultaneously reducing the risk associated with several NCDs through modifying shared risk factors and controlling inflammation.[44,45] Common oral diseases such as gum disease and dental caries (tooth decay) are largely preventable through dietary modifications, smoking cessation and proper oral hygiene practices.[46-48] Meanwhile, population-level preventive efforts like anti-smoking legislation, fluoridation of drinking water, and taxation of sugary drinks are also beneficial, as is education on good oral hygiene practices.[48-50]

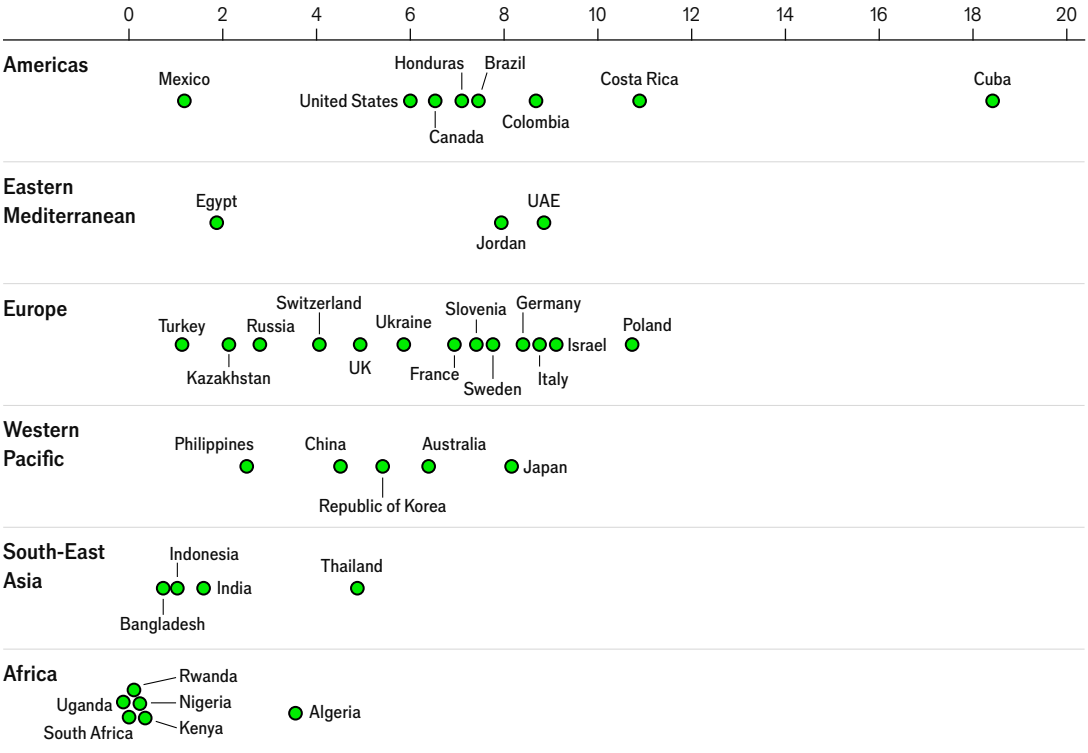
Yet, despite the preventable nature of oral diseases, they remain stubbornly prevalent worldwide. Oral diseases affect over 3.5bn people globally—almost half of the world's population—placing them among the most prevalent NCDs, affecting significantly more people than the five other major NCDs combined (mental disorders, cardiovascular diseases, diabetes, cancers and chronic respiratory diseases).[51] Furthermore, the economic impact of oral diseases is significant, estimated at US$710bn globally in 2019, almost half of which is made up of indirect costs such as lost wages and productivity.[52]

Lower-income populations are disproportionately affected by oral diseases for reasons including prohibitive costs and poor availability of dental care, and food insecurity associated with low-nutrient and high-sugar diets.[53-55] Only 23% of the global population has access to essential oral care services, with low-income countries facing the largest barriers.[c,47] The dentist-to-population ratio varies across the Index countries, with more than 10 per 10,000 in Costa Rica, Cuba and Poland, but fewer than 1 per 10,000 in five of the six African countries (Uganda, South Africa, Rwanda, Nigeria and Kenya) and Bangladesh (see Figure 4).[56]

[c] The WHO defines essential oral care services as the "emergency care, prevention and treatment of common oral diseases and conditions, and essential rehabilitation."

Figure 4: Availability of dentistry personnel varies between and within regions

Dentistry personnel per 10,000 population



*No data for Vietnam

Source: WHO's Global Health Observatory

Even within high-income countries, lower-income populations have poorer access to dental care. For instance, in the US, Medicaid dental coverage for low-income populations varies by state, and those without insurance coverage are left to seek care through emergency departments, which is both costly and does not offer sustainable solutions.[57] Even in countries with universal healthcare, such as Australia and the United Kingdom, underserved populations face disproportionate barriers to care due to a lack of availability of dentists and dental appointments, as well as high out-of-pocket costs.[58,59]

Socioeconomic status influences oral health in two ways, says Iain Chapple, professor of periodontology and consultant in restorative dentistry at Birmingham NIHR Biomedical Research Centre in Inflammation and Periodontal Research Group at the University of Birmingham, in the United Kingdom. "Firstly, health literacy. Those in areas of deprivation are frequently not as well educated about the importance of oral health.... [Second] is cost. Often, people of low socioeconomic status and in areas of social deprivation can't afford care, so their attendance rates at dental practices are low." One study conducted in five LMICs found that low-income mothers were less likely to access dental care than general healthcare. Among those seeking care, 50% were experiencing dental pain, indicating that the care is often provided too late and has to be restorative rather than preventive.[60]

Dental conditions such as gum disease and dental caries have both local and systemic health impacts that are amplified among low-income populations.

They can lead to significant discomfort, restricting the ability to open the mouth or chew food properly. Meanwhile, tooth discolouration and bad breath can negatively impact social interactions and employability. The consequences and costs of poor oral health are not limited to the mouth—a range of non-communicable and systemic diseases are also linked to oral diseases.[61-63] For example, there is a bidirectional association between gum disease and type 2 diabetes—poorly controlled diabetes is associated with a greater risk of periodontitis (severe gum disease), and chronic periodontitis is associated with worse blood sugar control in those with type 2 diabetes.[64] Collectively, these issues compromise both physical and psychological wellbeing, diminishing overall quality of life. Furthermore, the health and social impacts of oral diseases can affect access to employment, further disadvantaging lower-income groups.[65,66]

To explore the economic impact of improved oral health across different income levels, we developed two separate economic models—one for dental caries and the other for gum disease.

The dental caries model included two scenarios: the first assessed the impacts of preventive interventions aimed at reducing dental caries by 30% across all income levels for individuals aged 12-65 years, while the second focused on the potential impact of a needs-based approach focused on low-income groups. This could be seen as a comparison of equality versus equity.

The second model estimated the health and economic impacts of effectively managing gum disease to reduce the risk of developing type 2 diabetes. The model is based on data showing that people with gum disease are 26% more likely to develop type 2 diabetes as compared to those without gum disease, but effectively managing gum disease significantly reduces the risk of developing this common co-morbidity.[67,68]

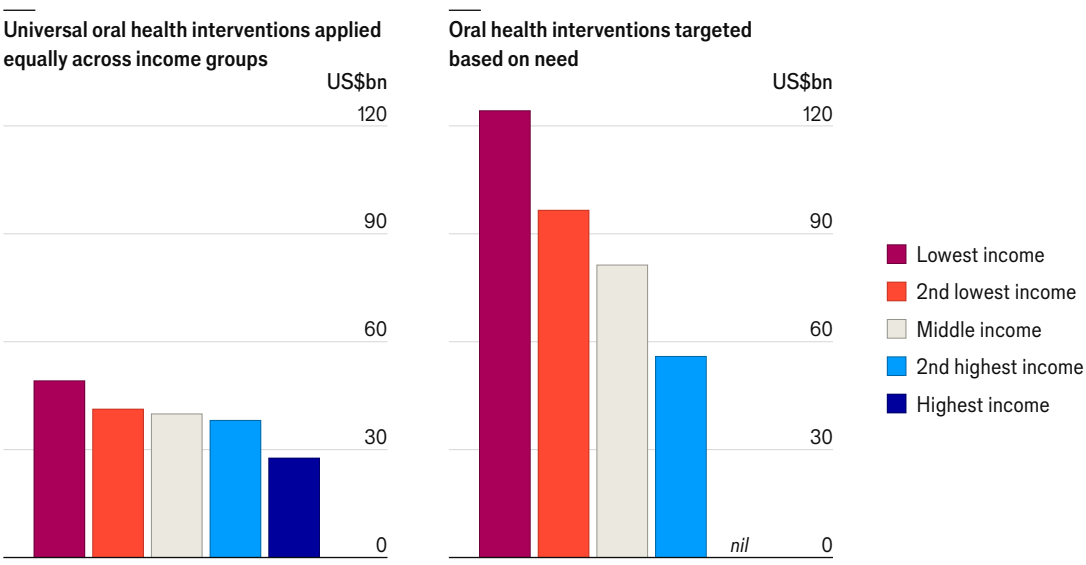
Health Inclusivity Index Phase 3 findings: the impacts of promoting oral health

Our analysis found that tooth decay imposes a significant economic burden on individuals and society in the 40 Index countries, particularly for lower-income groups who face higher costs owing to a lack of preventive care, which results in a higher disease burden. Meanwhile, the gum disease analysis quantifies the higher diabetes-related healthcare costs among low-income groups who have a greater prevalence of unmanaged gum disease.

Findings linked to reducing tooth decay prevalence

- Inadequate preventive dental care, and the resulting higher disease prevalence, means that treatment costs are, on average, 50% higher for lower-income groups as compared to higher-income groups.
- Implementing oral health interventions based on need (rather than applying blanket investments and targets regardless of income level) produces the greatest cost savings for the lowest-income groups in the 40 Index countries (see Figure 5). On average, targeted oral health promotion could reduce per-person lifetime dental costs for the lowest-income group by US$12,488, with savings reaching up to US$43,106 in the US. Across the lowest-income quintile of each of the 40 Index countries, this could equate to savings of US$124bn (see Figure 5).
- In addition to the analysis examining the direct costs of tooth decay over a lifetime, we examined the annual indirect costs associated with tooth decay, such as missed work due to pain or treatment. We estimate that adults miss 3.1bn work hours each year due to tooth decay, resulting in a US$34.7bn loss across the 40 countries studied. This underscores the major economic impact of poor oral health on the workforce.

Figure 5: Targeting tooth decay interventions by income level increases savings
Cost savings, by income quintile



Source: Economist Impact

Findings linked to tackling gum disease and type 2 diabetes

- Gum disease is linked to an increased risk of type 2 diabetes. Diabetes-related healthcare costs among people with gum disease cost the Index countries US$1trn over ten years.
- Diabetes-related healthcare costs for people with unmanaged gum disease are 50% higher for low-income groups than higher-income groups (see Figure 6).
- By seeking professional periodontal care and maintaining good oral hygiene at home, 57m people with gum disease could avoid developing type 2 diabetes by managing their condition, potentially boosting economies by US$181bn over ten years through reduced healthcare costs and increased productivity (see Figure 7). Owing to a higher disease burden, the greatest savings can be achieved among the lowest income groups.

Closing the divide: empowering lower-income groups with better oral care

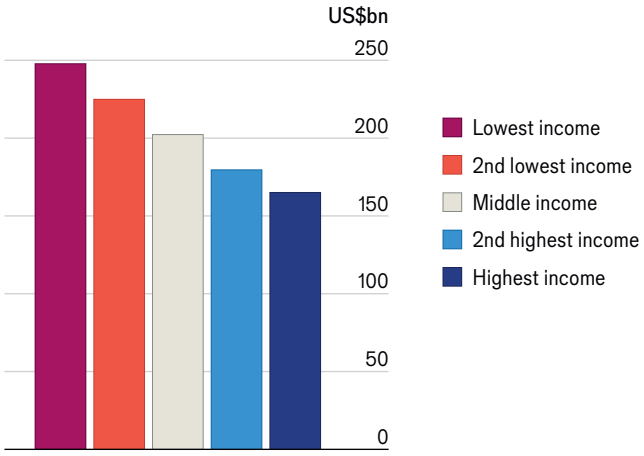
To reduce disparities in oral care based on income status, it is essential to address gaps throughout the entire care continuum, including prevention, treatment and maintenance of oral health through policy-level action and by strengthening health systems.

Making prevention more inclusive is key as it significantly reduces the need for people to seek restorative dental care, which is more expensive, timely and difficult to access. "It's about prevention, not repair—so we should adopt a wellness approach," says Prof Chapple. "The classic model for dentistry across the globe remains an outdated repair model rather than a wellness model. People go when something's wrong and they get it fixed, and that is always more expensive than preventing it in the first place."

Driving a shift towards prevention requires a two-pronged approach. The first area of focus requires raising awareness among underserved populations on individual preventive strategies like twice-daily

Figure 6: Type 2 diabetes costs among those with unmanaged gum disease are higher in lower-income groups

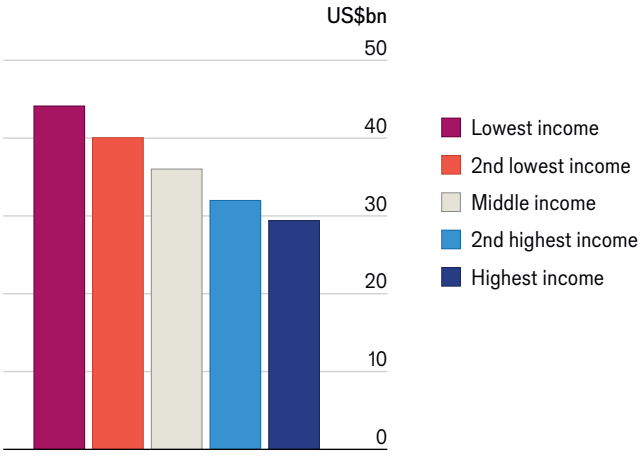
Diabetes-related costs over 10 years, by income quintile



Source: Economist Impact

Figure 7: Effectively managing gum disease would reduce the risk of developing type 2 diabetes and significantly reduce healthcare costs – with the greatest savings among lower-income groups

Cost savings over 10 years, by income quintile



Source: Economist Impact

"It's about prevention, not repair—so we should adopt a wellness approach… preventing a dental condition from developing in the first place should be the ultimate goal towards improving your health. "

Iain Chapple, professor of periodontology and consultant in restorative dentistry, Birmingham NIHR Biomedical Research Centre in Inflammation and Periodontal Research Group, the University of Birmingham, United Kingdom

brushing with fluoridated toothpaste, regular flossing and reducing sugar consumption. The second area of focus involves enhancing timely and affordable access to regular, preventive oral care check-ups. Globally, governments and NGOs are actively engaged in raising awareness and providing preventive care through school and community-based oral health programmes aimed at reaching deprived populations.[69] Many countries have implemented successful oral health promotion strategies in schools, while community-based programmes have also demonstrated positive outcomes among rural and indigenous populations in many countries.[70,71] These examples of successful practices can be adopted and adapted by other countries.

Meanwhile, upstream, policy-level strategies can further improve inclusivity in preventive care. Currently, about 25 countries benefit from water fluoridation schemes, aiding 400m people, with another 50m consuming naturally fluoridated water.[72] While studies have shown that water fluoridation is a cost-effective strategy for averting caries and reducing the need for dental treatments,[73] attention must be given to ensuring appropriate levels of water fluoridation. Excessive fluoride intake can result in tooth staining called dental fluorosis. In more extreme cases, there can be damage to internal organs like the bones and kidneys.[74,75] Implementing taxes on sugary drinks has shown to be effective in reducing sugar consumption and possibly caries risk among deprived populations.[50,76] Currently, 57% of the world's population live in countries that levy such sugar taxes.[77] Expanding these efforts to other countries and evaluating their efficacy in narrowing disparities in oral health is necessary. Similarly, expanding the implementation of anti-smoking measures can help to improve gum health. Tobacco taxes have been shown to be the most effective method to encourage smokers in low-income populations and LMICs to quit—yet such taxes remain among the least-utilised strategies.[78]

Alongside enhancing preventive measures at a population level, inclusive oral health means addressing challenges in accessing oral care. Expanding access to oral treatments will require a comprehensive strategy to bolster the oral health workforce with greater numbers of dentists, nurses, dental therapists and hygienists.[79] There is a need to raise awareness among dental professionals about the full scope of work that can be undertaken by dental therapists, dental hygienists, and dental nurses, in order to improve overall oral health outcomes by fully utilising the diverse skill sets of these professionals.[80] Including dental hygienists and therapists in the formal dental workforce, along with shifting tasks for preventive and minimally invasive care to them, could significantly enhance access to oral health services, and thereby improve oral health outcomes.[81,82] An empirical example of this is the finding that greater autonomy in the scope of dental hygienist practice has been associated with better population-level oral health.[83] Meanwhile, engaging community-based

dental therapists and dental worker aides in Canada via the Children's Oral Health Initiative (COHI) programme has effectively delivered preventive oral care to First Nations and Inuit communities.[84]

The WHO developed a Basic Package for Oral Care to improve oral health in low-resource settings, focusing on essential treatments that community health workers can provide in areas without dental facilities. This package includes urgent procedures like dental extractions and techniques for managing dental caries using only hand instruments—eliminating the need for drills or electricity. Expanding the package to include basic treatment for gum disease can enhance access to care.[85] A recent example from Nepal, where community health workers accurately conducted periodontal examinations in rural areas, demonstrates the potential to shift tasks away from highly trained dentists and periodontal examiners in low-resource and remote settings.[86]

Engaging primary care physicians and pharmacists in preventive oral care is another way to expand services to underserved populations. Medical schools have successfully piloted oral health clerkship programmes to improve knowledge of oral health among budding primary care physicians.[87] These efforts can be expanded by including mandatory oral health modules in medical curricula. Improving the cultural competency of oral health professionals is also key to offering inclusive care.[88]

In addition to making oral care professionals more accessible, improving insurance coverage for oral care is necessary to reduce the financial burden on deprived populations and encourage proactive, care-seeking behaviour.[89,90] Using financial means testing to decide suitable recipients for free dental services can ensure the sustainability of the health system. Offering financial incentives to dentists to treat underserved populations can further reduce disparities. For example, the Scottish government offers practice-based allowances to dentists that reflect the social deprivation status of the patients they serve.[91]

Through raising awareness of the importance of prevention, strengthening the oral health workforce and providing financial subsidies or incentives for oral care, improving inclusivity in oral health is feasible and sustainable. This will translate into reduced healthcare costs, better productivity and financial security for lower-income populations, and wider society.

Poor air: the socioeconomic air-quality divide

Globally, 99% of people breathe air that exceeds pollution levels recommended by the WHO.[92] Inhaling pollutants leads to inflammation, oxidative stress, immunosuppression and mutagenicity in cells, impacting almost every organ in the human body, especially the lungs, heart and brain.[93] The strongest links between air pollution and health impacts are seen in conditions like stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD), lung cancer, pneumonia and cataracts.[93] In 2021, 8% of the total global disease burden was caused by particulate matter air pollution, and air pollution caused 8.1m deaths worldwide that year.[94,95] This makes it the second-leading cause of death globally.

Income level and socioeconomic status are major factors impacting both exposure and resilience to air pollution. Pollution levels are particularly high in LMICs (see Figure 8). This is because of weaker regulation, the prevalence of older machinery and vehicles, fossil-fuel subsidies, congested urban transport, coal-based heating, rapidly developing industrial sectors, and slash-and-burn agricultural practices.[42] Globally, 7.3bn people are exposed to unsafe levels of PM2.5 air pollution (chemical particles in the air that are less than 2.5 micrometres in diameter). Of these, 80% live in LMICs—China (1.4bn people) and India (1.4bn) alone account for 38% of global exposure to PM2.5 concentrations above WHO guidelines.[42]

Meanwhile, some 716m people live in extreme poverty while facing unsafe air pollution levels.[42] In addition to facing higher exposure to air pollution, these people are made more vulnerable to the health impacts of air pollution owing to lower access to, and quality of, healthcare provision.[42] For example, infant mortality risks in India are two to three times greater than in high-income countries.[96] Particularly vulnerable populations include those living in slums or near busy roads, those working in certain (often industrial or

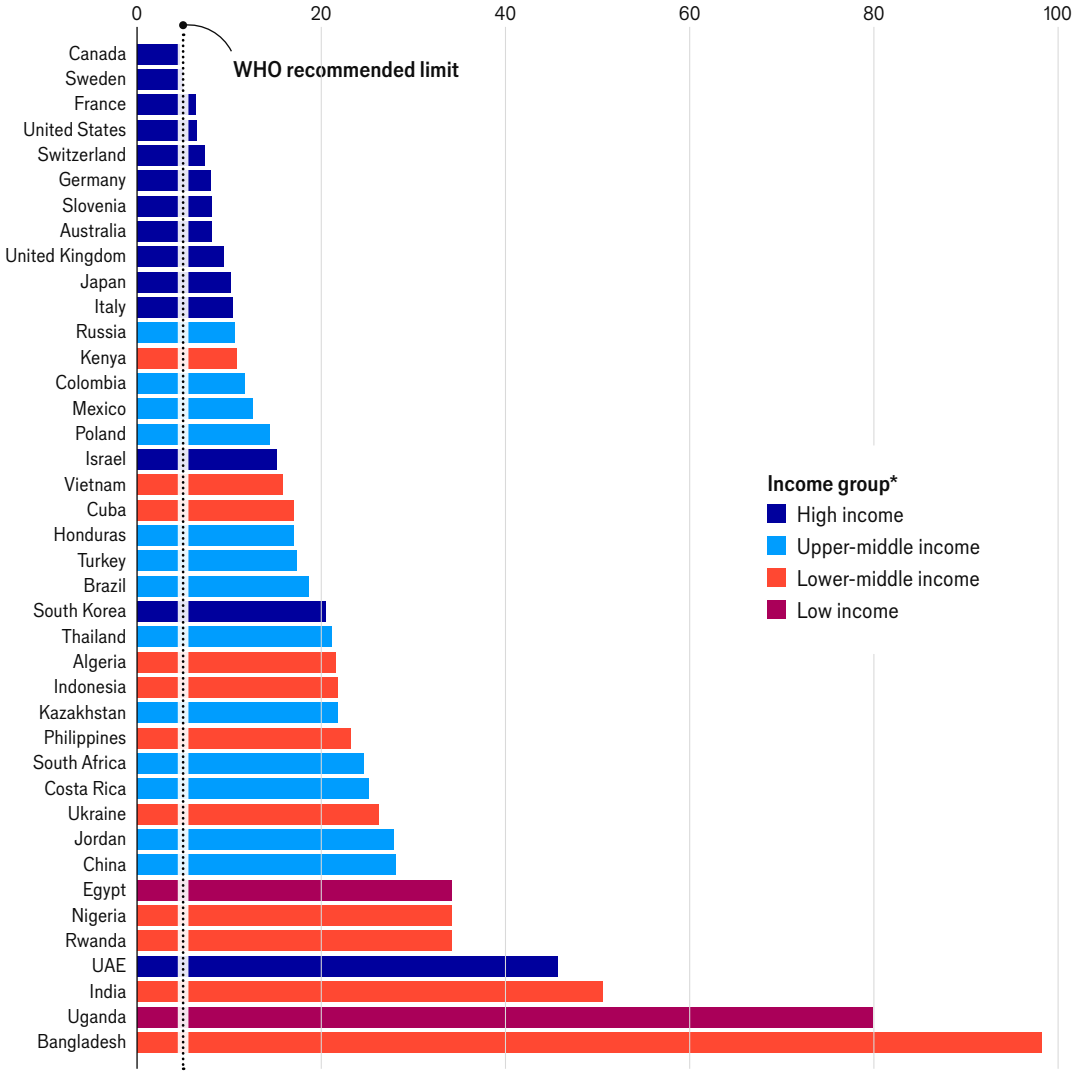
Globally, 99% of people breathe air that exceeds pollution levels recommended by the WHO.

manual) occupations, and those lacking access to clean cooking.[93] The impact of indoor air pollution should not be underestimated—of the 700,000 under-fives who died globally as a result of air pollution in 2021, for example, 500,000 were victims of indoor pollution.[95] Partly indoor air pollution arises because people from poorer households may rely on fuels that can be more easily gathered, such as wood or dung, while using simple, high-polluting stoves, fires and ovens.[93] Poor housing construction and location can also impact the levels of pollutants in household air.[97]

There is clear evidence that socioeconomic deprivation causes elevated impacts from air pollution in countries of all income levels. For example, a study based in Italy found that higher impacts were associated with lower-income areas.[98] Meanwhile, a Netherlands-based study of over 17m people found that minority

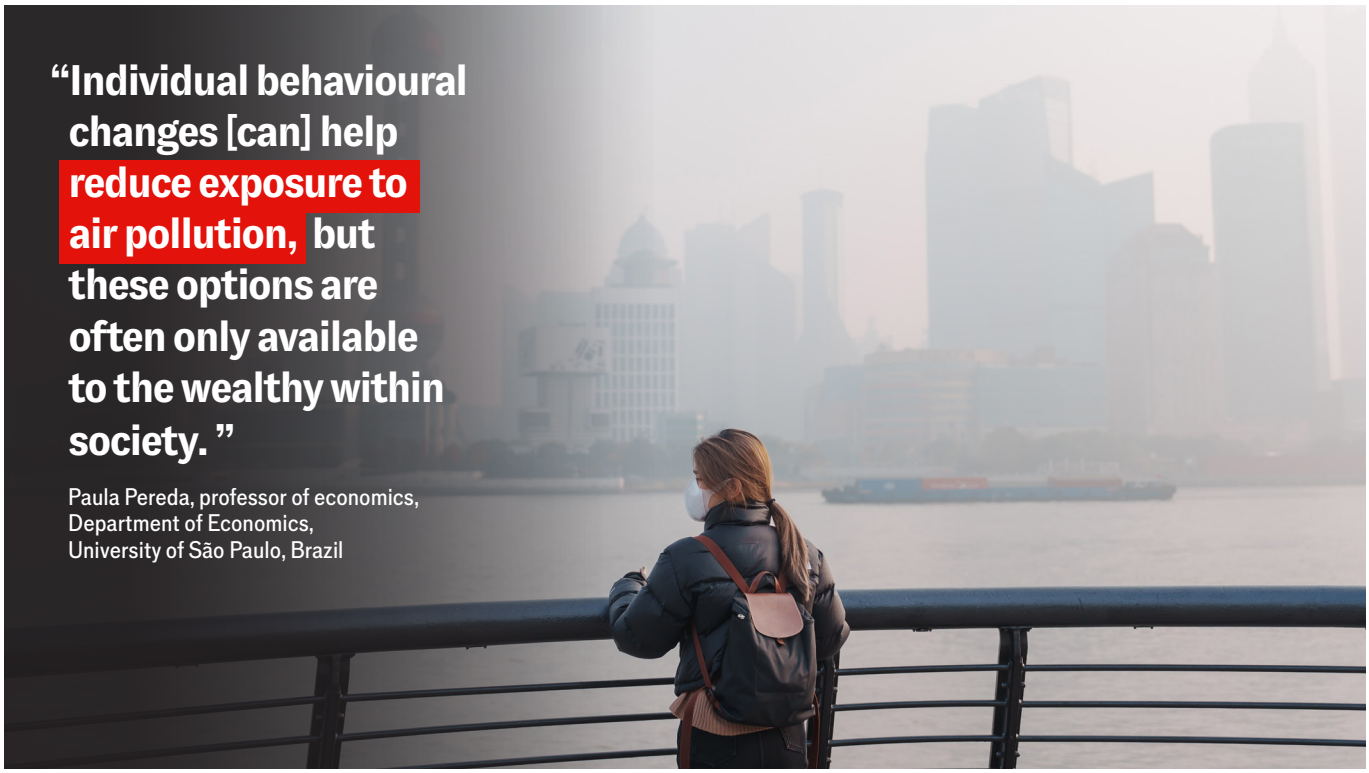
Figure 8: Air pollution levels are often higher in LMICs

Annual average concentrations of PM2.5 (μg/m^3)



*World Bank, 2021 classifications

Source: WHO's ambient air quality database



ethnic groups were consistently exposed to higher levels of air pollution than the ethnic Dutch population, and exposures were higher for the lowest income group.[99] Finally, a US study found that areas with a higher proportion of Black residents, higher population density, a higher proportion of people living in poverty and a smaller share of university-educated residents had higher PM2.5 concentrations. Mortality risk was higher in the lowest-income areas.[13]

One way that income status within countries impacts exposure to air pollution is through what Paula Pereda, a professor in the Department of Economics at the University of São Paulo, refers to as “defensive investments”. These are essentially adaptive measures taken when air quality is poor, and they are often not available to people of lower socioeconomic status. They can include where someone chooses to live, as those who can afford to will live where the air is cleaner—or they may be able to invest in improving air quality at home. Another example is avoiding outdoor activities on days when air pollution is high, or avoiding public transport routes affected by poor air quality. “These are individual behavioural changes that help reduce exposure to air pollution, but these options are often only available to the wealthy within society,” says Prof Pereda.

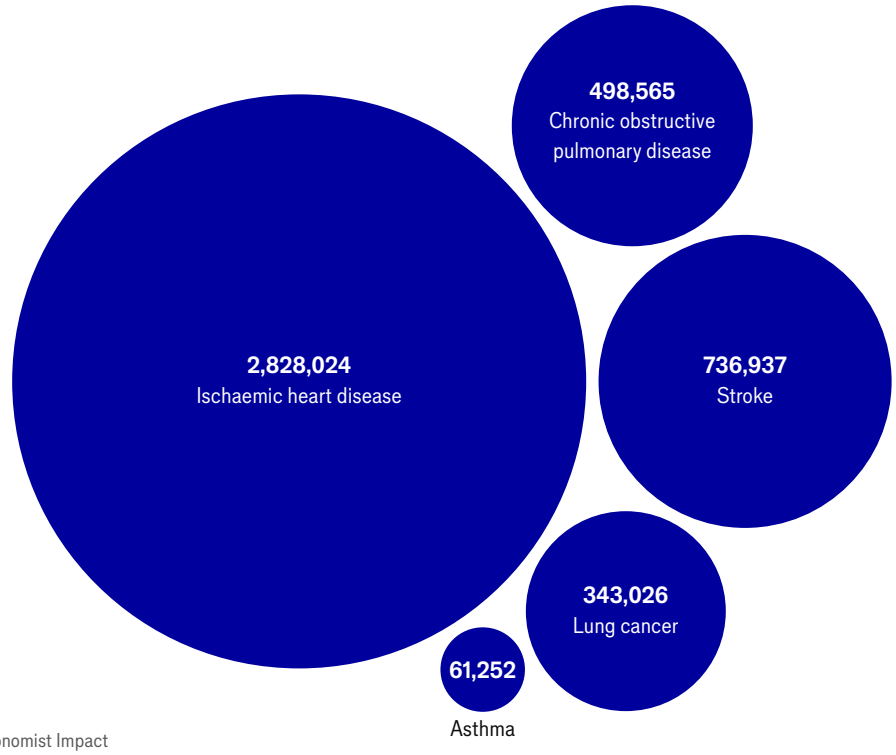
Health Inclusivity Index Phase 3 findings—the impacts of meeting the WHO guidelines on air pollution

Analysis of the 40 countries included in the Health Inclusivity Index demonstrates clear economic and health benefits to achieving the WHO’s air pollution targets, especially among lower-income groups.

- In terms of direct health impacts, reducing air pollution in line with the WHO’s guideline PM2.5 level of 5µg/m3 could avert 4.5m deaths annually due to lung cancer, ischaemic heart disease, COPD, stroke and asthma in the 40 Index countries (Figure 9).
- Reflecting the elevated impact of air pollution among poorer populations, the greatest benefits of meeting the WHO target in the 40 Index countries would be seen in the lowest-income groups (Figure 10). The WHO target could deliver a 64% greater economic benefit for the lowest income group compared to the highest.
- Reaching WHO’s target levels could result in an annual economic benefit of US$101bn in the 40 Index countries, driven by reduced mortality, lower healthcare costs and increased productivity.
- The US, India, and China stand to gain the most from achieving the WHO’s air pollution target—the potential boost to their economies could be US$5bn, US$12bn, and US$53bn, respectively.

Figure 9: More than 4 million deaths could be prevented per year across the 40 Health Inclusivity Index countries by reducing air pollution to WHO target levels

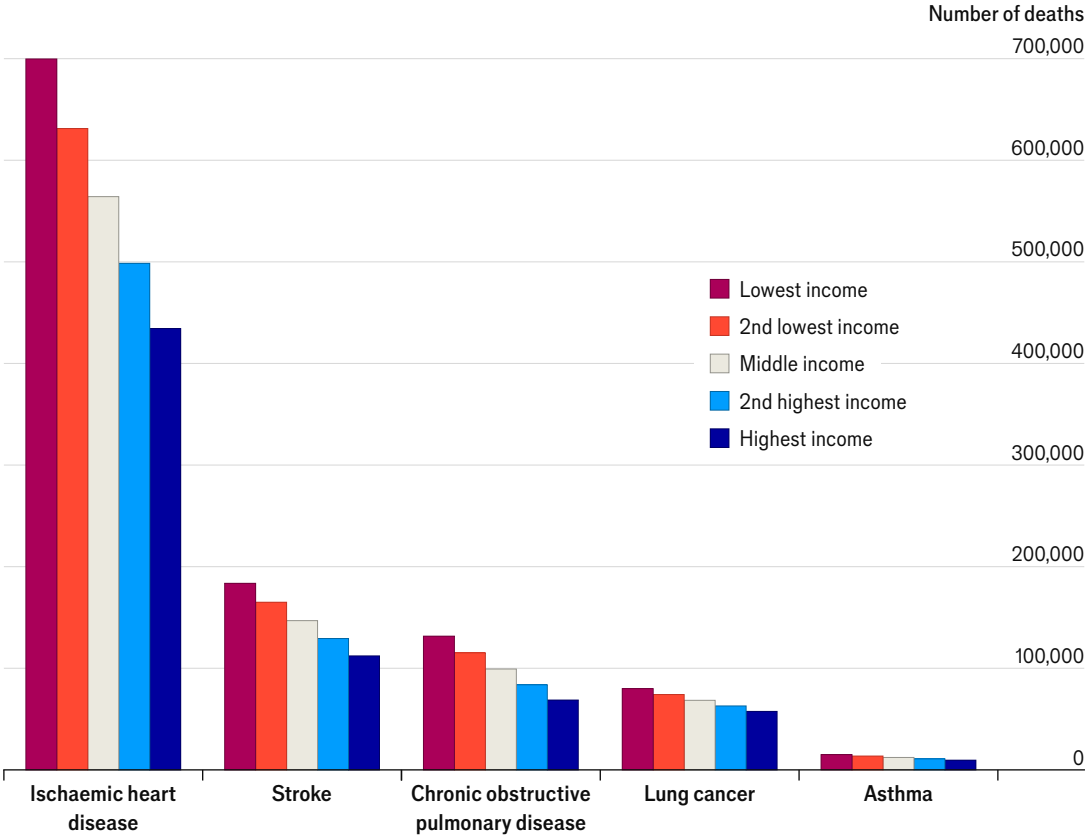
Number of deaths prevented, by condition



Source: Economist Impact

Figure 10: Lower-income groups face a higher burden of air pollution and have the most to gain from their countries achieving the WHO's recommended $PM_{2.5}$ levels

Number of deaths prevented across the 40 Health Inclusivity Index countries, by condition and income-group



Source: Economist Impact

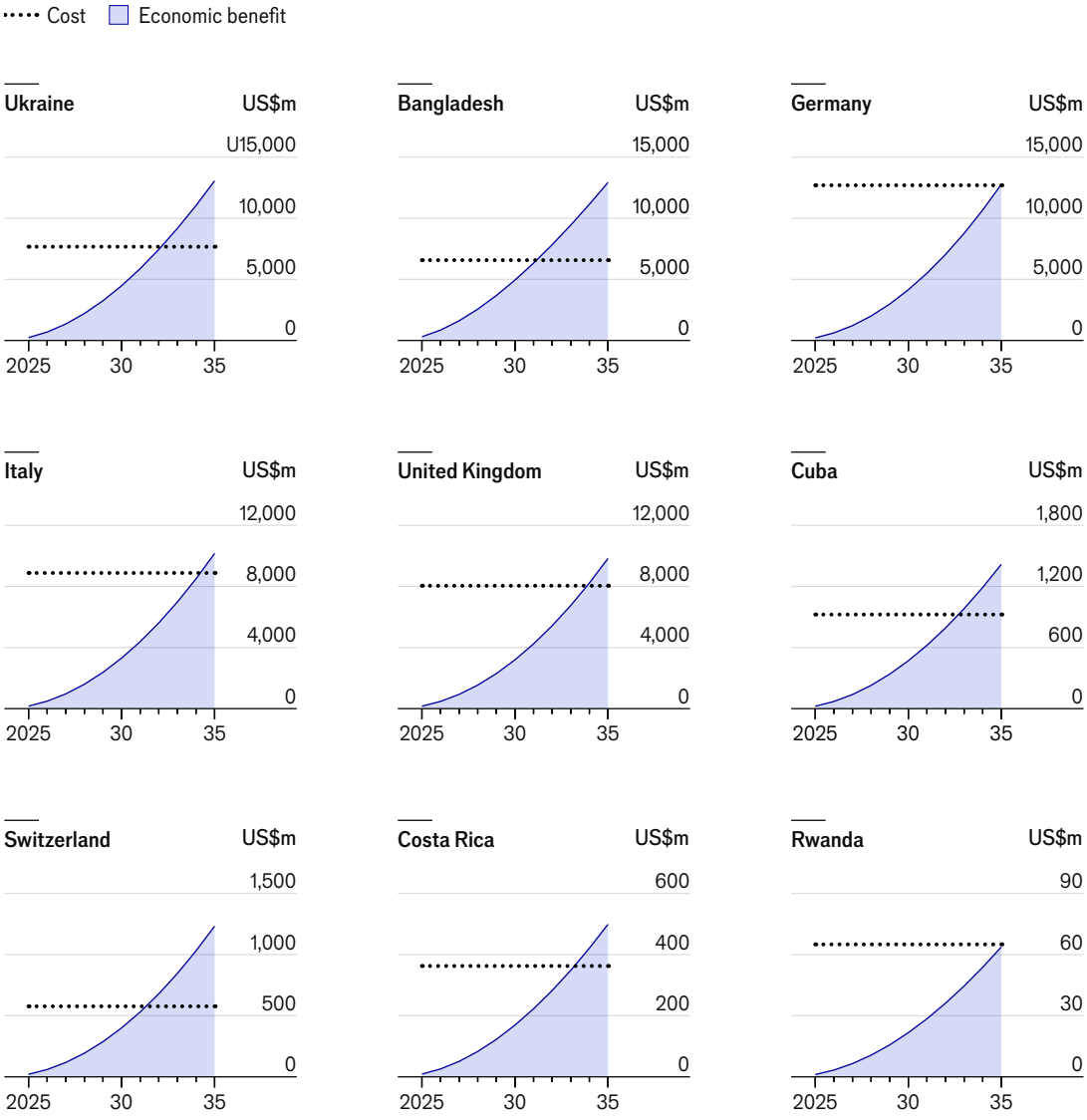
HEALTH INCLUSIVITY IN FOCUS:

Assessing the impact of air pollution reduction on a country-by-country level

To gather a clear, country-by-country picture, we conducted an experimental cost-benefit analysis of the economic impact of meeting the WHO's air pollution target. We compared the PM2.5 abatement costs, leveraging carbon emissions as a proxy, with the health benefits calculated above, to understand the cost-benefit of reducing air pollution in line with WHO's target level across the 40 countries considered in this study (see Methodology Note for more details on this approach).

According to this analysis, nine countries—Bangladesh, Costa Rica, Cuba, Germany, Italy, Rwanda, Switzerland, the UK and Ukraine—could achieve a return on investment within ten years or less from reducing PM2.5 levels in line with WHO guidelines. Figure 11 highlights the results of this analysis for these countries, which cover the full range of income levels, from low-income (Rwanda) to high-income (Germany, Italy, Switzerland and the UK).

Figure 11: Nine countries would see a return on investment within ten years
2025-2035 forecast, US$m



Source: Economist Impact

Breathing easier: how air quality improvements promote health inclusivity

When it comes to reducing air pollution, our analysis shows that the health, economic and productivity benefits are clear for countries of all income levels. Supporting a range of relevant policies and investments—the WHO highlights sustainable land use, cleaner household energy and transport, energy-efficient housing, power generation, industry, and better municipal waste management—can drive down air pollution.[100] In addition, policies to reduce air pollution produce a combination of impacts for both climate and health, lowering disease burden and contributing to climate-change mitigation—both of which would yield significant benefits for lower-income populations.[100]

To derive the maximum benefit, it is critical that air pollution policies are grounded in the reality of inequalities in PM2.5 exposure. "Policies must account for the differential impacts of pollution on vulnerable populations and ensure that the benefits of cleaner air are shared equally," says Prof Pereda. "Without addressing these inequalities, environmental policies can unintentionally reinforce health and economic disparities." Yet regulation lags behind the necessary actions required to achieve the WHO target in almost all of the countries in the Index. In fact, according to the WHO's air quality standards database, Norway is the only country globally—including countries outside of the 40 covered in the Health Inclusivity Index—with annual 24-hour PM2.5 legal limits that match the guidelines.[101]

Robust policy and legal instruments are needed to reduce air pollution systematically, in line with WHO guidelines, and for lowering air pollution disparities between and within countries. For instance, policymakers should review and enforce national and international legal air pollution limits to bring them in line with WHO guidelines. Beyond this, there is a need to support community-based efforts on air quality monitoring and advocacy to address the disproportionate impact on lower-income groups.[102] Governments must also develop and enhance access to green infrastructure and transport, particularly in low-income areas, as well as enforce pollution controls, implement stricter emission standards, and promote environmental justice initiatives. Crucially, air pollution policies should include inclusivity considerations to acknowledge and mitigate disparities in exposure to, and impacts of, air pollution, which disproportionately fall on low-income groups.

"Policies must account for the differential impacts of pollution on vulnerable populations and ensure that the benefits of cleaner air are shared equally… Without addressing these inequalities, environmental policies can unintentionally reinforce health and economic disparities."

Paula Pereda, professor, Department of Economics, University of São Paulo, Brazil

Health inclusivity spotlight: women

Globally, women experience greater ill health than men. This gap widens with age, and data show that there has been little change in this trend over the past 30 years.[103] Looking across all stages of life, women experience healthcare inequities owing to unique social, economic and cultural barriers. Women of low socioeconomic status, low levels of education and women of minority and migrant backgrounds are most at risk, experiencing circumstances that often lead to delayed access to medical care, greater rates of treatment complications, and a higher rate of undiagnosed medical conditions.[104]

We have selected two conditions that disproportionately impact women—micronutrient deficiencies and musculoskeletal conditions—to illustrate the potential economic impact of addressing these disparities.

A silent crisis: the impact of micronutrient deficiencies on women's health

Unlike deficiencies in macronutrients, which are more visible and typically result in clear signs of malnutrition, micronutrient deficiencies—such as those in iron, zinc, folate, iodine and vitamins A, B12 and D—can go unnoticed for extended periods. These deficiencies can all have severe impacts, including weakened immunity, pregnancy complications and birth defects, growth impairments and cognitive impairment, which may not be immediately apparent but can impact women's overall health and well-being, as well as that of their children.[105]

Many factors, largely related to diet, food insecurity and poverty, contribute to micronutrient deficiencies.[106] Poverty and food insecurity lead to the consumption of diets that are high in calories (energy-dense) rather than nutrients (nutrient-dense) because the former are simply cheaper and easier to access.[107] "Even in the most remote areas of Mexico, even in areas where you can't get to by driving, where you need to walk or go by horse, even there, you'll find a store where you can buy soda drinks and sweets, but nothing nutritious," says Vanessa De la Cruz-Góngora, professor of nutrition and ageing in the School of Public Health of Mexico (ESPM). "And also, the soft drinks will be cheaper than buying milk or water." And women are more likely to be food insecure than men—60% of food insecure people in the world are women.[108]

Women are also especially susceptible to micronutrient deficiencies owing to the fact that they require higher levels of certain micronutrients as a result of menstruation, pregnancy and lactation—two-thirds of non-pregnant women of reproductive age worldwide have nutrient deficiencies, and pregnant women are at the greatest risk of developing them.[105,109,110] "For example, women of reproductive age require more than twice as much iron (18 mg) as men (8 mg), and pregnant women require more than three times as much iron (27 mg)," says Ty Beal, head of food systems data and analytics at Global Alliance for Improved Nutrition (GAIN). Dietary changes in menopausal and perimenopausal women give rise to elevated risk of nutrition-related conditions such as obesity, cardiovascular disease and osteoporosis, with significant impacts on quality of life and productivity; this can require mitigation via increased intake of B vitamins, vitamin C, vitamin D, calcium and protein. Beyond their inherently higher micronutrient needs, women also face a range of socially constructed nutrition-related challenges, such as their unequal access to nutrients. These gender-driven disparities range from inequalities in food production and farming, as well as in consumption of foods derived from animal sources, to differences in women's access to appropriate and reliable nutrition information and services such as food fortification and nutritional supplementation. Consequently, women and adolescent girls make up 60% of the 820m people worldwide with malnutrition.[111]

Iron deficiency, which affects 1bn people worldwide and is the most prevalent micronutrient deficiency among women of reproductive age, often gives rise to anaemia.[d,112] Anaemia is defined by the WHO as a condition in which "the number of red blood cells (and consequently their oxygen-carrying capacity) is insufficient to meet the body's physiological needs".[113] These needs can vary according to a person's location, age, gender and, in women, their pregnancy status and stage. Women are especially likely to have anaemia—almost a third of all women of reproductive age have the condition.[112] Along with the many causes of anaemia that affect both men and women, common drivers specific to women include consistently heavy menstrual bleeding, maternal blood volume expansion during pregnancy, and blood loss during and after childbirth, particularly in cases of postpartum haemorrhage.[112] Some 571m women worldwide face serious health problems linked to anaemia.[114]

Anaemia is especially prevalent in lower-income regions and communities.[114] This is partly due to their lower food security, with diets lacking in iron-rich foods being a major driver of anaemia. Half of young women in West and Central Africa and South Asia have anaemia, for example, and lower socioeconomic status also correlates with higher anaemia rates within relatively wealthy countries.[112,115,116] For example, there were almost 192,000 hospital admissions for iron-deficiency anaemia in England in 2023-24, a 104% increase as compared with 2013-14.[117] Healthy diets are unaffordable for the poorest 20% of the population in the UK, which contributes to micronutrient deficiencies and overall health inequalities.[118]

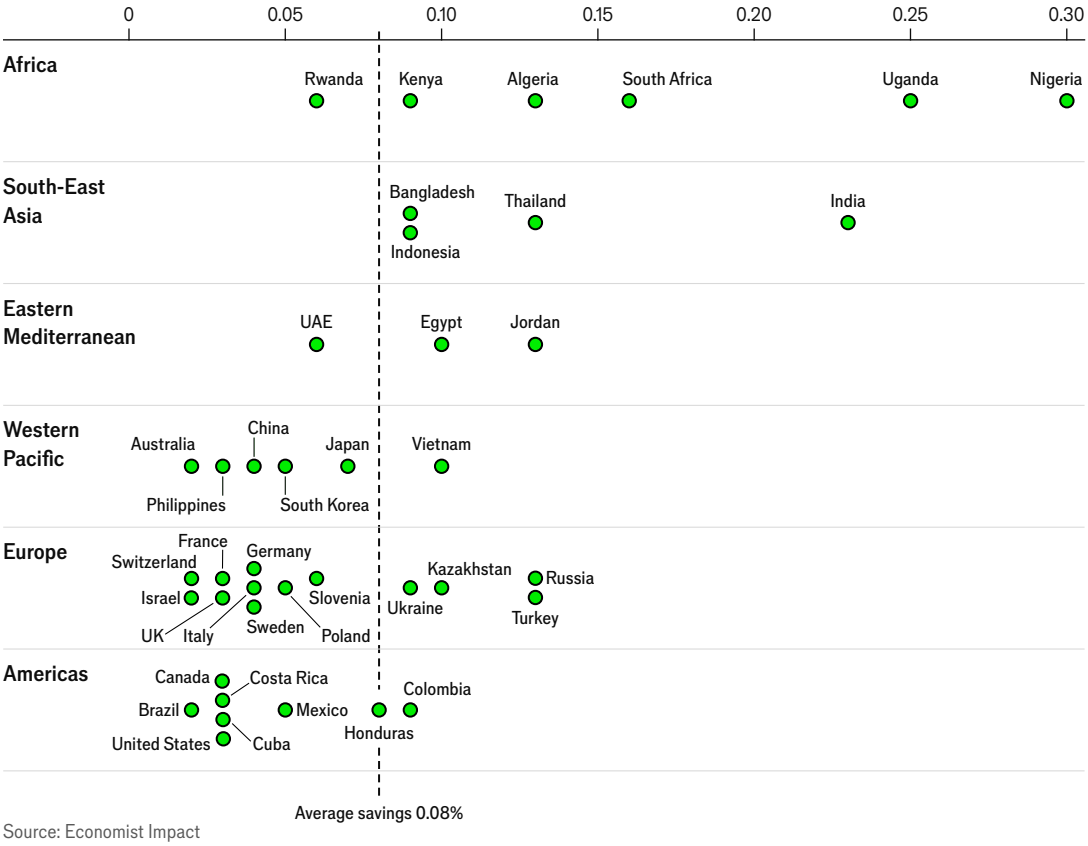
Anaemia costs the global economy billions of dollars in healthcare costs and indirect impacts such as work absenteeism and reduced productivity.[114,119] Conversely, the WHO estimates that every US$1 invested globally in interventions aimed at reducing anaemia in women could yield US$12 in economic returns.[114] With this in mind, the UN has set a goal, linked to Sustainable Development Goal 2 (SDG 2, "End hunger"), of reducing anaemia among women of reproductive age by 50% (from 2012 levels) by 2030.

Given the disproportionate impact of micronutrient deficiencies on women of reproductive age—and the lack of inclusive strategies to address it—we conducted an economic impact assessment using anaemia as a case study for tackling broader micronutrient deficiencies. The focus of the analysis was simple: what would be the individual, social and economic benefits of reaching the 2030 SDG target of reducing anaemia in women by 50% in the 40 countries of the Index?

[d] Anaemia can also be caused by a range of factors including other nutritional deficiencies, infections, inflammation, gynaecological and obstetric conditions, and inherited red blood cell disorders.

Figure 12: Reducing anaemia in women of reproductive age could benefit countries in Africa and South-East Asia the most

Annual savings, % of GDP



Source: Economist Impact

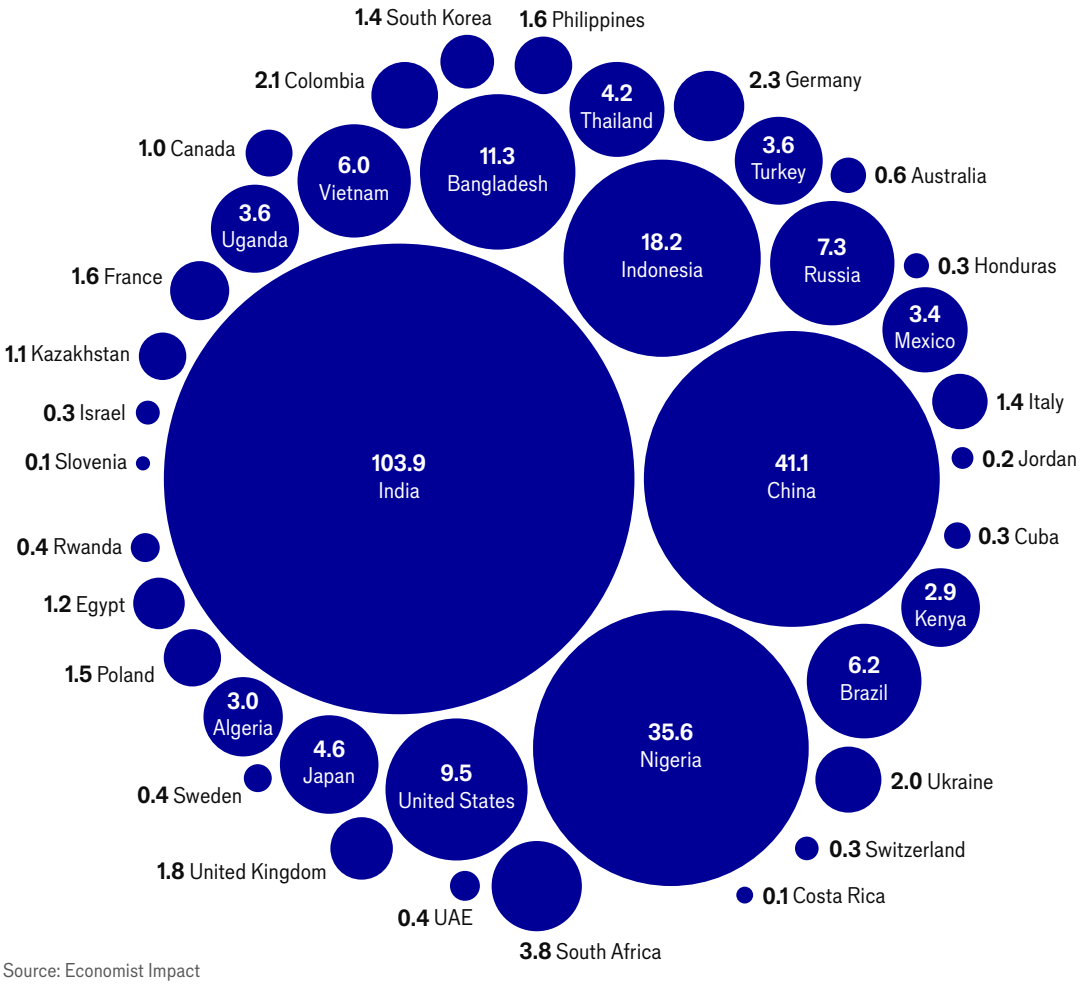
Health Inclusivity Index Phase 3 findings: the impact of reducing the burden of anaemia, and by extension micronutrient deficiencies, in women

- Across the 40 countries included in the Health Inclusivity Index, reaching the SDG target to reduce anaemia in women by 50% (from 2012 levels) by 2030 could result in an annual benefit of US$48bn through reduced healthcare costs and productivity gains.
- Across the 40 countries studied, women lose 568m workdays annually due to anaemia. Reflecting the elevated anaemia levels among women in lower-income groups, the greatest benefits would be seen in LMICs, especially in Africa and South-East Asia (see Figure 12). For example, our model predicts that achieving the SDG target for anaemia would result in productivity gains of 36m, 41m and 104m additional workdays for the female workforce in Nigeria, China and India, respectively; it would also provide an overall boost to GDP of more than 0.25% in Uganda and Nigeria (see Figure 13).
- However, our findings suggest this reward is threatened, with none of the 40 Index countries currently on track to achieve the SDG target (see Figure 14). Concerningly, rather than progressing towards the goal, nearly three-quarters of the countries are witnessing an increase in the prevalence of anaemia among women of reproductive age. Due to rising anaemia rates, countries like Jordan, France, Germany and Vietnam would each need an almost 60% reduction in anaemia rates to meet their SDG target.

- Some countries are performing better. Having achieved a 27% reduction thus far, the Philippines is the closest to achieving the 2030 SDG target. Brazil and Egypt are faring the next best with more modest progress, achieving reductions of 12% and 9%, respectively. Lower- and upper-middle-income countries such as these may not have necessarily been the ones expected to make the greatest strides on anaemia reduction, but they offer potential lessons to policymakers in other countries. For example, government food fortification programmes in the Philippines have been cited as a major factor in the reduction of anaemia among women of reproductive age, including in rural areas, where anaemia levels had previously been high.[120]

Figure 13: Over 290m work days gained each year from achieving the Sustainable Development Goals on anaemia reduction in women across the 40 Index countries

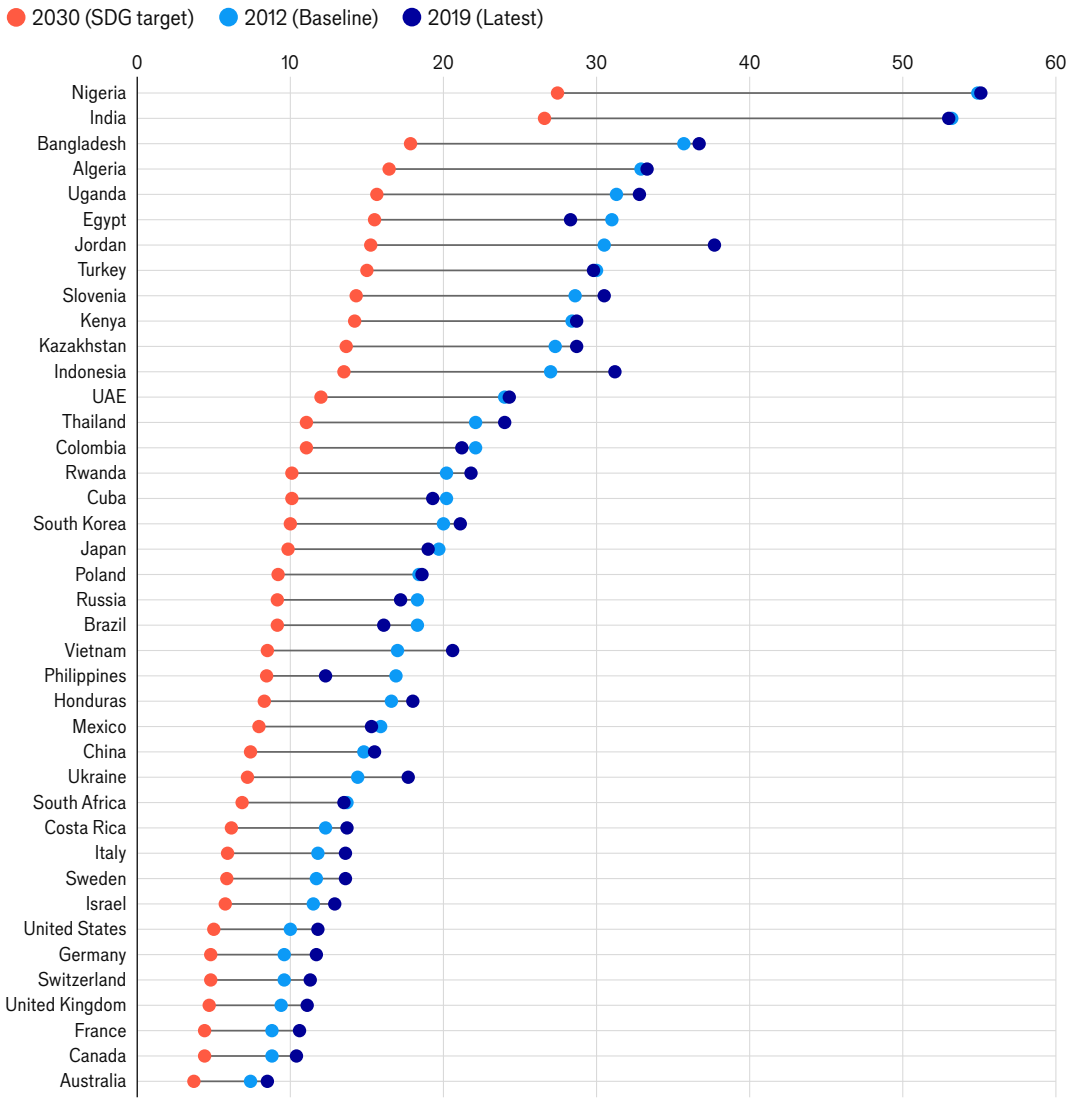
Per country, m



Source: Economist Impact

Figure 14: Little progress has been made in reducing anaemia in women since 2012 in many of the 40 Health Inclusivity Index countries

Prevalence, % of women (aged 15-49 years)



Source: WHO's Global Health Observatory

Understanding causes and driving prevention: tackling micronutrient deficiencies to advance women's wellness

Taking concerted and strategic steps to prevent, diagnose early and treat micronutrient deficiencies would mean that hundreds of millions of women worldwide would have better health outcomes. They would live healthier, more active lives, leading to clear economic and productivity benefits.

Given the oversized health and economic burden of anaemia on women worldwide, countries must work harder to achieve the SDG goal of a 50% reduction (from 2012 levels) in anaemia among women of reproductive age by 2030. In a framework published in 2023, the WHO sets out five action areas to achieve "sustained, equitable and effective" impacts on anaemia prevention, diagnosis and treatment.[114] These action areas begin with analysing cause and risk-factor data, ranging from haemoglobin levels to population-level assessment of diet. As well as developing a better understanding of the matrix of causes of anaemia in a specific setting, policymakers should prioritise key preventive and therapeutic interventions and optimise service delivery to ensure those interventions are accessible and effectively implemented. Added to this, the WHO's action points include strengthening leadership, coordination and governance through national anaemia/nutrition policies. The WHO also advises expanding research, learning and innovation to expand knowledge on the effectiveness of interventions and innovative approaches to delivering them.

Given the strong link between food insecurity and anaemia, and the disproportionate prevalence of food insecurity among women, improving food security is crucial to reducing anaemia rates among women. The UN Food and Agriculture Organization (FAO) advocates a twin-track approach to ensure food security.[121] The first area of focus—rural development and productivity enhancement—focuses on longer-term investment and development in areas such as infrastructure, land access, agricultural diversity, and reintegration of refugees and displaced people, among many others. The second area of focus—direct and immediate access to food—sets out shorter-term steps, such as food aid, cash transfers and peace-building efforts in areas of conflict. Beyond this, there are also successful examples of behaviour-change interventions. For example, programmes in Nigeria engage women in adding fortified stock cubes or leafy greens to recipes to increase the nutrient levels in foods.[122]

Such broad actions require integrated, cross-sectoral collaboration. Policy strategies need to engage the health and nutrition, as well as the food and agriculture, sectors. Diversification of diet, nutrient supplementation and fortification of foods with micronutrients are some key multisectoral strategies proven to address the issue. Policymakers should also look at awareness-raising around anaemia and dietary education programmes targeted at women and girls. As with other areas linked to awareness and health-related education, efforts to improve health literacy would help to improve the impact of prevention of both micronutrient deficiencies and musculoskeletal conditions in women.[114] "Awareness, accessibility and affordability—all of these are important," says Prof de la Cruz-Góngora. "You can't just have one; each of these has a strong impact on nutrient consumption."

"Awareness, accessibility and affordability—all of these are important… You can't just have one; each of these has a strong impact on nutrient consumption."

Vanessa de la Cruz-Góngora, professor of nutrition and ageing, School of Public Health of Mexico (ESPM)

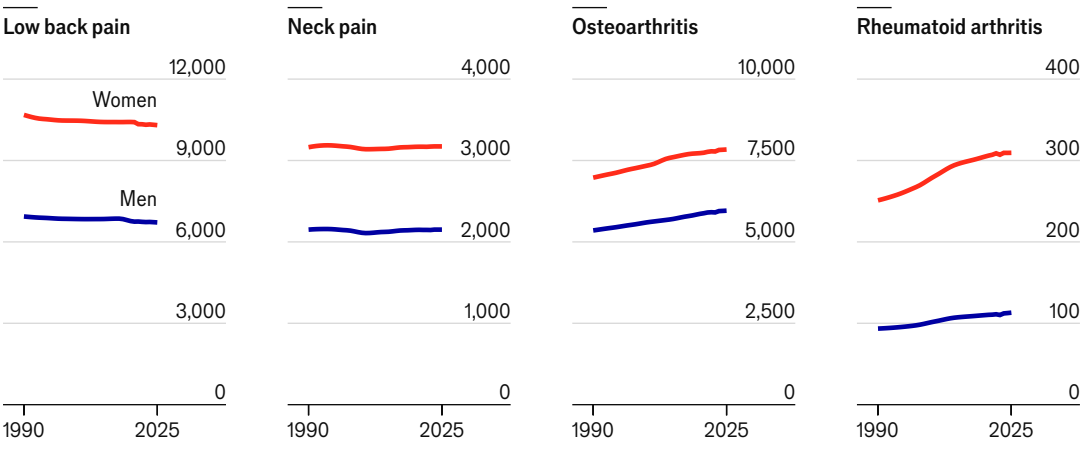
Higher prevalence, greater severity: the impact of musculoskeletal conditions in women

Our second economic impact assessment related to health inclusivity and women looks at the disproportionate burden women face from musculoskeletal conditions. These conditions, which affect the bones, joints, muscles and connective tissue such as cartilage and ligaments, are the largest global contributor to years lived with disability (YLDs)—they cause approximately 149m YLDs each year, 17% of the global total.[123] However, this burden shows a marked gender imbalance, with musculoskeletal conditions being more prevalent and severe among women.[124] For example, across the 40 Index countries, the prevalence of low back pain and neck pain is around 50% higher in females as compared to males, while the prevalence of rheumatoid arthritis is 175% higher (see Figure 15).[3]

Musculoskeletal conditions typically manifest in pain, and it is widely recognised that women often have difficulty in having their pain recognised and appropriately investigated and treated by healthcare professionals.[125] A German study further found that women with musculoskeletal conditions were more likely than men to have no improvement in their condition despite treatment, suggesting that treatments are suboptimal for women.[126] Partly, this is because women are under-represented in drug trials—despite an increase in participation, women still make up only 41% of participants in US trials, for example.[127] Not only does this undermine the effectiveness of treatments for women, it also leads to over-medication (as doses are based on male-dominated trials), which gives rise to a greater burden from side effects.[128] In addition, there is limited evidence investigating basic sex differences in musculoskeletal tissues that might help to advance the understanding and development of improved therapies.[129]

Figure 15: Women experience a higher burden of low back pain, neck pain, knee osteoarthritis and rheumatoid arthritis

Age-standardised prevalence of musculoskeletal conditions by gender across the 40 Health Inclusivity Index countries, per 100,000 population



Source: Global burden of disease

There is also an interplay of micronutrient deficiencies and musculoskeletal conditions. Micronutrient deficiencies can lead to reduced musculoskeletal strength, and women are particularly likely to suffer these impacts, owing to generally having lower muscle mass than men.[130,131] The effects of the two conditions combined amplify their impact—one study found that the combination of anaemia and weak muscles heightens the risk of death within ten years by 117% in women aged 50 and over, as compared with 64% in men of the same age group.[131]

To assess the impact of health inclusivity on musculoskeletal conditions among women in the 40 Health Inclusivity Index countries, we estimated the health and economic burden of reducing the impact among women of four musculoskeletal conditions. Specifically, we focused on lowering the recurrence of low back pain and neck pain, and the onset of osteoarthritis (the breaking down of cartilage and underlying bone in the knee joints) and rheumatoid arthritis (an autoimmune condition that results in swollen, stiff and painful joints), all conditions that have a higher prevalence among women—through primary and secondary prevention. Primary prevention measures focus on lowering the risk of a condition developing by addressing modifiable risk factors, while secondary prevention aims to prevent the recurrence of a condition after an initial episode.

Health Inclusivity Index Phase 3 findings: the impact of reducing the burden of musculoskeletal conditions in women

- Musculoskeletal conditions such as low back pain, neck pain, knee osteoarthritis, and rheumatoid arthritis cost economies US$120bn annually in healthcare expenses and lost productivity across the 40 countries studied in the Index.
- The cost of musculoskeletal conditions could be slashed drastically—by US$51bn—if countries increased access to, and uptake of, primary and secondary prevention for these conditions among women. Particularly important are reducing modifiable risk factors such as obesity, poor diet, smoking promotion of physical activity, and early access to diagnosis and effective treatment. It should be noted that our estimates are conservative as our analysis focused on the secondary prevention of low back pain and neck pain, preventing their onset in the first place could result in even greater savings.
- Musculoskeletal conditions are a major cause of work absences, with 155m work days lost every year in Index countries. These conditions can also lead to an early exit from the workforce. Improving access and uptake of primary and secondary preventive care for musculoskeletal conditions tackles a key barrier to reduced workforce participation among women.

Supporting strength: tackling musculoskeletal disorders in women

Tackling musculoskeletal disorders in women has the potential to bring both individual and societal benefits. The first step is prioritisation. Musculoskeletal conditions are a significant cause of work absences and can lead to an early exit from the workforce.[132] Yet they "aren't prioritised as highly as they should be when you consider their immense economic burden," says Kristina Åkesson, professor of orthopaedics at Lund University, Sweden. Better primary and secondary prevention of musculoskeletal conditions could help women to remain healthy and stay in the workforce for longer, which is critically important in our ageing society. It is also vital from an inclusivity perspective. Women already face many barriers to workforce participation, with only 47% of women participating in the labour force, as compared to 72% of men.[133] This has wide-ranging impacts on their lives, including their income, personal agency and ability to access healthcare.

There is also the unfortunate reality of gender disparities in research and, therefore, treatment—efforts are needed to ensure musculoskeletal research is reflective of the specific burden faced by women. Partly, this may be a question of funding. "Looking at the research money going into musculoskeletal conditions, in relative terms, it hasn't increased at all over the past 25 years," explains Prof Åkesson.

Interdependent and high-potential: a gender-inclusive lens for micronutrient deficiencies and musculoskeletal conditions would have a payoff for all

Our analyses reveal the economic impact of micronutrient deficiencies and musculoskeletal conditions on women's health. Despite their distinctions, both micronutrient deficiencies and musculoskeletal conditions exert wide-ranging effects on women's health globally. Developing tailored, holistic strategies to mitigate these conditions could yield ripple effects across a broad spectrum of other areas, enabling women to achieve better health and engage more actively in society. In simple terms, addressing these two conditions would significantly improve health inclusivity for women and deliver extensive economic and social benefits for countries as a whole.

Health inclusivity spotlight: people aged 50 and over

The world's population is ageing, with life expectancy showing impressive growth since the 1950s and the number of individuals aged 50 and over steadily increasing (see Figure 16).[134] This trend is not restricted to Europe or North America, with Latin America and the Caribbean predicted to experience a ten-year increase in the median age of the population from 31 to 41 years between 2020 and 2050.[135] In light of this population ageing, people will need to work longer and stay in good health in order to do so effectively.[136]

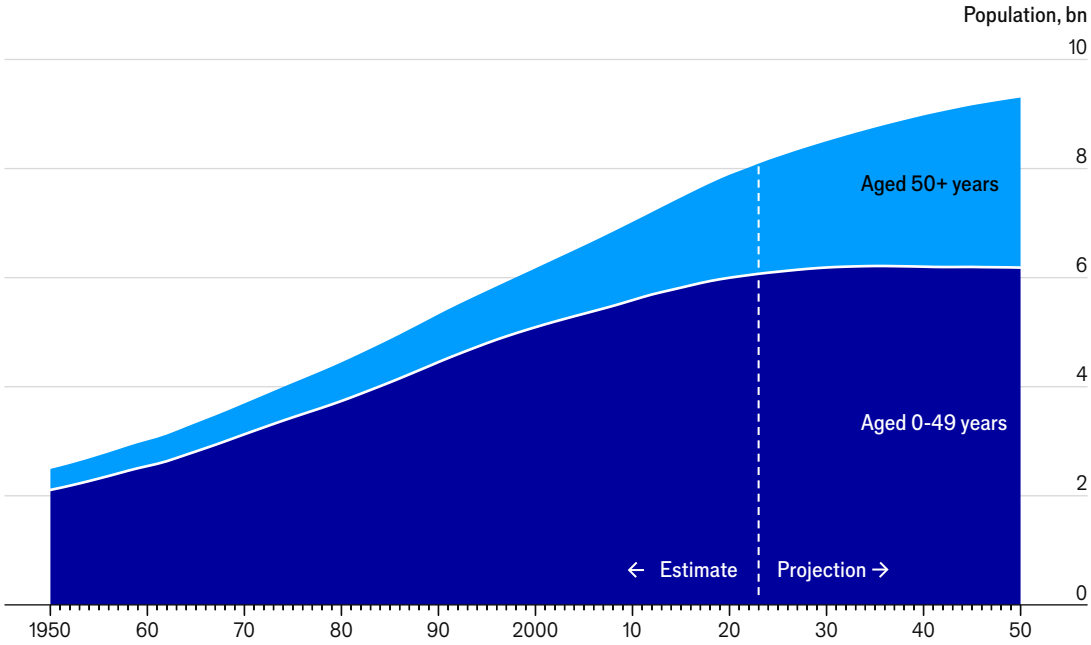
However, evidence suggests that the converse is happening—people are living longer in poorer health, with conditions such as osteoarthritis, hearing and vision loss, depression and dementia becoming increasingly common with age.[137,138] Older people experience greater challenges with accessing care, due to lower income and socioeconomic status, poorer health and digital literacy, issues with mobility and transport, shortages of integrated specialist care and caregivers, as well as difficulties in navigating fragmented health systems.[139] All of this can lead to, or exacerbate, declines in quality of life, physical activity and social engagement. These are all major challenges to achieving health inclusivity among older people. An older population living more years in ill health will also have a direct economic impact—public spending on healthcare and long-term care is expected to rise significantly across countries of all income levels in the coming decades.[140]

Widespread and undertreated: the age-related impact of musculoskeletal conditions

Musculoskeletal conditions are among the most common health issues affecting older people, and certain disorders are disproportionately prevalent among them. One significant consequence of population ageing is that the number of older people with musculoskeletal conditions is rising, as are the related health and economic burdens.

Musculoskeletal conditions impose a significant economic burden through higher healthcare costs, long-term care needs, and lost productivity.[141] Around 1.7bn people have musculoskeletal conditions worldwide—they are the leading contributor to disability, with low back pain being the single leading cause of disability in 160 countries.[123] At the individual level, musculoskeletal conditions can reduce the capacity to engage in physical and social activity and drive functional decline, resulting in frailty, reduced wellbeing and loss of independence.[142]

Figure 16: The proportion of older people in the world's population is increasing
Global population by age group



Source: UN

Among the musculoskeletal conditions which become more common with age are osteoarthritis, knee pain and back pain. Another significant musculoskeletal condition that becomes increasingly common with age is osteoporosis, which causes bones to become weak and brittle and prone to fracture even with low-intensity impacts.[143] The condition is more common among older women owing to the hormonal changes associated with menopause, with one in two women over 50 experiencing an osteoporotic fracture in their lifetime compared to one in five men.[e,4]

Because osteoporosis has no overt symptoms, it is significantly under-detected and under-treated, often only being diagnosed after a person has had their first fracture. For example, in Europe, on average, about 71% of women who meet the criteria for osteoporosis treatment are not treated.[144] Furthermore, the impact of osteoporosis on men is under-appreciated. "Around one-third of osteoporotic fractures occur in men, and with it comes significant health and societal costs," says Mickaël Hiligsmann, associate professor in health economics and health technology assessment at Maastricht University's CAPHRI Care and Public Health Research Institute. Research also shows that men have higher mortality rates after osteoporotic fractures than women.[145] "Greater focus is needed to address osteoporosis needs in this patient group," says Prof Hiligsmann.

The main goal in treating osteoporosis is to strengthen bones and reduce the risk of fractures as they have a major impact on individuals' lives. Not only do fractures cause pain, inhibit mobility, and impact independence, but they are also associated with an increased risk of death, particularly in the year after the fracture.[146] Fractures of the hip and spine are among the most common and are the most serious.

The impacts that musculoskeletal conditions have on movement lead to reduced ability to work, earlier retirement, lower levels of well-being and a generally reduced ability to take part in society.[147] There is also a clear bidirectional association with mental health challenges—some mental health conditions increase the risk of musculoskeletal conditions, while musculoskeletal conditions can have significant impacts on quality of life and, therefore, mental health. Among people with arthritis in the US, one in eight report experiencing depression symptoms (as compared with around 1 in 20 among the general population), while more than one in five report symptoms of anxiety (as compared with around 1 in 25 among the general population).[148-150]

A profound burden of musculoskeletal disease exists in both developed and developing nations, far exceeding service capacity. High-income countries face the highest burden, with 441m people affected.[123] In these countries, population growth and ageing, along with

[e] The definition of an osteoporotic fracture is challenging, not least because many people globally never have bone mineral density measurement and remain undiagnosed. In line with the approach used in the International Osteoporosis Foundation's SCOPE report, we considered all fractures of the hip and spine in individuals aged 50 and over as likely to be related to osteoporosis, as fractures at these sites increase with greater loss of bone mineral density and increase with age.

a rise in sedentary lifestyles, are driving a significant social and healthcare burden, to which musculoskeletal conditions are a major contributor.[142] The burden is also significant in lower-income countries—as is the challenge facing the less well-equipped health and social care systems in those countries.[123]

To assess the impact of tackling musculoskeletal conditions among people aged 50 and over in our 40 countries of interest, we conducted an economic impact assessment centred on four conditions—the recurrence of low back pain and neck pain, and the onset of knee osteoarthritis and rheumatoid arthritis. Separately, we assessed the impact of efforts to combat the effects of osteoporosis on people aged 50 and over. Osteoporosis was analysed individually as osteoporotic fractures are associated with a significant increase in mortality, and this was factored into the economic model. For the other four musculoskeletal conditions, the main economic impacts stem from the pain and disability they cause so only healthcare and productivity costs were considered.

Health Inclusivity Index Phase 3 findings: the impacts of reducing the burden of musculoskeletal conditions in people aged 50 and over

To ascertain the potential gains from an improved picture in terms of musculoskeletal conditions among older population groups, we assessed the direct and indirect benefits associated with increasing access to, and uptake of, primary or secondary prevention for these conditions.

For example, the onset of knee osteoarthritis can be reduced by reducing obesity, a major risk factor (primary prevention). Meanwhile, the recurrence of low back pain and neck pain can be minimised through exercise and educational programmes (secondary prevention). Osteoporotic fractures can be prevented through improved detection and treatment of osteoporosis either before individuals experience a fracture (primary prevention), or after they experience a first fracture (secondary prevention). Strength training and dietary interventions (such as calcium supplements) are also important preventive elements,

as is education around the causes and prevention of musculoskeletal conditions. The benefits of increasing access to primary and secondary prevention across these musculoskeletal conditions would be clear and significant.

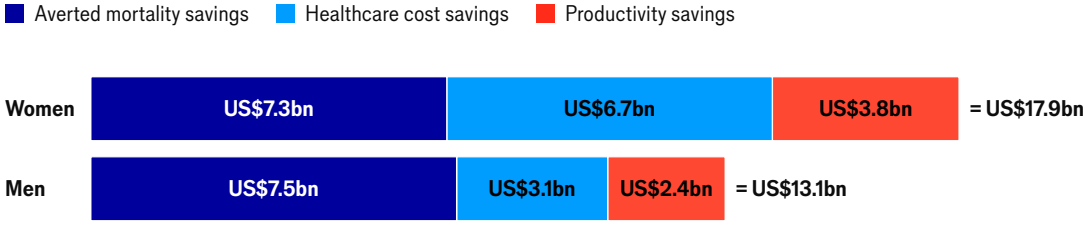
- In the 40 Index countries, the total annual economic burden of the recurrence of low back pain and neck pain and the onset of knee osteoarthritis and rheumatoid arthritis is US$121bn, with nations that have a larger number of older people facing the highest costs.
- Increasing access to, and uptake of, primary and secondary prevention for these four conditions could save the 40 Index economies a combined total of over US$50bn annually through reduced healthcare costs and increased productivity. It should be noted that our estimates are conservative as our analysis focused on the secondary prevention of low back pain and neck pain, preventing their onset in the first place would result in even greater savings.
- A key target for secondary prevention should be low back pain, which is the most common musculoskeletal condition among older people. Improving access to care for low back pain could significantly reduce its recurrence and save nearly US$34bn per year across the 40 countries studied.
- Hip and spinal fractures among people aged 50 and over cost the 40 economies in the Index US$141bn annually in premature mortality, healthcare costs and reduced productivity.
- Improving bone health through better access to osteoporosis detection and care to reduce osteoporosis-related fractures of the hip or spine by 20% and 30%, respectively, across the 40 Index countries, results in an annual economic benefit of US$31bn in healthcare savings and productivity gains (see Figure 17).
- The greatest gains would be seen in the countries with the oldest populations—Japan, where nearly 50% of the population is aged 50 and over, faces the highest economic burden from osteoporosis-related hip and spinal fractures, costing the economy 0.3% of annual GDP, could save almost US$2.5bn annually.[151]

These figures are likely to underestimate the potential benefit of comprehensive efforts to prevent, detect and treat osteoporosis. They use conservative assumptions of the effectiveness of treatment and do not include the impact of osteoporotic fractures at sites other than the hip and spine.

Furthermore, the estimates do not account for the benefits of reducing the burden of co-morbidities that commonly accompany musculoskeletal conditions, such as depression and anxiety. “Depression attributable to musculoskeletal pain accounts for approximately 10% of the economic burden of musculoskeletal conditions.” says Manuel Antonio Espinoza, associate professor of health economics, at the School of Public Health at The University of Hong Kong. Therefore, the impact of addressing musculoskeletal conditions may have knock-on health and economic benefits for older people, and society at large.

Figure 17: Promoting bone health results in substantial savings across genders

Economic benefit of averted premature mortality, reduced healthcare costs and productivity gains, by gender, US$



Source: Economist Impact

Strength in ageing: addressing musculoskeletal health in the over 50s

Increased life expectancy is a success story of advances made in public health and clinical medicine over many decades. People living longer bring vast financial, social and cultural benefits.[147] Yet, like any demographic shift, it also requires adaptation to ensure that people are best supported to benefit from such positive consequences. Part of this involves tackling the increased burden of health challenges, such as musculoskeletal conditions, among older people.

Musculoskeletal conditions significantly impact mobility, limiting the ability of people—especially those aged 50 and over—to enjoy active lives. As highlighted in the previous section of the report, these conditions have a gendered impact, with women more strongly affected by multiple musculoskeletal conditions.[124] Meanwhile, the vicious cycle that can be formed by musculoskeletal and mental health conditions further impacts the quality of life of those affected, along with families, loved ones and carers. All of this adds up to a significant toll on health and wellbeing for many people.

This could be viewed as the behavioural or human side of our economic analysis. People not being able to live their lives to their full potential has a cost, and this cost is huge in aggregate. Similarly, the savings we have identified that can result from tackling the impacts of musculoskeletal conditions among people aged 50 and over demonstrate the importance of action to older people, their communities and economies more widely.

To realise these savings, health systems need to ensure that appropriate services are available to help prevent, detect and treat musculoskeletal conditions among older people. Primary prevention activities include the reduction of modifiable risk factors for musculoskeletal conditions such as rheumatoid arthritis and knee osteoarthritis—factors such as obesity, lack of physical activity, poor diet, poor dental hygiene and smoking.[152] Physical activity is not only useful in helping to prevent the onset of musculoskeletal conditions, it can also help prevent the recurrence or worsening of neck and back pain (secondary prevention).[153,154] Early-detection tools such as bone-density testing are also effective. Meanwhile, under-detection and undertreatment can also be countered using policy interventions such as making musculoskeletal reviews part of health checks among people aged 50 and over, and promoting strength and weight-bearing exercise, adequate intake of calcium and vitamin D, and, in some cases, hormone treatment.[155]

People's habits and beliefs when it comes to ageing and physical activity are already changing. "There's a completely different attitude to growing older and reaching retirement age," says Prof Åkesson. "So many

more are out running or going to gyms. There is an increasing awareness that it's not dangerous—you can go to a gym and you can lift weights at any age and benefit." Improving access to appropriate exercise programmes for people aged 50 and over could support them in their quest to stay healthy and active.

Weight-bearing exercise also helps to boost bone density and muscle mass and reduce the risk of osteoporosis.[156] Other ways to reduce osteoporosis risk include maintaining a healthy weight (as being underweight is a risk factor), ensuring adequate intake of calcium, protein and vitamin D in the diet, and adding supplements if dietary intake is insufficient.[157] Cutting back on alcohol and smoking also helps to reduce bone loss and fracture risk.[156] All of these preventive efforts can be reinforced and bolstered by an educated, proactive healthcare workforce, especially in primary care—and this in itself requires policy support. "We need to make sure that all primary care physicians are having extra education in musculoskeletal health," says Prof Åkesson. "They are the ones who are going to drive prevention." For osteoporosis, this involves being aware of the risk factors for osteoporosis and osteoporosis-related fractures among older people, as well as using risk assessment tools plus bone density scanning to assess their fracture risk.

Improved detection of individuals at high risk of osteoporotic fractures is crucial to ensure that they receive the treatment they need to reduce this risk. In 2019, only 29% of women at high risk of osteoporotic fractures in Europe were receiving treatment.[158] Even after an older person suffers a fracture, 80% are still not assessed or treated for osteoporosis.[159]

There are clearly opportunities being missed to intervene and reduce the impact of fractures, both for individuals and wider society. Intervening to prevent subsequent osteoporotic fractures in people who have already experienced one has been identified by the International Osteoporosis Foundation as the most effective way to improve patient care and reduce fracture-related costs.[160] They facilitate this through their global Capture The Fracture programme, which provides a variety of tools and guidelines for post-fracture care aimed at systematically identifying people with a high risk of fracture so they can be appropriately treated.[160]

In addition to making sure that inclusive care is available, it is important to ensure that older people are well informed about the importance of musculoskeletal health and how to maintain it. Policymakers should also raise awareness of the services available to older people, and ensure that they are able to access them in a timely fashion. Modern society, including health systems, is increasingly reliant on technology, but providers need to ensure that technology does not create more barriers for older people to access information and services—which links back to the risks of lower digital health literacy among older people impacting health inclusivity, as discussed earlier in this report.[161,162]

The rural-urban divide can also impact health inclusivity for older people. In some countries and regions, including the US and the EU, the proportion of older people living in rural areas is higher, and health services can be harder to access in these areas.[163,164] Evaluating these and other health inclusivity challenges older people face within countries will be important in developing holistic solutions to address them.

Providers need to ensure that technology does not create more barriers for older people to access information and services.

Conclusion: a systemic, cross-sectoral approach to health inclusivity pays dividends

Across Phases 1, 2 and 3 of the Health Inclusivity Index, we set out to measure and quantify the significant health, social and economic impacts of boosting health inclusivity in 40 countries of varying incomes worldwide. In addition, our research in Phase 2 showed that policies alone are not enough—there is a clear gap between policymaking and lived experience that can only be bridged by implementation, alongside people and community empowerment. In this report, we analysed seven health topics spanning a range of large, yet underserved, populations. In doing so, we demonstrate that the benefits of acting on health inclusivity are substantial:

US$303 bn saved annually, and Index countries' economies boosted by 0.4%, with a 25% reduction in low health literacy

US$12,000 per-person saved in low-income groups through targeted oral health interventions between the age of 12-65 years

57 million people prevented from developing type 2 diabetes from better managing their gum disease over 10 year

4.5m deaths avoided annually (2.1m of these are among the lowest-income groups) by achieving the WHO's air pollution targets, as well as savings of over US$100 bn

US$48 bn saved annually by achieving SDG target to halve anaemia (from 2012 levels) among women by 2030; 290m workdays added for women

>40% reduction in costs related to musculoskeletal conditions by increasing older people and women's access to primary and secondary prevention

US$31 bn added to Index economies by promoting bone health (reducing premature mortality and healthcare costs, increasing productivity gains)

Our analysis highlights the urgent need for countries to capitalise on the benefits of inclusive health, but the approach they take is crucial. Our research encompasses billions of people who find themselves as members of underserved populations—people with low health literacy, lower-income groups, women, and older people. Our analyses centred around health topics that are addressable with proven solutions available to reduce their burden – the challenge for our focus population is the ability to access and utilise them.

The evidence we have uncovered has led us to **three key calls to action** that align with the three domains that are the focus of the Health Inclusivity Index: People and Community Empowerment, Inclusive Health Systems, and Health in Society.

1. People and Community Empowerment: Take a public health approach to inclusive health literacy

Health literacy affects every topic area, condition and population group covered in this report, and combating low health literacy would have positive impacts across all of them. Firstly, it empowers people to practise prevention and self-care, which helps to ensure that people remain in generally good health and wellbeing. Secondly, health literacy helps people to be more aware of health challenges and how to detect them, meaning that they can seek timely assessment, diagnosis and treatment, potentially lessening the impact of serious conditions. Thirdly, it helps people to understand how health systems work, what services are available and most appropriate to specific issues, and how to access and navigate them. Combined, these three positive effects of high health literacy help ensure that people enjoy better health and live fuller, more productive lives. A health-literate population also reduces the burden on health services and ensures that they are used in the most efficient way.

Policymakers must take a public health approach to health literacy—this means setting policy on the basis that it is the role of health systems (and the education sector) to enable individuals to comprehend health information, navigate health systems and manage their health. This approach spans both organisational and professional health literacy—healthcare services must enable health literacy among the general public and professionals working in healthcare and education. On a wider scale, policymakers must treat raising health literacy as a truly multisectoral effort—schools, universities, workplaces, community amenities, businesses and more must all be engaged when it comes to ensuring inclusive health literacy among their students, employees, local residents, customers, and so on.

Put simply, policymakers must prioritise inclusive health literacy as a strategic tool to equip people to make informed decisions about their health and wellbeing. Doing so will unlock huge amounts of health and economic potential—as demonstrated by the analysis conducted in Phase 3 of the Health Inclusivity Index.

2. Inclusive Health Systems: Ensure access to care for all

Beyond empowering people to take ownership of their health and understand how to navigate health systems, policymakers must ensure that appropriate, necessary and quality care is accessible, available, affordable and culturally appropriate for all. Avoidable morbidity and mortality inflict a major cost on individuals, their families, society and economies. Yet, a major factor affecting all of the underserved populations covered in this report is the barriers to access. Access challenges are at the heart of what it means to be underserved by health services—as are poorer outcomes and more time lived with illness. A less-well population results in a less dynamic, less cohesive, less productive society.

Health policy must ensure that access to healthcare is available for all. This means understanding which sectors of the population are underserved and why, whether that be due to income level, race and ethnicity, gender, age, lack of health literacy, or any number of possible reasons for exclusion at the point of access and beyond. This includes access to research—women are just one example of a population that must be better represented in research so that treatment and understanding of conditions is inclusive of, and applicable to, all.

3. Health in Society: Make health inclusion a crosscutting imperative

As demonstrated by the broad scope of health inclusivity, it is a multisectoral issue. In this sense, it is grounded in the social determinants of health, described by the WHO as "the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life."[5] As we have seen, these determinants are central to the health disparities presented in this report. Micronutrient deficiencies and musculoskeletal conditions in women, for example, are strongly linked to food insecurity, income and discrimination. Health literacy is reliant on education and social inclusion. Air pollution relates to issues around working conditions, housing and the environment. Oral health is closely tied to education, income, and access to affordable and high-quality healthcare services. Education around diet and physical activity, as well as food insecurity and income-related barriers to exercise, are key factors impacting outcomes related to musculoskeletal conditions, including among the over-50s population. The final determinant impacting all of the issues covered in this report is social inclusion and non-discrimination—in short, health inclusion has significant crossover effects with social inclusion.

Policymakers must use the social determinants of health to advocate for the incorportation of health inclusivity considerations in policy- and decision-making beyond the health sector. The benefits reach far beyond the health service and the health of individuals. Equally, health inclusivity can only achieve its full potential if embedded in policies surrounding education, social care, housing and urban planning, employment, food and agriculture, and the environment, among others. Policymakers must take a multisectoral approach if they are to properly implement, and achieve, health inclusion in a systemic way.

The results of the analysis in this latest phase of the Health Inclusivity Index demonstrate that achievable, measurable inclusivity would have significant individual, social and, crucially, economic benefits. With a concerted focus on achieving progress in the three areas highlighted above, countries across the world would see improvements in the health, wellbeing, social participation and productivity of vast swathes of their populations. It is imperative that countries act now to capitalise on the significant health and economic benefits offered by health inclusivity.

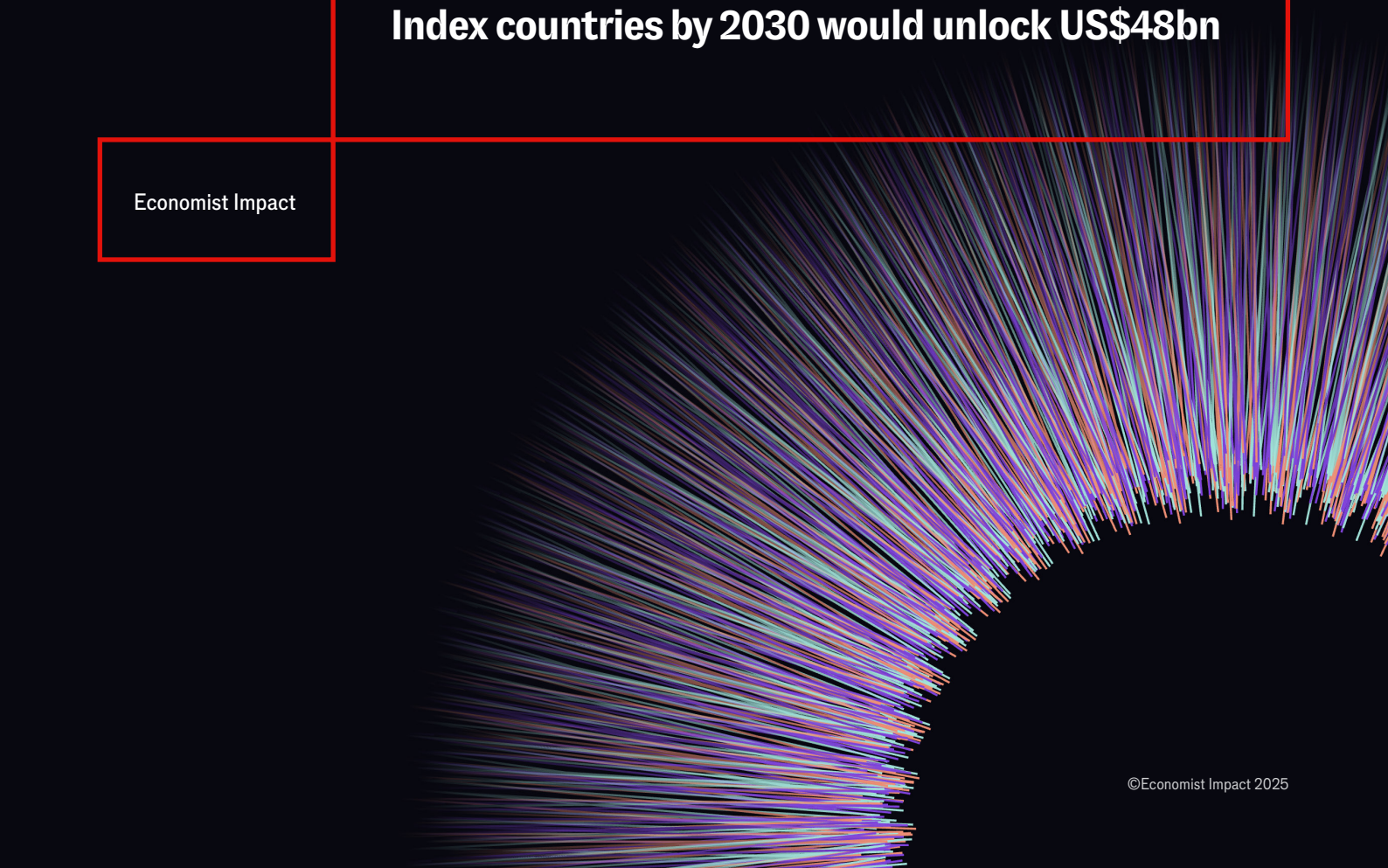
US$303bn A 25% decrease in low health literacy would save Index countries US$303bn in annual healthcare costs

US$181bn Reducing the risk of developing type 2 diabetes as a result of improved oral health care would save Index countries US$181bn over ten years

US$101bn Reaching World Health Organization target levels of air quality across the Index countries would result in an annual economic benefit of US$101bn

US$48bn Achieving the SDG target to halve anaemia among women of reproductive age in Index countries by 2030 would unlock US$48bn

Economist Impact



References

1. Economist Impact. The Health Inclusivity Index: measuring progress towards good health for everyone. Economist Impact, 2022. Available from: https://impact.economist.com/projects/health-inclusivity-index/documents/EI-Haleon_Report_A4.pdf.

2. Economist Impact. The Road to Health Inclusivity: from policy to practice. Economist Impact, 2023. Available from: https://impact.economist.com/projects/health-inclusivity-index/documents/the_road_to_health_inclusivity_health_inclusivity_index_2023_economist_impact_final.pdf.

3. IHME. Global Burden of Disease (GBD) [Internet]. Seattle WA: Institute For Health Metrics And Evaluation (IHME). Available from: https://www.healthdata.org/research-analysis/gbd.

4. Coughlan T, Dockery F. Osteoporosis and fracture risk in older people. Clin Med (Lond). 2014;14(2):187-91.

5. World Health Organization. Social determinants of health [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1.

6. World Health Organization. Health literacy [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news-room/fact-sheets/detail/health-literacy.

7. Griffey RT, Kennedy SK, D'Agostino McGowan L, et al. Is low health literacy associated with increased emergency department utilization and recidivism? Acad Emerg Med. 2014;21(10):1109-15.

8. Rasu RS, Bawa WA, Suminski R, et al. Health Literacy Impact on National Healthcare Utilization and Expenditure. Int J Health Policy Manag. 2015;4(11):747-55.

9. Zaidman EA, Scott KM, Hahn D, et al. Impact of parental health literacy on the health outcomes of children with chronic disease globally: A systematic review. J Paediatr Child Health. 2023;59(1):12-31.

10. Lee HY, Zhou AQ, Lee RM, et al. Parents' functional health literacy is associated with children's health outcomes: Implications for health practice, policy, and research. Children and Youth Services Review. 2020;110:104801.

11. Randall S. Health information: are you getting your message across? [Internet]. National Institute for Health and Care Research (NIHR). Available from: https://evidence.nihr.ac.uk/collection/health-information-are-you-getting-your-message-across/.

12. World Health Organization. Billions left behind on the path to universal health coverage [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news/item/18-09-2023-billions-left-behind-on-the-path-to-universal-health-coverage.

13. Boing AF, deSouza P, Boing AC, et al. Air Pollution, Socioeconomic Status, and Age-Specific Mortality Risk in the United States. JAMA Netw Open. 2022;5(5):e2213540.

14. Madsen C, Gabbe BJ, Holvik K, et al. Injury severity and increased socioeconomic differences: A population-based cohort study. Injury. 2022;53(6):1904-10.

15. Ohm E, Madsen C, Gravseth HM, et al. Post-injury long-term sickness absence and risk of disability pension: The role of socioeconomic status. Injury. 2024;55(4):111480.

16. World Economic Forum. Why getting more girls into STEM is key to closing the gender health gap [Internet]. World Economic Forum. Available from: https://www.weforum.org/stories/2024/10/women-health-gap-healthcare-gender/.

17. Amin A, Remme M, Allotey P, et al. Gender equality by 2045: reimagining a healthier future for women and girls. BMJ. 2021;373:n1621.

18. Samulowitz A, Gremyr I, Eriksson E, et al. "Brave Men" and "Emotional Women": A Theory-Guided Literature Review on Gender Bias in Health Care and Gendered Norms towards Patients with Chronic Pain. Pain Res Manag. 2018;2018:6358624.

19. Seedat S, Rondon M. Women's wellbeing and the burden of unpaid work. BMJ. 2021;374:n1972.

20. Liu G, Sun B, Yu L, et al. The Gender-Based Differences in Vulnerability to Ambient Air Pollution and Cerebrovascular Disease Mortality: Evidences Based on 26781 Deaths. Glob Heart. 2020;15(1):46.

21. Modi N. Closing the gender health gap: the importance of a Women's health strategy [Internet]. England: BMA. Available from: https://www.bma.org.uk/news-and-opinion/closing-the-gender-health-gap-the-importance-of-a-women-s-health-strategy.

22. Nutritioncluster. Why women and girls experience poorer nutrition and how to close gender gap [Internet]. Nutritioncluster.net. Available from: https://www.nutritioncluster.net/news-and-events/news/why-women-and-girls-experience-poorer-nutrition-and-how-close-gender-gap.

23. UNICEF. Sexual and reproductive health [Internet]. UNICEF. Available from: https://data.unicef.org/topic/gender/sexual-and-reproductive-health.

24. United Nations. World Population Ageing. New York: 2015. Available from: https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015_Report.pdf.

25. AARP International. How Women 50-Plus Are Driving the Global Longevity Economy [Internet]. AARP International. Available from: https://www.aarpinternational.org/resources/longevity-economy/how-women-50-plus-are-driving-the-global-longevity-economy.

26. Nagarajan NR, Sixsmith A. Policy Initiatives to Address the Challenges of an Older Population in the Workforce. Ageing Int. 2023;48(1):41-77.

27. Menabde N. Health literacy and the SDGs. World Health Organization Office at the UN, 2017. Available from: https://www.sustainablegoals.org.uk/wp-content/uploads/2017/03/030-031-SDG-MENABDE.pdf.

28. Sørensen K, Pelikan JM, Röthlin F, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25(6):1053-8.

29. Chakraverty D, Baumeister A, Aldin A, et al. Gender differences of health literacy in persons with a migration background: a systematic review and meta-analysis. BMJ Open. 2022;12(7):e056090.

30. Lima ACP, Maximiano-Barreto MA, Martins TCR, et al. Factors associated with poor health literacy in older adults: A systematic review. Geriatr Nurs. 2024;55:242-54.

31. Lee HY, Lee J, Kim NK. Gender Differences in Health Literacy Among Korean Adults: Do Women Have a Higher Level of Health Literacy Than Men? Am J Mens Health. 2015;9(5):370-9.

32. Stormacq C, Van den Broucke S, Wosinski J. Does health literacy mediate the relationship between socioeconomic status and health disparities? Integrative review. Health Promot Int. 2019;34(5):e1-e17.

33. Urstad KH, Andersen MH, Larsen MH, et al. Definitions and measurement of health literacy in health and medicine research: a systematic review. BMJ Open. 2022;12(2):e056294.

34. Imamura Y, Kubota K, Morisaki N, et al. Association of Women's Health Literacy and Work Productivity among Japanese Workers: A Web-based, Nationwide Survey. Jma j. 2020;3(3):232-9.

35. Smith B, Magnani JW. New technologies, new disparities: The intersection of electronic health and digital health literacy. Int J Cardiol. 2019;292:280-2.

36. Economist Impact. Empowering healthy communities and individuals: Removing barriers through health literacy. 2024. Available from: https://impact.economist.com/projects/health-inclusivity-index/articles/empowering-healthy-communities-and-individuals.

37. Yao R, Zhang W, Evans R, et al. Inequities in Health Care Services Caused by the Adoption of Digital Health Technologies: Scoping Review. J Med Internet Res. 2022;24(3):e34144.

38. Esteban-Navarro M-Á, García-Madurga M-Á, Morte-Nadal T, et al. The Rural Digital Divide in the Face of the COVID-19 Pandemic in Europe—Recommendations from a Scoping Review. Informatics. 2020;7(4):54.

39. WHO. Promoting health in the SDGs. Shanghai: World Health Organization (WHO), 2016. Available from: https://iris.who.int/bitstream/handle/10665/259183/WHO-NMH-PND-17.5-eng.pdf?sequence=1.

40. Flecha A, García R, Rudd R. Using Health Literacy in School to Overcome Inequalities. European Journal of Education. 2011;46(2):209-18.

41. UNICEF. Primary education [Internet]. UNICEF. Available from: https://data.unicef.org/topic/education/primary-education/.

42. Rentschler J, Leonova N. Global air pollution exposure and poverty. Nature Communications. 2023;14(1):4432.

43. Wolf TG, Cagetti MG, Fisher JM, et al. Non-communicable Diseases and Oral Health: An Overview. Front Oral Health. 2021;2:725460.

44. Martínez-García M, Hernández-Lemus E. Periodontal Inflammation and Systemic Diseases: An Overview. Front Physiol. 2021;12:709438.

45. Botelho J, Mascarenhas P, Viana J, et al. An umbrella review of the evidence linking oral health and systemic noncommunicable diseases. Nature Communications. 2022;13(1):7614.

46. EFP. Gum disease: Prevention [Internet]. EFP. Available from: https://www.efp.org/for-patients/gum-diseases/gum-disease-prevention/.

47. World Health Organization. Draft Global Oral Health Action Plan (2023–2030). Geneva. Available from: https://cdn.who.int/media/docs/default-source/ncds/mnd/oral-health/eb152-draft-global-oral-health-action-plan-2023-2030-en.pdf?sfvrsn=2f348123_19&download=true.

48. Jepsen S, Blanco J, Buchalla W, et al. Prevention and control of dental caries and periodontal diseases at individual and population level: consensus report of group 3 of joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. J Clin Periodontol. 2017;44 Suppl 18:S85-s93.

49. Sanders AE, Grider WB, Maas WR, et al. Association Between Water Fluoridation and Income-Related Dental Caries of US Children and Adolescents. JAMA Pediatr. 2019;173(3):288-90.

50. Petimar J, Gibson LA, Wolff MS, et al. Changes in Dental Outcomes After Implementation of the Philadelphia Beverage Tax. Am J Prev Med. 2023;65(2):221-9.

51. World Health Organization. Global oral health status report: towards universal health coverage for oral health by 2030. Geneva: World Health Organization, 2022.

52. Jevdjevic M, Listl S. Global, Regional, and Country-Level Economic Impacts of Oral Conditions in 2019. J Dent Res. 2025;104(1):17-21.

53. CDC. Health Disparities in Oral Health [Internet]. Centers For Disease Control And Prevention (CDC). Available from: https://www.cdc.gov/oral-health/health-equity/index.html.

54. Zhang X, Wang X, Wu J, et al. The global burden of periodontal diseases in 204 countries and territories from 1990 to 2019. Oral Diseases. 2024;30(2):754-68.

55. Wen PYF, Chen MX, Zhong YJ, et al. Global Burden and Inequality of Dental Caries, 1990 to 2019. J Dent Res. 2022;101(4):392-9.

56. World Health Organization. Dentists (per 10 000 population) [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/data/gho/data/indicators/indicator-details/GHO/dentists-(per-10-000-population).

57. Tiwari T, Franstve-Hawley J. Addressing Oral Health of Low-Income Populations-A Call to Action. JAMA Netw Open. 2021;4(9):e2125263.

58. Duckett S, Cowgill M, Swerissen H. Filling the gap: A universal dental scheme for Australia [Internet]. Grattan Institute. Available from: https://grattan.edu.au/wp-content/uploads/2019/03/915-Filling-the-gap-A-universal-dental-scheme-for-Australia.pdf.

59. Oral Health Foundation. UK could face dental health crisis as costs soar, says Oral Health Foundation [Internet]. Oral Health Foundation. Available from: https://www.dentalhealth.org/news/uk-could-face-dental-health-crisis-as-costs-soar-says-oral-health-foundation.

60. Susarla SM, Trimble M, Sokal-Gutierrez K. Cross-Sectional Analysis of Oral Healthcare vs. General Healthcare Utilization in Five Low- and Middle-Income Countries. Front Oral Health. 2022;3:911110.

61. Ferreira MC, Dias-Pereira AC, Branco-de-Almeida LS, et al. Impact of periodontal disease on quality of life: a systematic review. J Periodontal Res. 2017;52(4):651-65.

62. Pyo J, Lee M, Ock M, et al. Quality of Life and Health in Patients with Chronic Periodontitis: A Qualitative Study. Int J Environ Res Public Health. 2020;17(13).

63. Zaror C, Matamala-Santander A, Ferrer M, et al. Impact of early childhood caries on oral health-related quality of life: A systematic review and meta-analysis. Int J Dent Hyg. 2022;20(1):120-35.

64. Kinane DF, Stathopoulou PG, Papapanou PN. Periodontal diseases. Nature Reviews Disease Primers. 2017;3(1):17038.

65. Uphoff EP, Pickett KE, Cabieses B, et al. A systematic review of the relationships between social capital and socioeconomic inequalities in health: a contribution to understanding the psychosocial pathway of health inequalities. International Journal for Equity in Health. 2013;12(1):54.

66. Sigsgaard A, Bolvig I, Øzhayat E. Oral health promotion and labour market prospects among socially disadvantaged, unemployed citizens. European Journal of Public Health. 2021;31(Supplement_3).

67. Stöhr J, Barbaresko J, Neuenschwander M, et al. Bidirectional association between periodontal disease and diabetes mellitus: a systematic review and meta-analysis of cohort studies. Sci Rep. 2021;11(1):13686.

68. Simpson TC, Clarkson JE, Worthington HV, et al. Treatment of periodontitis for glycaemic control in people with diabetes mellitus. Cochrane Database Syst Rev. 2022;4(4):Cd004714.

69. Gargano L, Mason MK, Northridge ME. Advancing Oral Health Equity Through School-Based Oral Health Programs: An Ecological Model and Review. Front Public Health. 2019;7:359.

70. Elsadek YE, Baker SR. Oral health promotion through health-promoting schools in developing countries: A scoping review. Community Dent Oral Epidemiol. 2023;51(6):1197-208.

71. Nghayo HA, Palanyandi CE, Ramphoma KJ, et al. Oral health community engagement programs for rural communities: A scoping review. PLoS One. 2024;19(2):e0297546.

72. GOV.UK. Health and Care Bill: water fluoridation: Policy Paper [Internet]. London, United Kingdom: Department of Health & Social Care; Ministerial Correspondence and Public Enquiries Unit, United Kingdom. Available from: https://www.gov.uk/government/publications/health-and-care-bill-factsheets/health-and-care-bill-water-fluoridation#what-the-bill-will-do.

73. Mariño R, Zaror C. Economic evaluations in water-fluoridation: a scoping review. BMC Oral Health. 2020;20(1):115.

74. Niazi FC, Pepper T. Dental Fluorosis. StatPearls. Treasure Island (FL): StatPearls Publishing, Copyright © 2025, StatPearls Publishing LLC.; 2025.

75. Dharmaratne RW. Exploring the role of excess fluoride in chronic kidney disease: A review. Hum Exp Toxicol. 2019;38(3):269-79.

76. Bissett J. Consumption of sugar from soft drinks falls within a year of UK sugar tax [Internet]. dental-nursing.co.uk. Available from: https://www.dental-nursing.co.uk/news/consumption-of-sugar-from-soft-drinks-falls-within-a-year-of-uk-sugar-tax.

77. World Health Organization. Global report on the use of sugar-sweetened beverage taxes, 2023 [Internet]. Geneva: World Health Organization (WHO),. Available from: https://www.who.int/publications/i/item/9789240084995.

78. World Health Organization. Tobacco Free initiative [Internet]. Geneva: World Health Organization (WHO),. Available from: https://www.emro.who.int/tfi/mpower/index.html.

79. Glick M, Williams DM, Yahya IB, et al. Vision 2030: Delivering Optimal Oral Health for All. FDI World Dental Federation, 2021. Available from: https://www.fdiworlddental.org/sites/default/files/2021-02/Vision-2030-Delivering%20Optimal-Oral-Health-for-All_0.pdf.

80. Preshaw PM, Minnery H, Dunn I, et al. Teamworking in Dentistry: The Importance for Dentists, Dental Hygienists and Dental Therapists to Work Effectively Together-A Narrative Review. Int J Dent Hyg. 2024.

81. Reinders JJ. Task shifting, interprofessional collaboration and education in oral health care. Dissertation University Groningen. Available from: https://research.hanze.nl/files/41483428/Ebook_Reinders_2018_.pdf.

82. Nagatani Y, Imafuku R, Takemoto T, et al. Dental hygienists' perceptions of professionalism are multidimensional and context-dependent: a qualitative study in Japan. BMC Med Educ. 2017;17(1):267.

83. Langelier M, Continelli T, Moore J, et al. Expanded Scopes Of Practice For Dental Hygienists Associated With Improved Oral Health Outcomes For Adults. Health Aff (Millwood). 2016;35(12):2207-15.

84. Schroth RJ, Kyoon-Achan G, McNally M, et al. Children's Oral Health Initiative: workers' perspectives on its impact in First Nations communities. Health Promot Chronic Dis Prev Can. 2023;43(9):393-402.

85. Koirala B, Acharya S, Spero L, et al. A Clinical Competency Framework for the Basic Package of Oral Care: Perceptions of Primary Oral Health Providers in Rural Nepal. Front Public Health. 2022;10:914581.

86. Erchick DJ, Agrawal NK, Khatry SK, et al. Feasibility of training community health workers to conduct periodontal examinations: a validation study in rural Nepal. BMC Health Services Research. 2020;20(1):412.

87. Morel MM, Chuang E, Laniado N. Bridging gaps in oral health education in a medical school in the United States: a pilot study. BMC Med Educ. 2022;22(1):578.

88. Behar-Horenstein LS, Warren RC, Dodd VJ, et al. Addressing Oral Health Disparities Via Educational Foci on Cultural Competence. Am J Public Health. 2017;107(S1):S18-s23.

89. NIH. Oral health in America: Advances and challenges. United States: National Institutes of Health (NIH). Available from: https://www.nidcr.nih.gov/sites/default/files/2021-12/Oral-Health-in-America-Executive-Summary.pdf.

90. NHS (UK). NHS Low Income Scheme (LIS) [Internet]. NHS (UK). Available from: https://www.nhs.uk/nhs-services/help-with-health-costs/nhs-low-income-scheme-lis/.

91. Scottish Government. Healthier Scotland. Oral health improvement plan [Internet]. Scotland: Scottish Government, 2018. Available from: https://www.scottishdental.nhs.scot/wp-content/uploads/2018/01/Oral-Health-Improvement-plan-.pdf.

92. World Health Organization. Ambient (outdoor) air pollution [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.

93. World Health Organization. Air quality, energy and health [Internet]. Geneva: World Health Organization,. Available from: https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health/health-impacts.

94. Institute For Health Metrics And Evaluation (IHME). Air pollution [Internet]. Seattle, WA: Healthdata.org. Available from: https://www.healthdata.org/research-analysis/health-risks-issues/air-pollution.

95. UNICEF. Air pollution accounted for 8.1 million deaths globally in 2021, becoming the second leading risk factor for death, including for children under five years. UNICEF Middle East and North Africa, 2024. Available from: https://www.unicef.org/press-releases/air-pollution-accounted-81-million-deaths-globally-2021-becoming-second-leading-risk.

96. La Nauze A, Severnini E. Air Pollution and Adult Cognition: Evidence from Brain Training National Bureau of Economic Research, 2021.

97. Ferguson L, Taylor J, Davies M, et al. Exposure to indoor air pollution across socio-economic groups in high-income countries: A scoping review of the literature and a modelling methodology. Environ Int. 2020;143:105748.

98. Renzi M, Badaloni C, Trentalange A, et al. Association between air pollution, socioeconomic inequalities and cause specific mortality in a large administrative cohort in a contaminated site of central Italy. Atmospheric Environment. 2025;347:121082.

99. van den Brekel L, Lenters V, Mackenbach JD, et al. Ethnic and socioeconomic inequalities in air pollution exposure: a cross-sectional analysis of nationwide individual-level data from the Netherlands. The Lancet Planetary Health. 2024;8(1):e18-e29.

100. World Health Organization. Air pollution [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/health-topics/air-pollution#tab=tab_1.

101. World Health Organization. Ambient Air Quality Database Application [Internet]. Geneva: World Health Organization (WHO). Available from: https://worldhealthorg.shinyapps.io/AmbientAirQualityDatabaseV6_1/.

102. Georgetown Climate Center. Issue Brief: How Community-Based Air Quality Monitoring Can Make Climate Policy More Equitable [Internet]. Available from: https://www.georgetownclimate.org/articles/community-based-air-quality-monitoring-equitable-climate-policy.html.

103. Patwardhan V, Gil GF, Arrieta A, et al. Differences across the lifespan between females and males in the top 20 causes of disease burden globally: a systematic analysis of the Global Burden of Disease Study 2021. The Lancet Public Health. 2024;9(5):e282-e94.

104. Myatra SN, Tripathy S, Einav S. Global health inequality and women - beyond maternal health. Anaesthesia. 2021;76 Suppl 4:6-9.

105. Stevens GA, Beal T, Mbuya MNN, et al. Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys. Lancet Glob Health. 2022;10(11):e1590-e9.

106. Lopes SO, Abrantes LCS, Azevedo FM, et al. Food Insecurity and Micronutrient Deficiency in Adults: A Systematic Review and Meta-Analysis. Nutrients. 2023;15(5).

107. Drewnowski A, Specter SE. Poverty and obesity: the role of energy density and energy costs. Am J Clin Nutr. 2004;79(1):6-16.

108. World Food Program USA. Women Are Hungrier [Internet]. World Food Program USA,. Available from: https://www.wfpusa.org/women-are-hungrier-infographic/.

109. World Health Organization. e-Library of Evidence for Nutrition Actions (eLENA) [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/tools/elena/interventions/micronutrients-pregnancy.

110. Ritchie H, Roser M. Micronutrient Deficiency [Internet]. Our World in Data. Available from: https://ourworldindata.org/micronutrient-deficiency.

111. Botreau H, Cohen MJ. Chapter Two - Gender inequality and food insecurity: A dozen years after the food price crisis, rural women still bear the brunt of poverty and hunger. In: Cohen MJ, editor. Advances in Food Security and Sustainability. 5: Elsevier; 2020. p. 53-117.

112. World Health Organization. Anaemia [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news-room/fact-sheets/detail/anaemia.

113. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Geneva: World Health Organization (WHO), 2011. Available from: https://iris.who.int/bitstream/handle/10665/85839/WHO_NMH_NHD_MNM_11.1_eng.pdf?sequence=22&isAllowed=y.

114. World Health Organization. Accelerating anaemia reduction. Geneva: World Health Organization (WHO), 2023. Available from: https://iris.who.int/bitstream/handle/10665/367661/9789240074033-eng.pdf?sequence=1.

115. Kim JY, Shin S, Han K, et al. Relationship between socioeconomic status and anemia prevalence in adolescent girls based on the fourth and fifth Korea National Health and Nutrition Examination Surveys. Eur J Clin Nutr. 2014;68(2):253-8.

116. Tang GH, Sholzberg M. Iron deficiency anemia among women: An issue of health equity. Blood Reviews. 2024;64:101159.

117. NHS (England). Hospital Admitted Patient Care Activity [Internet]. England: NHS (England). Available from: https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity.

118. UK Parliament. Inequalities in diets [Internet]. UK Parliament. Available from: https://post.parliament.uk/inequalities-in-diets/.

119. Balarajan Y, Ramakrishnan U, Ozaltin E, et al. Anaemia in low-income and middle-income countries. Lancet. 2011;378(9809):2123-35.

120. Exemplars. Why Is The Philippines An Exemplar? [Internet]. Exemplars In Global Health. Available from: https://www.exemplars.health/topics/anemia-among-wra/philippines/why-is-the-philippines-an-exemplar.

121. FAO Agricultural and Development Economics Division. Food Security. 2006. Available from: http://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf.

122. University of California, Davis. Fortifying Bouillon Could Reduce Malnutrition in West Africa [Internet]. Available from: https://www.ucdavis.edu/magazine/fortifying-bouillon-could-reduce-malnutrition-west-africa. .

123. World Health Organization. Musculoskeletal health [Internet]. Geneva: World Health Organization. Available from: https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions.

124. Overstreet DS, Strath LJ, Jordan M, et al. A Brief Overview: Sex Differences in Prevalent Chronic Musculoskeletal Conditions. Int J Environ Res Public Health. 2023;20(5).

125. eClinicalMedicine. Gendered pain: a call for recognition and health equity. eClinicalMedicine. 2024;69.

126. Brzoska P, Annac K, Yilmaz-Aslan Y. Intersectional Differences in Health Care Outcomes among Patients with Musculoskeletal Disorders in Germany. Reports [Internet]. 2023; 6(2).

127. Sosinsky AZ, Rich-Edwards JW, Wiley A, et al. Enrollment of female participants in United States drug and device phase 1-3 clinical trials between 2016 and 2019. Contemp Clin Trials. 2022;115:106718.

128. Anwar Y. Lack of females in drug dose trials leads to overmedicated women [Internet]. UC Berkeley News. Available from: https://news.berkeley.edu/2020/08/12/lack-of-females-in-drug-dose-trials-leads-to-overmedicated-women/.

129. Tosi LL, Templeton K, Pennington AM, et al. Influence of Sex and Gender on Musculoskeletal Conditions and How They Are Reported. J Bone Joint Surg Am. 2024;106(16):1512-9.

130. Baygutalp Fh, Kul A. Frequency of Anaemia in Patients with Musculoskeletal Pain. Turkish Journal of Osteoporosis. 2020;26:98-103.

131. Luiz MM, Schneider IJC, Kuriki HU, et al. The combined effect of anemia and dynapenia on mortality risk in older adults: 10-Year evidence from the ELSA cohort study. Arch Gerontol Geriatr. 2022;102:104739.

132. Woolf A. Musculoskeletal health, wealth and business, and wider societal impact. European Journal of Public Health. 2022;32(5):831-3.

133. ILO. The gender gap in employment: What's holding women back? [Internet]. International Labour Organization (ILO). Available from: https://webapps.ilo.org/infostories/en-GB/Stories/Employment/barriers-women.

134. United Nations. World Population Prospects 2024 [Internet]. Department of Economic and Social Affairs, Population Division, United Nations. Available from: https://population.un.org/wpp/graphs?loc=900&type=Demographic%20Profiles&category=Line%20Charts.

135. Ruiz N, Noe-Bustamante L, Saber N. Coming Of Age [Internet]. International Monetary Fund (IMF). Available from: https://www.imf.org/en/Publications/fandd/issues/2020/03/infographic-global-population-trends-picture.

136. Amaglobeli D, Gaspar V, Dabla-Norris E. Getting Older But Not Poorer [Internet]. International Monetary Fund (IMF). Available from: https://www.imf.org/en/Publications/fandd/issues/2020/03/impact-of-aging-on-pensions-and-public-policy-gaspar.

137. Choi M, Sempungu JK, Lee EH, et al. Living longer but in poor health: healthcare system responses to ageing populations in industrialised countries based on the Findings from the Global Burden of Disease Study 2019. BMC Public Health. 2024;24(1):576.

138. United Nations. Ageing And Disability [Internet]. Department of Economic and Social Affairs, United Nations. Available from: https://social.desa.un.org/issues/disability/disability-issues/ageing-and-disability.

139. Khan HTA, Addo KM, Findlay H. Public Health Challenges and Responses to the Growing Ageing Populations. Public Health Challenges. 2024;3(3):e213.

140. UN DESA. World Social Report 2023: Leaving No One Behind In An Ageing World [Internet]. Available from: https://desapublications.un.org/publications/world-social-report-2023-leaving-no-one-behind-ageing-world.

141. Gorasso V, Van der Heyden J, De Pauw R, et al. The health and economic burden of musculoskeletal disorders in Belgium from 2013 to 2018. Popul Health Metr. 2023;21(1):4.

142. Briggs AM, Cross MJ, Hoy DG, et al. Musculoskeletal Health Conditions Represent a Global Threat to Healthy Aging: A Report for the 2015 World Health Organization World Report on Ageing and Health. Gerontologist. 2016;56 Suppl 2:S243-55.

143. Fejer R, Ruhe A. What is the prevalence of musculoskeletal problems in the elderly population in developed countries? A systematic critical literature review. Chiropr Man Therap. 2012;20(1):31.

144. Kanis JA, Norton N, Harvey NC, et al. SCOPE 2021: a new scorecard for osteoporosis in Europe. Arch Osteoporos. 2021;16(1):82.

145. Rinonapoli G, Ruggiero C, Meccariello L, et al. Osteoporosis in Men: A Review of an Underestimated Bone Condition. Int J Mol Sci. 2021;22(4).

146. International Osteoporosis Foundation (IOF). Fragility Fractures [Internet]. Switzerland: International Osteoporosis Foundation (IOF). Available from: https://www.osteoporosis.foundation/health-professionals/fragility-fractures.

147. GOV.UK. Productive healthy ageing and musculoskeletal (MSK) health [Internet]. United Kingdom: Public Health England.

148. Guglielmo D, Hootman JM, Boring MA, et al. Symptoms of Anxiety and Depression Among Adults with Arthritis - United States, 2015-2017. MMWR Morb Mortal Wkly Rep. 2018;67(39):1081-7.

149. World Health Organization. Depressive disorder (depression) [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news-room/fact-sheets/detail/depression.

150. World Health Organization. Anxiety disorders [Internet]. Geneva: World Health Organization (WHO). Available from: https://www.who.int/news-room/fact-sheets/detail/anxiety-disorders.

151. International Longevity Center UK. Nearly half of Japanese workers could be aged 50+ by 2035 [Internet]. United Kingdom: International Longevity Center UK. Available from: https://ilcuk.org.uk/nearly-half-of-japanese-workers-could-be-aged-50-by-2035/.

152. Koller-Smith L, Mehdi AM, March L, et al. Rheumatoid arthritis is a preventable disease: 11 ways to reduce your patients' risk. Internal Medicine Journal. 2022;52(5):711-6.

153. Steffens D, Maher CG, Pereira LSM, et al. Prevention of Low Back Pain: A Systematic Review and Meta-analysis. JAMA Internal Medicine. 2016;176(2):199-208.

154. Teichert F, Karner V, Döding R, et al. Effectiveness of Exercise Interventions for Preventing Neck Pain: A Systematic Review With Meta-analysis of Randomized Controlled Trials. J Orthop Sports Phys Ther. 2023;53(10):594–609.

155. LeBoff MS, Greenspan SL, Insogna KL, et al. The clinician's guide to prevention and treatment of osteoporosis. Osteoporos Int. 2022;33(10):2049-102.

156. Johns Hopkins Medicine. Osteoporosis: What You Need to Know as You Age [Internet]. Johns Hopkins Medicine. Available from: https://www.hopkinsmedicine.org/health/conditions-and-diseases/osteoporosis/osteoporosis-what-you-need-to-know-as-you-age.

157. International Osteoporosis Foundation (IOF). Prevention [Internet]. Switzerland: International Osteoporosis Foundation (IOF). Available from: https://www.osteoporosis.foundation/health-professionals/prevention.

158. Willers C, Norton N, Harvey NC, et al. Osteoporosis in Europe: a compendium of country-specific reports. Arch Osteoporos. 2022;17(1):23.

159. International Osteoporosis Foundation (IOF). Burden Of Osteoporosis [Internet]. Switzerland: International Osteoporosis Foundation (IOF). Available from: https://www.osteoporosis.foundation/policy-makers.

160. International Osteoporosis Foundation (IOF). Capture The Fracture [Internet]. Switzerland: International Osteoporosis Foundation (IOF). Available from: https://www.osteoporosis.foundation/educational-hub/topic/capture-the-fracture.

161. Mubarak F, Suomi R. Elderly Forgotten? Digital Exclusion in the Information Age and the Rising Grey Digital Divide. INQUIRY. 2022;59:00469580221096272.

162. University of Plymouth. How can closing the digital divide improve older people's lives? [Internet]. Plymouth, United Kingdom: University Of Plymouth. Available from: https://www.plymouth.ac.uk/discover/how-can-breaking-the-digital-divide-improve-the-health-and-wellbeing-of-older-people.

163. Cromartie J. Rural Aging Occurs in Different Places for Very Different Reasons [Internet]. United States: U.S. Department of Agriculture (USDA). Available from: https://www.usda.gov/about-usda/news/blog/rural-aging-occurs-different-places-very-different-reasons#:~:text=In%20fact%2C%2019%20percent%20of,population%20age%2065%20or%20older.

164. Eurostat. Urban-rural Europe - demographic developments in rural regions and areas. 2025. Available from: https://ec.europa.eu/eurostat/statistics-explained/SEPDF/cache/112342.pdf.

ECONOMIST IMPACT

LONDON

The Adelphi
1-11 John Adam Street
London WC2N 6HT
United Kingdom
Tel: (44) 20 7830 7000
Email: london@economist.com

GENEVA

Rue de l'Athénée 32
1206 Geneva
Switzerland
Tel: (41) 22 566 2470
Fax: (41) 22 346 93 47
Email: geneva@economist.com

SÃO PAULO

Rua Joaquim Floriano,
1052, Conjunto 81
Itaim Bibi, São Paulo,
SP, 04534-004
Brasil
Tel: +5511 3073-1186
Email: americas@economist.com

NEW YORK

900 Third Avenue
5th Floor
New York, NY 10017
United States
Tel: (1.212) 554 0600
Fax: (1.212) 586 1181/2
Email: americas@economist.com

DUBAI

Office 1301a
Aurora Tower
Dubai Media City
Dubai
Tel: (971) 4 433 4202
Fax: (971) 4 438 0224
Email: dubai@economist.com

HONG KONG

1301
12 Taikoo Wan Road
Taikoo Shing
Hong Kong
Tel: (852) 2585 3888
Fax: (852) 2802 7638
Email: asia@economist.com

SINGAPORE

8 Cross Street
#23-01 Manulife Tower
Singapore
048424
Tel: (65) 6534 5177
Fax: (65) 6534 5077
Email: asia@economist.com