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GLOBAL HEALTH 2050
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Global health 2050: the path to halving premature death by mid-century

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Executive summary

In Global Health 2050, the *Lancet* Commission on Investing in Health concludes that dramatic improvements in human welfare are achievable by mid-century with focused health investments. By 2050, countries that choose to do so could reduce by 50% the probability of premature death in their populations—ie, the probability of dying before age 70 years—from the levels in 2019. We call this goal 50 by 50. The interventions that enable achieving the goal of 50 by 50 should also reduce morbidity and disability at all ages.

Historical experience and continued scientific advances suggest that 50 by 50 is a feasible aspiration. Seven of the 30 most populous countries have reduced their probability of premature death over the past decade at a rate that would halve the probability before 2050, including countries as diverse as Bangladesh, Ethiopia, Iran, and Türkiye. These focused gains can be achieved early on the pathway to full universal health coverage.

To achieve the 50-by-50 goal, action focusing on 15 priority conditions is required. In countries that have a high probability of premature death, infectious diseases and maternal conditions are the highest priority. Seven clusters of non-communicable diseases and injuries among the 15 priority conditions are important in all countries, and addressing them will be central to achieving 50 by 50 in most countries with a low probability of premature death. Focused attention on health-system strengthening for primary care and first-level hospitals will be crucial to improving capacity to address all 15 conditions in a universal health coverage package. Packaging interventions into 19 modules (including a childhood immunisation module and a module on prevention and low-cost widely available treatments for cardiovascular disease) should help to address the 15 priority conditions. Adoption of this focused approach should also enable investment in key areas of health-system strengthening and addresses major morbidities, such as psychiatric illness, that are not already covered by mortality-reducing interventions. Value for money can be assessed through a two-step process: technical cost effectiveness to assess how best to achieve module-specific goals (eg, reductions in child mortality or cardiovascular mortality) and political assessment of trade-offs in investing in expanding module coverage.

In many countries seeking reform, standard mechanisms of blanket budget transfers from ministries of finance to ministries of health have failed to successfully reorient systems towards priority interventions that improve health. This problem could be addressed by directing a substantial and increasing fraction of budget transfers towards making available and affordable the specific drugs, vaccines, diagnostics, and other commodities required for control of the 15 priority conditions. Making drugs available and affordable will typically require four complementary components: redirection of general budget transfers to line-item transfers (subsidies) for specific priority drugs, centralised procurement by government (or perhaps internationally), procurement in sufficient volumes to ensure availability when needed, and use and strengthening of existing supply chains (public and private).

Of the many intersectoral policies that governments can adopt to help to achieve the 50-by-50 goal, tobacco control is by far the most important, given the number of deaths caused by tobacco and the established and improving capacity of governments to implement tobacco policy. A high level of tobacco taxation is essential (and valuable in the short-to-medium term for public finances) and should be accompanied by a package of other effective tobacco control policies.

Background research conducted for the Commission points to exceptionally high mortality risk from pandemics. Management of the COVID-19 pandemic,

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and resulting outcomes, varied greatly between countries. Eventual vaccine availability attenuated, but did not eliminate, this variability in outcomes by the end of the emergency phase of COVID-19. National implementation of public health fundamentals—early action, isolation of infected individuals, quarantining of those exposed, and social and financial support for people isolating or quarantining—accounted for much of the success of the best-performing nations, such as China and Japan. In the next pandemic, implementation of these fundamentals should reduce mortality while awaiting vaccine development and deployment.

In addition to these country-level actions, we recommend enhanced commitment from the development assistance community. Development assistance should focus on two broad purposes. The first is the provision of direct financial and technical support to countries with the least resources to help them to develop health systems to better control diseases. The second is the financing of global public goods, including reducing the development and spread of antimicrobial resistance, preventing and responding to pandemics, identifying and spreading best practices, and developing and deploying new health technologies. For both of these purposes, focusing efforts on the 15 priority conditions would best contribute to achieving a 50% reduction in the probability of premature death by 2050. A decade ago, there were no malaria vaccines and the only available tuberculosis vaccine had low efficacy. As of 2024, two partly successful malaria vaccines have been approved and three promising tuberculosis vaccines are in late-stage trials. These successes exemplify the enormous contribution of development assistance, broadly defined, in funding development of new medicines, vaccines, diagnostics, and operational research against the 15 priority conditions.

The 50-by-50 goal, with an interim milestone of a 30% reduction in the probability of premature death by 2035, remains within reach. The most efficient route is to focus resources against a narrow set of conditions and scale up financing to develop and deploy new health technologies. Our analyses have shown that the economic value of achievable mortality declines is high and is often a substantial fraction of the value of gains from economic growth itself. The case is better than ever for the value of investing in health for reducing mortality and morbidity, alleviating poverty, growing economies, and improving human welfare.

Introduction

In 1993, when the use of economic analysis in improving global health was initially gaining traction, the World Bank published the influential report[1] "Investing in Health"—the only time that the organisation has devoted its flagship annual World Development Report (perhaps the world's most widely distributed economic publication) to the topic of health improvement. Aimed at finance ministers and international aid donors, the report's central message was that targeted spending on cost-effective interventions for high-burden diseases could rapidly improve health outcomes, boost the economy, and improve human welfare.

In 2013, this core message was re-examined in the first report of the *Lancet* Commission on Investing in Health,[2] "Global health 2035: a world converging within a generation" (GH2035). This report, which examined long-term trends in health, found that from about 1850, life expectancy in the best-performing countries had increased steadily by about 2·5 years every decade. The Commission then pointed to the promise of an ambitious but focused framework for achieving "grand convergence" by 2035. In a grand convergence, countries that chose to do so could reduce levels of mortality from infectious diseases and maternal conditions to enable their life expectancies to converge toward those of the best-performing countries.

In 2018, on the occasion of the 40th anniversary of the Declaration of Alma-Ata, *The Lancet* invited the Commission on Investing in Health to assess progress towards grand convergence and to reflect on the future of the global push for universal health coverage (UHC). This second Commission report—which, like its predecessor, departed from mainstream thinking on UHC by stressing the need for selectivity in the interventions initially included in health benefit packages—showed a partly positive picture on progress towards convergence.[3] However, the 6 years since its publication have been defined by rising geopolitical tensions, the increasingly manifest effects of climate change, growth in nationalistic populism, dwindling concern for global health, slowed progress towards UHC, and, most significantly, the COVID-19 pandemic.

In this third report of the *Lancet* Commission on Investing in Health, we assess these challenges—as well as opportunities for investment in health in increasingly turbulent times—up to 2050. To draft this report, we doubled the number of authors to increase representation from low-income and middle-income countries (LMICs) and of early career researchers. We have learned lessons from the experiences of publishing the previous Commission reports. GH2035 had a demonstrable effect on global health organisations—eg, it informed global women's and children's health strategies at WHO and the Partnership for Maternal, Newborn and Child Health and it provided evidence to support the Global Fund to Fight AIDS, Tuberculosis and Malaria's fourth replenishment.[4,5] The report also fed into discussions of the Sustainable Development Goals (SDGs).[6] Since 2013, there has been impressive progress on HIV, child mortality, and other high-priority targets. Many LMICs have prioritised domestic health spending. However, GH2035 did not anticipate that others would struggle with challenges such as debt and national security and deprioritise health as a result. In "Global health 2050",

Panel 1: Measuring survival progress—shifting from life expectancy at birth to PPD

Life expectancy at birth is a commonly used measure to monitor progress in population health. It is often misunderstood—"People think it means that when they're reporting life expectancy for 2022 that this is how long a baby who is born in 2022 will live"[8]—but the actual definition is the expected number of years a newborn would live if prevailing patterns of age-specific mortality at the time of birth were to remain throughout its life. Despite such misunderstandings, life expectancy at birth is widely used—including occasionally in this Commission—because as a concept it is easy to communicate.[9]

In this Commission, the main metric that we use is PPD, defined as the probability of dying before age 70 years under the current age-specific mortality rates. PPD is related to life expectancy at birth, and both measures are independent of the age structure of the underlying population. We chose PPD as our main indicator for two reasons. First, PPD encapsulates improvements in survival across all age groups before age 70 years more effectively than life expectancy at birth, which is crucial as more deaths shift to older ages in most countries. As of 2019, the global median age at death was 76 years, with projections indicating a rise to 81 years by 2050.[10] The highest median age at death in 2019 was in the North Atlantic region (84 years) and the lowest median age at death was in the sub-Saharan Africa region (at 65 years), both of which are projected to increase (to 88 years and 69 years, respectively).[10]

Second, although life expectancy at birth is influenced by both age-specific death rates and the remaining life-years of each age group, PPD is affected only by age-specific death rates. For example, a reduction in the number of deaths at younger ages will have a greater impact on life expectancy at birth than a reduction in deaths at older ages because the younger age groups would have more remaining life-years. Life expectancy at birth is thus commonly used to show changes in younger age mortality, but modest declines in life expectancy at birth could mask large reductions in mortality at older ages.

The differences between the two measures in terms of reflecting progress in survival become more evident as overall premature mortality falls.[11] In sub-Saharan Africa between 2000 and 2019, life expectancy at birth rose from 51·2 to 60·7 years (an 18% increase), whereas the PPD fell from 66% to 52% (a 20% decrease)—broadly similar relative improvements (appendix p 7). By contrast, in the North Atlantic region during that same period, life expectancy at birth increased from 78·6 years to 82·4 years (a 5% increase), whereas PPD fell from 21% to 15% (a 27% decrease). Thus, changes in PPD are in close agreement with life expectancy at birth in regions with high premature mortality, but more sensitively characterise the magnitude of change in countries with low premature mortality.

PPD=probability of premature death.

we are more realistic about public spending on health, and we hope that our focused approach to achieving mortality reductions and improving health at all ages informs discussions of both SDGs and post-SDG targets and frameworks.

The data for economic, social, demographic, and health-system indicators that informed this report include gaps and inaccuracies for all countries but particularly for low-income and lower middle-income countries, where national statistical systems are often severely under-resourced. However, UN institutions—eg, the World Bank, the UN Population Division, WHO—have made major efforts to construct time-series that enable comparisons between countries and across time. The institutions producing these data are forthcoming about underlying weaknesses and explicit about the methods they use to assemble their publications. We use their 2024 results for a wide range of analyses in this report and wish to explicitly acknowledge our debt to them while recognising that other data sources are available (eg, estimates from the Global Burden of Disease 2021 Demographics Collaborators[7]). That said, we are aware of data shortcomings and will welcome improved data as they become available, and we encourage readers with better data sources for particular countries or indicators to use those data instead and to make us aware of their availability.

This report is divided into eight parts. Part 1 documents progress in global health indicators from 1970 to 2023 to give an indication of potential future trends in mortality decline. In part 2, we explore the feasibility of all nations reducing by 50% their probability of premature death (PPD)—ie, the probability of dying before age 70 years under current age-specific mortality rates (panel 1)—by 2050 (which we refer to as 50 by 50). An important milestone on the way to this goal would be a 30% reduction in premature mortality by 2035, and we also examine the feasibility of reaching this milestone. In part 3, we make the case for prioritising the control of a set of 15 health conditions to achieve a 50% reduction by 2050 in PPD. In part 4, we propose a modular approach to strengthening health systems to achieve the 50-by-50 goal and we introduce a new tool, modular cost-effectiveness analysis. Part 5 explores ways to finance and deliver the interventions targeting the 15 priority conditions to achieve 50 by 50. In part 6, we document countries' performances in addressing the COVID-19 pandemic, provide new estimates of the ongoing pandemic risk, and argue that too little is being done to prepare for the next pandemic. We next outline the key steps that could be taken to be better prepared for a future pandemic. In part 7, we consider the crucial role of intersectoral policies in addressing high-impact social determinants of health, with a focus on smoking, the

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See **Online** for appendix

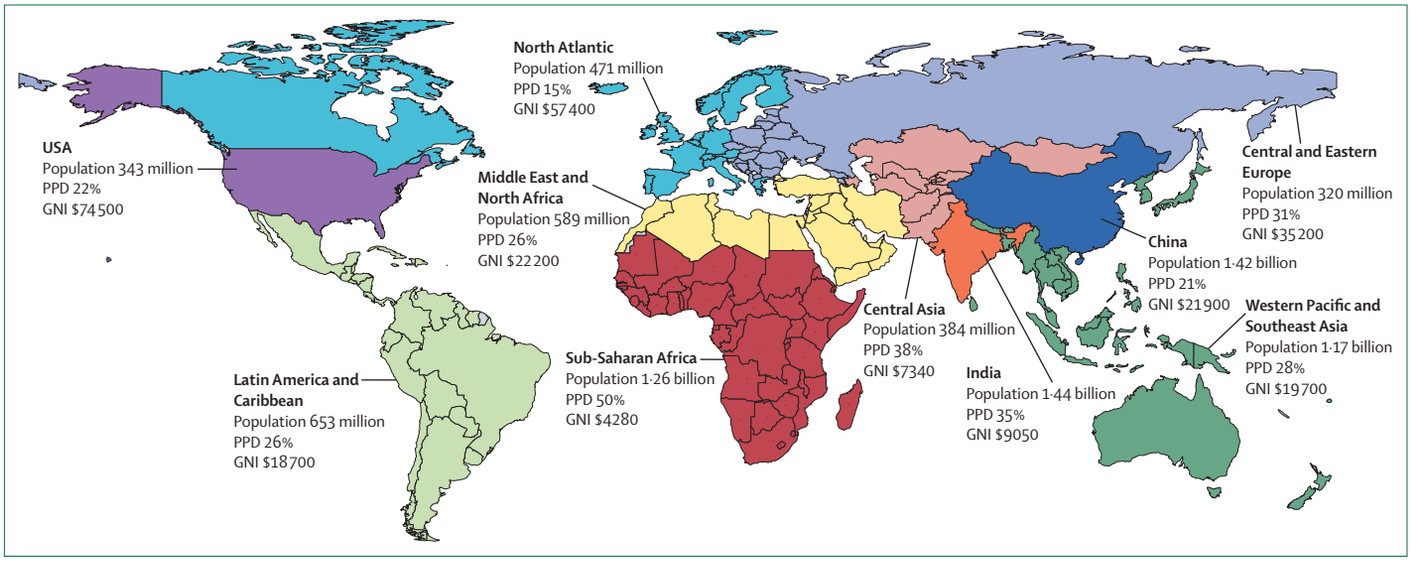

Figure 1: **Commission on Investing in Health regions with basic statistics**
As of 2023, the global population was 8·09 billion, the PPD was 30%, and the GNI per capita was $20 400. The appendix includes a list of countries in each region (p 3) and basic health, economic, and demographic indicators for each region (p 6). PPD=probability of premature death (ie, death before age 70 years at the prevailing [2023] age-specific mortality rates). GNI=gross national income per capita (in 2021 international dollars—ie, dollars adjusted for purchasing power parity).

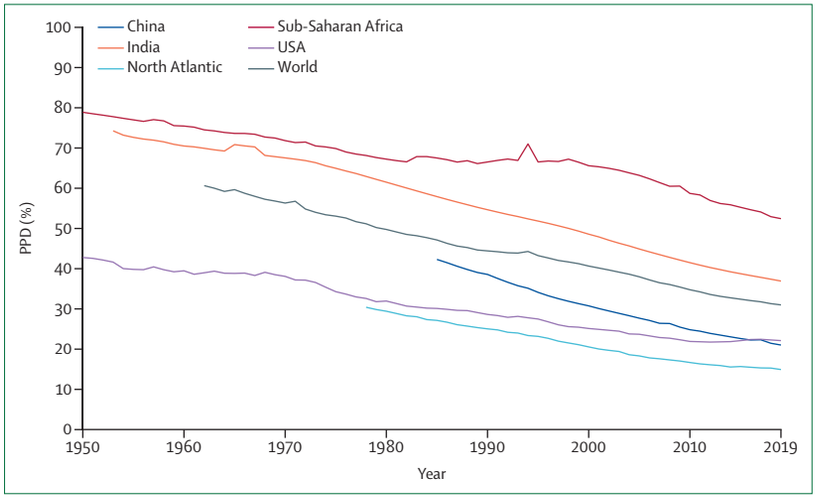

Figure 2: **Time for PPD to decrease by 50% in specific Commission on Investing in Health regions**
Sub-Saharan Africa did not halve its PPD in this timeframe but has been included as a comparator. PPD=probability of premature death (ie, death before age 70 years at the prevailing [2023] age-specific mortality rates).

most important social determinant of morbidity and mortality in most countries—and the most actionable, given the overwhelming evidence for the effectiveness of large excise taxes. Finally, part 8 looks at trends in and priorities for international collective action for health.

Despite obstacles to progress in global health—from climate change to rising health-care costs to the setbacks caused by COVID-19—we remain convinced, as we were when GH2035 was published, that ever-improving technical capacity, combined with focused investment in tackling the 15 priority conditions, offer the potential for major health improvements that could provide large gains in human welfare. Doubling down on the successful health investments of recent decades promises continued success. Even in a world of seemingly intractable problems, for countries that choose to prioritise health, the goal of 50 by 50 is within reach.

Part 1: Health in a world of change, 1970–2023

In this section, we analyse how key health metrics have changed since 1970 to provide a sense of what global health improvements by 2050 are feasible. First, we examine the 50-year period from 1970 to 2019, which was defined by steady progress in most countries, with some major exceptions. Then, we focus on 2020–23, when the COVID-19 pandemic and major conflicts caused setbacks in global health. Finally, we reflect on key trends that are likely to shape the global health response from 2024 to 2050.

In examining the progress of countries and regions, we have used the regional groupings shown in figure 1. The regions we used differ from the World Bank regional groupings in two ways. First, we separate China from the East Asia and Pacific region and India from the South Asia region because, as a result of their high populations, the statistics of these two nations dominate their regions. Second, we create a North Atlantic region that comprises western European countries and Canada, which perform well on health indicators. We separate out the USA because its health metrics are distinct (it does not perform as well as western European countries and Canada) and because it is so populous.

A key metric that we use throughout this report is the probability of premature death (PPD), defined as the probability of dying before age 70 years under the current

age-specific mortality rates (panel 1). PPD also serves as a proxy for progress in mortality after age 70 years and in morbidity. We use 70 years as the cutoff based on a previous study by the *Lancet* Commission on Investing in Health,[12] in which the authors noted that global "life expectancy is now just over 70 years, and most deaths before that age are avoidable". As Richard Doll says, "In old age death is inevitable, but death before old age is not."[13]

1970–2019: steady progress, with major exceptions

From 1970 to 2019, the global PPD fell from 56% to 31% (appendix p 11). The PPD declined in all regions, with particularly noteworthy progress in China and the North Atlantic (figure 2). The PPD in the USA decreased relatively slowly from 1970, and actually rose in the 2010s, and the PPD in India in 2019 (37%) was lower than that in the USA in 1970 (38%; appendix pp 11–15). In 2019, the best performing region was the North Atlantic, with a PPD of 15%, and the region with the highest PPD was sub-Saharan Africa (52%; figure 2). The HIV/AIDS pandemic was a major setback for mortality declines in sub-Saharan Africa, with the PPD rising in the 1990s.[14] However, since 2000, the rate of decline in premature mortality was faster in much of sub-Saharan Africa than in any other region (figure 2). The appendix (p 11) provides information on PPD in 1970 and 2019 in 105 countries with populations greater than 5 million.

Overall, PPD globally has been converging steadily, although slowly, towards the level in the world's best-performing (ie, frontier) country (appendix p 88). Table 1 shows how long it would take the world's 30 most-populous nations to halve the PPD assuming the rate of improvement in PPD that these nations achieved from 2010 to 2019 is maintained (appendix pp 9–10). If this rate of improvement is maintained, seven of these countries, including Bangladesh, Ethiopia, Iran, and Türkiye, would halve their PPD by 2050 or earlier. An acceleration in progress would be needed for the other 23 countries to halve their PPD by 2050.

Some of the 30 most populous nations are out-performing expectations with regard to reducing PPD relative to per-capita income and others are under-performing (table 1). Not surprisingly, there is a correlation, although far from perfect, between countries with favourable PPDs and those most rapidly improving—ie, those in which the PPD is quickly halving (figure 3). As of 2019, a few countries have performed well in terms of both relative PPD and the PPD halving time (eg, Bangladesh, China, Colombia, Iran), whereas others have seriously faltered (eg, Kenya, Nigeria, the USA). Although multiple reasons underly good country performance, a common element seems to be investment in robust, community-based primary health-care infrastructure focused on health outcomes.[15]

Although we focus on reductions in premature mortality, a background paper prepared for this Commission suggested that mortality is highly correlated with morbidity.[16] Thus, health interventions that are put in place to drive down mortality are also likely to improve morbidity and levels of functioning. Figure 4 shows that life expectancy is highly correlated with health-adjusted life expectancy. However, even in countries with high life expectancy, not all additional years of life are lived in full health (figure 4). There are important exceptions to the correlation between mortality and morbidity or loss of

	PPD (2019)		Time required to reduce PPD by 50%*		PPD predicted by income†	
	Actual (%)	Rank	Years	Rank	Predicted (%)	Difference (predicted–actual)
Global	31%	NA	55	NA	NA	NA
South Korea	12%	1	18	1	18%	6
Japan	12%	1	38	8	18%	6
Italy	12%	1	48	14	18%	6
France	16%	4	56	16	16%	0
UK	16%	4	72	21	16%	0
Germany	17%	6	>75	23	11%	–6
Iran	20%	7	30	5	35%	15
China	21%	8	38	8	34%	13
Colombia	22%	9	45	13	35%	13
Türkiye	22%	9	30	5	27%	5
USA	22%	9	>75	30	6%	–16
Thailand	26%	12	>75	24	33%	7
Brazil	26%	12	43	11	35%	9
Viet Nam	28%	14	>75	28	37%	10
Mexico	29%	15	>75	27	32%	2
Bangladesh	32%	16	26	2	40%	8
Egypt	36%	17	43	11	36%	1
Russia	36%	17	26	2	28%	–8
India	37%	19	54	15	39%	2
Indonesia	37%	19	70	20	36%	–1
Philippines	39%	21	>75	26	38%	–1
Pakistan	41%	22	>75	22	40%	–1
Ethiopia	42%	23	30	5	42%	–1
Sudan	42%	23	59	18	41%	–1
Myanmar	44%	25	58	17	40%	–3
Tanzania	47%	26	38	8	42%	–5
South Africa	49%	27	29	4	35%	–14
DR Congo	51%	28	62	19	42%	–9
Kenya	55%	29	>75	25	40%	–14
Nigeria	63%	30	>75	29	40%	–23

PPD is defined as the probability that a person born in a given year would die before age 70 years if the age-specific mortality rates in the year of birth continued, as was calculated (as of 2019) based on the UN's World Population Prospects (2024).[10] PPD=probability of premature death. NA=not applicable. *Based on the average rate of improvement between 2010 and 2019 (time required to reduce PPD by 50%=69·3/r, where r is the average annual rate of improvement in PPD). †Predicted by linear regression based on 2019 gross domestic product per capita (appendix pp 9–10). Data shown are the difference between predicted and actual PPDs—eg, the predicted PPD for Italy was 18%, but the actual PPD in 2019 was 12%, and thus the country performed 6 percentage points better than predicted. Negative values indicate that actual PPD was worse than predicted.

Table 1: **PPD (2019), difference between actual and predicted PPD (based on income level), and projected time required to halve PPD in the world's 30 most populous countries**

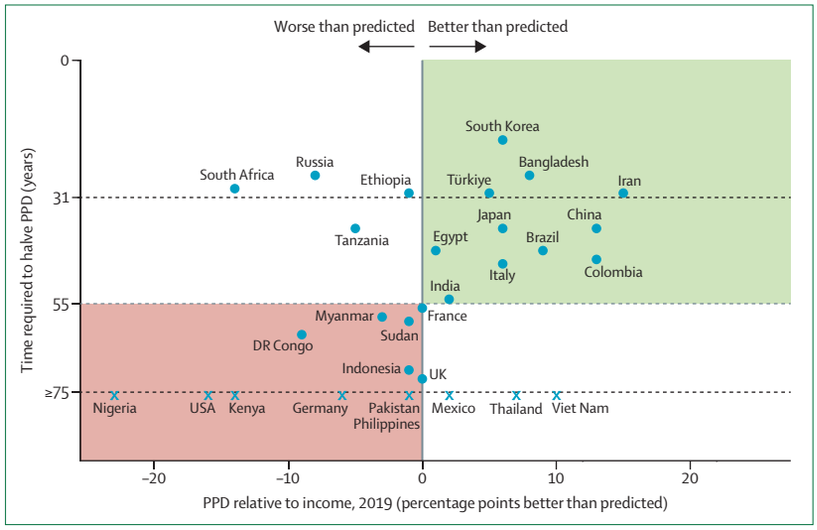

Figure 3: **PPD relative to per-capita income, and time to halve PPD in the world's 30 most populous countries, 2019**

The x-axis shows a country's percentage-point deviation from the PPD that would be predicted based on its income in 2019 (ie, deviation is the difference between predicted and actual PPD). Positive values indicate that the actual PPD is better than the value-predicted PPD, whereas Negative values indicate that the value-predicted PPD is higher than the actual PPD. The y-axis values show the number of years required to halve a country's PPD if its rate of improvement in 2010–19 were to continue. The upper dotted line shows a halving time of 31 years (ie, enabling a reduction in PPD of 50% by 2050). In 2019, the global average PPD was 31%. PPD=probability of premature death (ie, death before age 70 years).

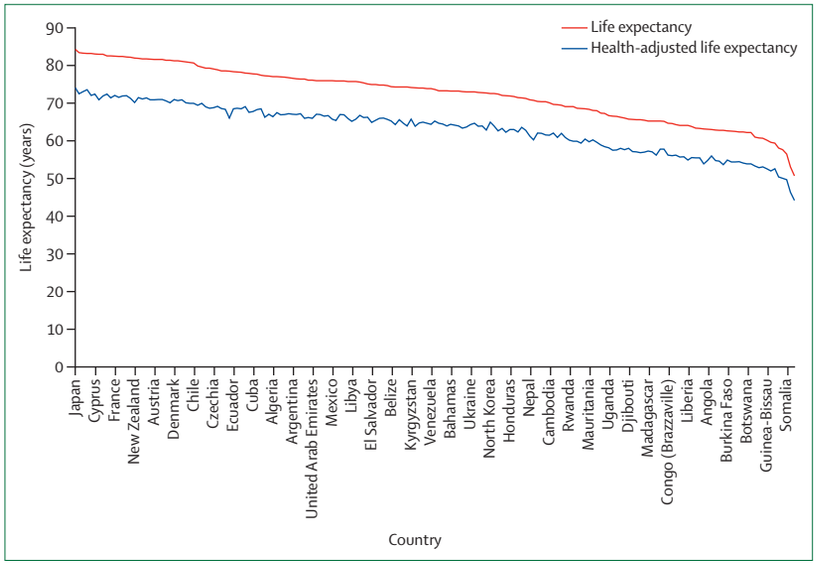

Figure 4: **Life expectancy versus health-adjusted life expectancy**

All 183 countries with available data for health-adjusted life expectancy are plotted from highest to lowest life expectancy. Every fifth country is indicated on the x-axis for illustrative purposes. Source: Norheim et al (2024).[16]

function. Some conditions cause substantial suffering and health burdens but do not result in high premature mortality—including some psychiatric disorders, old age dementias, and failure to grow healthily in children and adolescents.[17]

GH2035 provided estimates of the value relative to income levels of the mortality declines experienced by countries.[2] In estimating the economic value of such mortality decline, we used an inclusive metric called full-income valuation. Full income captures both dimensions of the impact of better health on the economy: economic productivity, or gross domestic product (GDP), as measured in a country's national income accounts (the so-called instrumental value of better health), and the intrinsic value of better health in and of itself. GH2035 stated that "the inclusively measured economic benefits of improved health are shown to be decisively greater than when health is valued only by its effect on national income accounts."[2] It estimated the contribution of mortality decline to growth in full income for various regions from 2000 to 2011—eg, in South Asia, mortality declines in 2000–11 contributed about 2·9% of average national income per year. This contribution was almost half as large as the contribution of increases in income levels during this period. The full-income methods from GH2035 have subsequently been used in investment cases for women's and children's health and the prevention and treatment of non-communicable diseases (NCDs), among others.[18] At the same time, contributions measured in the national income accounts are important. Healthy populations enable increased income for countries, faster economic growth, and more rapid poverty reduction, as was documented in the report of the WHO Commission on Macroeconomics and Health.[19,20] Although the contribution of better health to GDP growth is only part of its contribution to full income, it is an important part.

For this report, we have brought the full-income data up to date.[21] Table 2 shows income change, mortality change, and change in full income in 2010–19 for the world's 30 most populous countries, expressed relative to their 2010 income level, confirming the very large contribution of health to economic welfare. Figure 5 compares the USA and France over the same period. While growth in GDP in the USA exceeded that in France, the value of mortality change in France exceeded that in the USA, with the result that the changes in full income were similar in both countries. Consistent with these findings, Chen and colleagues have argued that countries underspend on health improvements relative to their value.[23] The full-income approach is one of the several ways to generate compelling evidence for finance ministries and government planners, and we are studying how this evidence is used (or not) and how it could be improved to better meet the needs of the target audience.[24]

2020–23: COVID-19 and international tensions

The period 2020–23 was marked by the enormous mortality and economic consequences of the COVID-19 pandemic. During what WHO defined as the emergency period of the pandemic—ie, Jan 30, 2020, to May 4, 2023—we estimate that about 23 million excess deaths occurred, mostly from COVID-19 (appendix pp 71–76). In

a 2021 analysis, we suggested that the pandemic would be a major setback for achieving global mortality targets, particularly those for tuberculosis and maternal mortality,[25] although evidence presented later in this report suggests that we were too pessimistic.

The effects of the pandemic were compounded by conflicts in Europe, the Middle East, and west and east Africa, which resulted in direct and indirect civilian deaths, and by continued USA–China tensions that are substantially altering the global political environment. There is no end in sight for any of these issues. Conflicts are also driving increases in the number of refugees and internally displaced people, who are now at a record high, and who are a challenging cohort for health-service delivery. Some consequences of these tensions and the COVID-19 pandemic include increases in inflation, energy prices, food prices, and debt servicing. By the end of 2022, the external debt of LMICs reached $27 trillion.[26] Between 2022 and 2023, official non-concessional financial flows to LMICs dropped by almost $40 billion per year to actually become reverse flows (flows, however, substantially increased to Ukraine).[27,28] Concessional flows barely rose, and private flows out of LMICs rose to about $190 billion per year.[27,28] The International Monetary Fund has argued that "higher long-term real interest rates, lower growth and higher debt will put pressure on medium-term fiscal trends and financial stability."[29]

The changed financial environment will probably also slow economic growth rates, tighten development assistance budgets, and reduce the willingness of powerful countries to collaborate in addressing global challenges, including those related to health. For example, as discussed in part 8, there have been major reallocations of aid to the war in Ukraine and many large aid donors, such as France and Germany, have cut their budgets for official development assistance.[30–32]

Geopolitical tensions, competition for limited assistance funds, and political polarisation are placing strains on global health. In the USA, for example, the US President's Emergency Plan for AIDS Relief (PEPFAR) is threatened by governmental dysfunction.[33] Since its launch in 2003, PEPFAR has been reauthorised for 5-year terms with strong bipartisan support. However, after a bruising partisan battle, in March, 2024, the US congress passed only a 12-month reauthorisation bill, and PEPFAR's future is in jeopardy. Rising nationalism, such as the vaccine nationalism that occurred during the COVID-19 pandemic,[34] presents a challenge to the agenda laid out in this Commission report, and greater international collective action is needed to generate global public goods, including for pandemic preparedness and curbing antimicrobial resistance. We recognise that LMICs might have to generate national public goods for health themselves,[35] or to rely on support from regional initiatives such as the Africa Centres for Disease Control and Prevention.

	Value of change in gross national income (% per year)	Value of mortality change (% per year)	Value of full income change (% per year)	Ranking, value of change in full income
Global	2·6	1·5	4·1	NA
Bangladesh	6·7	2·3	8·9	5
Brazil	–0·1	1·0	1·0	29
China	8·9	1·1	10·0	3
Colombia	2·7	0·9	3·7	19
DR Congo	2·6	4·7	7·2	8
Egypt	1·4	1·3	2·6	21
Ethiopia	8·4	5·4	13·8	1
France	1·1	0·6	1·7	26
Germany	1·9	0·6	2·5	22
India	6·4	2·5	8·8	6
Indonesia	4·9	1·2	6·1	11
Iran	9·1	1·2	10·2	2
Italy	0·3	0·6	0·9	30
Japan	1·1	0·8	1·9	24
Kenya	4·2	1·7	5·9	12
Mexico	0·7	0·3	1·0	28
Myanmar	7·6	2·1	9·7	4
Nigeria	0·5	2·3	2·8	20
Pakistan	2·9	2·3	5·2	15
Philippines	5·1	0·5	5·6	14
Russia	1·0	2·9	4·0	17
South Africa	0·5	5·1	5·6	13
South Korea	2·9	1·3	4·1	16
Sudan	–1·4	2·8	1·4	27
Tanzania	3·4	4·1	7·6	7
Thailand	3·0	0·7	3·7	18
Türkiye	4·9	1·2	6·1	10
UK	1·3	0·5	1·8	25
USA	2·0	0·0	2·0	23
Viet Nam	6·5	0·3	6·8	9

The data that we based our valuation calculations on were from Chang et al (2024).[21] To calculate valuation, we followed the suggestions of the Harvard Benefit–Cost Analysis Reference Case Guidelines.[22] Data are the average annual value of the total change as of 2019 expressed relative to gross national income levels in 2010. In Bangladesh, for example, the change in gross national income per capita per year between 2010–19 was 6·7% of the 2010 income, and the dollar value of the declining mortality rates per year in that period was 2·3% of the 2010 income. Full income was thus increasing by an average amount of 8.9% per year (sums are not exact because of rounding).

Table 2: **Value of change in gross national income, mortality, and full income (2010–19) in the world's 30 most populous countries**

Trends likely to shape global health, 2024–50

The global health response is likely to face substantial challenges in the next 25 years, including ongoing and new conflicts (and the attendant risk of escalation to thermonuclear war[36]), climate change, pandemics, and demographic pressures. These pressures lead to both increases in demands for health services as a result of ageing of populations, and fertility declines leading to a relative decline in the working-age population, with attendant implications for capacity to finance and provide health services.

Current estimates (appendix, pp 95–97) suggest that climate change will have highly uncertain but conceivably

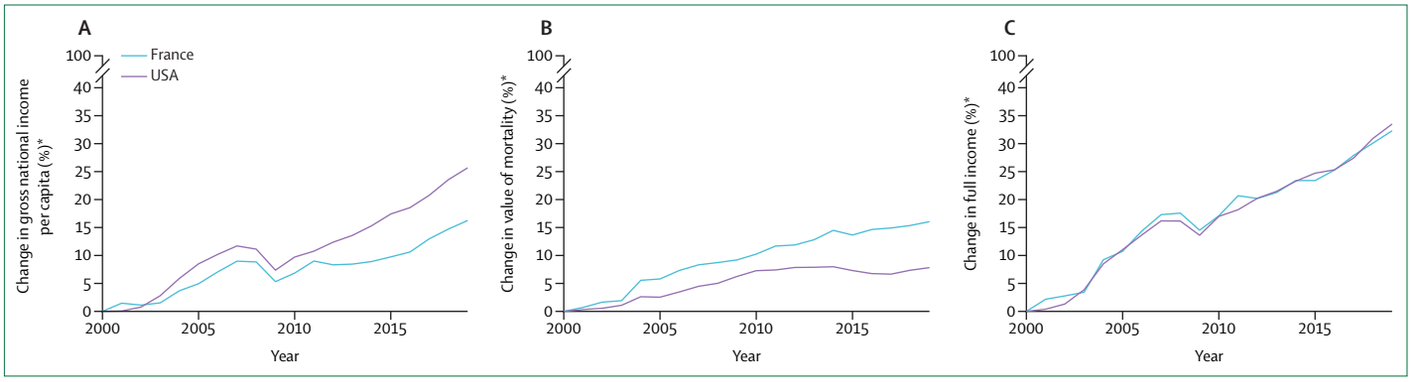

Figure 5: **Percentage change in income (A), value of mortality change (B), and full income (C) in France and the USA, 2000–19**
Source Chang et al (2024).[21] *Relative to 2000 gross national income per capita.

large consequences for human mortality by 2100, although estimated effects on mortality by 2050 are much smaller. A background analysis[37] that we undertook to inform this Commission report and to inform Disease Control Priorities (which reviews the evidence on cost-effective interventions for high burden diseases in LMICs) provides assessments of future pandemic risk. Our background analysis predicted an average, at current levels of risk, of 2·5 million deaths from future pandemics per year (with no deaths in most years and substantially more deaths in some years, as in the COVID-19 pandemic). Another way to present our assessment of risk is that there is about a 50% chance that a new pandemic causing 25 million or more deaths will occur between now and 2050.

Maintaining current health-care services will become costlier over time (even without factoring in the cost of new health technologies and services that are likely to become available in coming decades). These cost increases are related to increases in population size and average age, combined with the Baumol effect (rising salaries in professions with no obvious productivity gains in response to rising salaries in other professions that did see such gains).[38] Better paying opportunities outside the health sector and deteriorating work conditions often lead to a large gap between the supply of, and need for, health workers.[38] International migration compounds the pattern of rising costs in many lower-income countries: higher wages for physicians and skilled nurses in upper middle-income and high-income countries create a combination of out migration and upward pressure on domestic wages, leading to doubly bad outcomes.[38]

As health-care costs increase, public finances for health have deteriorated in many countries. Kurowski and colleagues from the World Bank recently noted that "the stark reversal in the priority given to health in government spending does not bode well for global health security and progress toward the health-related Sustainable Development Goals".[39] These challenges are compounded by the reverse capital flows described in the previous section.[28]

An important factor that could accelerate progress in global health is the impact of new medicines, vaccines, diagnostics, and other health tools. Countries that adopt such new tools see mortality declines accelerate. GH2035 noted that "historical experience suggests that the adoption of new technologies is associated with a decrease in the under-5 mortality rate of about 2% per year".[2] A study by Jamison and colleagues[40] found that around 80% of the decline in mortality in children younger than 5 years across 95 LMICs between 1970 and 2000 can be explained by the diffusion of such technologies. The pipeline of candidate medicines, vaccines, and diagnostics for neglected diseases, emerging infections, and child and maternal health is more robust than ever, and newly launched therapies are having a transformative effect (appendix pp 105–06). Schäferhoff and colleagues[41] and Ogbuoji and colleagues[42] both suggest that the current development pipeline is likely to yield a suite of new tools that could have a dramatic impact on global health.

Part 2: Health goals for 2035 and 2050

Health systems serve several important goals, including preventing and reducing the severity of disease, improving quality of life at all ages, reducing premature mortality, responding to day-to-day health concerns, and protecting against financial risk (ie, protecting populations from catastrophic expenditures on health services). Most countries also explicitly value equity in access to services and the attainment of health outcomes.

However, a multiplicity of goals can lead to an absence of specific actionable goals. To address this problem, in this report we argue that reduction in the PPD (panel 1) works well as an overarching goal to bring more coherence and focus to these efforts. Other goals correlate well with achieving reductions in PPD and, of course, focusing most effort on one goal does not preclude other efforts, such as attempts to improve quality of life or reduce within-country inequalities (panel 2).

Globally, a person born somewhere in the world in 2019, just before the COVID-19 pandemic, had about a

Panel 2: Sex-based and socioeconomic inequalities in mortality within countries

Sex differences in health outcomes

Sex and gender are important determinants of health outcomes.[43] The "Global Health 2035" Commission documented faster mortality improvements in females than in males, which contrasted sharply with discrimination against females at birth and in higher mortality in girls younger than 5 years than in boys younger than 5 years (hereafter referred to as under-5 mortality) in some countries.[2] In that Commission, sex differences were examined in rates of decline in mortality rather than in levels of mortality, with the conclusion that much of the overall improvements in survival were driven by improvements in females. In this Commission, the goal of reducing PPD by 50% by 2050 is not sex-specific. Considering females only, nine of the 30 most populous countries were on track to halve the PPD by 2030 (appendix p 89), whereas for males, only three countries were on track (Bangladesh, Russia, and South Korea). Overall, declines in PPD were greater in females than in males in 20 of the 30 countries. Among countries where females have a higher decline in PPD than males, the difference between the sexes was largest in Ethiopia, Tanzania, and Thailand. Of the countries where males have a higher rate of decline in PPD than females, this advantage is greatest in France, Italy, and Japan.

Globally in 2019, females had a lower PPD than males. This gap was widest in the Central and Eastern European region, where the male PPD was up to 2·2 times higher than the female PPD. Other countries where the male PPD was twice the female PPD include South Korea, Russia, Viet Nam, Thailand, Türkiye, and Japan.

Beyond the fact that females are biologically likely to live longer than males (about 25% of the sex difference in life expectancy is accounted for by biology[44]), the remaining differences in life expectancy can be attributed mostly to higher risk exposure among males—most notably smoking. Evidence is growing for interventions specifically targeting men that can reduce such exposure.[45] Conversely, our analysis showed the smallest sex differences in PPD in a mix of countries in the North Atlantic, Sub-Saharan Africa, and Middle East and North Africa regions. In Nigeria, the PPD in males was only 1 percentage point higher than that in females. In Qatar, Kuwait, Bahrain, Togo, the United Arab Emirates, the Netherlands, Guinea, Malta, Sweden, and Benin, the difference between the male and female PPD was less than 5 percentage points. Given that life expectancy is generally 5 years longer in females than females, smaller survival differences could indicate discrimination against females.[46]

Although females live longer, they generally have higher rates of disability and poorer health than males, which is known as the health–survival paradox.[47] Females also face higher age-specific rates of mental illnesses, dementia, and some of the indicators of failure in child development than males.[48] However, the absence of sex-disaggregated data for disease prevalence, other morbidity indicators, and access to health care and other essential services severely constrains our understanding of these sex differences. These data gaps also make sex-responsive and gender-responsive programmes and policies to reduce these inequalities difficult to design.

Socioeconomic inequality in survival

The "Global health 2035" Commission pointed to the health of vulnerable groups as a key health challenge, and highlighted that avoidable mortality is concentrated disproportionately in poor communities.[2] Historically, high life expectancy was associated with low lifespan variation—ie, lower inequality in the length of life lived in a population.[49,50] However, trends in some high-income countries show widening gaps between the richest and poorest individuals: the gap in age at death between the richest 1% and poorest 1% of the US population between 2000 and 2014 was about 15 years in males and 10 years in females.[51] Similar findings were reported in Norway.[52] The gap in life expectancy between rich and poor populations has widened in the USA, the UK, and Denmark,[53-55] but narrowed in other countries, including South Korea and many European countries.[56,57]

In LMICs, more attention has been paid to studying inequality in childhood mortality by socioeconomic groups. Chao and colleagues estimated that, in 2016, under-5 mortality was twice as high in the poorest households than in the richest in LMICs (excluding China).[58] Despite substantial absolute reductions in this gap since 1990, the relative gap remained similar, with under-5 mortality roughly twice as higher in poor households. Key factors that affect these inequalities include living in a rural rather than an urban residence, maternal education, sex of the child, and source of drinking water.[59]

In comparison, inequality in adult mortality in LMICs has received much less attention. A study in five countries in sub-Saharan Africa showed a difference of 6–10 years in life expectancy between the lowest and highest socioeconomic groups in 2003–16.[60] In India, an 8-year gap in life expectancy was noted between the richest and poorest quintiles in 2011–12,[61] and in Indonesia, a 4-year difference in life expectancy at age 30 years was noted between the richest and poorest quintiles in 2007–15.[62] Studies[60-62] have shown that the relationship between socioeconomic status and adult mortality in LMICs may differ from that in high-income countries, due to different patterns of epidemiological and demographic transitions, including rates of multimorbidity from non-communicable diseases and rates of tobacco and alcohol use.

PPD=probability of premature death. LMICs=low-income and middle-income countries.

31% chance of dying before age 70 years (assuming continuation of the 2019 age-specific mortality rates). For comparison, the global PPD was 62% in the early 1960s [55] (figure 2). Analyses underpinning this Commission report show that most countries could feasibly reduce their national PPD by 50% before 2050,[16] which we posit

is a reasonable long-term goal to aim for (ie, 50 by 50). If this goal were achieved globally, a person born anywhere in the world in 2050 would have only a 15% chance of dying before age 70 years (the PPD in the North Atlantic region in 2019).

We chose 2019 as a baseline for our analyses because of the substantial impact of COVID-19 on PPD, which shows how exogenous shocks such as pandemics can threaten 50 by 50. Although COVID-19 deaths were highly skewed towards the oldest age groups, 36% of all excess deaths worldwide in 2020–21 were among those younger than 65 years.[63] From 2019 to 2021, the worldwide PPD rose by over four percentage points.[10] However, the COVID-19 pandemic was presumably a temporary setback to mortality declines in the long run. Data suggest that in 2023 premature mortality started falling again, although it remained higher than pre-pandemic levels in many countries.[64] We used 2019 as the baseline year to avoid the effects of these presumably temporary distortions on overall trends.

Time required to halve PPD

Our assessment began by looking at historical progress in reducing the PPD from 1970 to 2019, a period in which remarkable progress was made, but with disparities across regions and countries (appendix pp 11–15). Importantly, there is no significant correlation between current PPD and rates of change in the past decade (2010–19)[16]—ie, high rates of decline in PPD are possible irrespective of the initial PPD. For example, South Korea had the most rapid improvement in PPD from a low initial PPD, and Ethiopia also had a rapid improvement in PPD despite a high initial PPD (table 1).

For the world as a whole, changes in PPD since 1970 have largely been driven by improvements in people aged 50–69 years.[16] Between 2010 and 2019, about 50% of the improvement in PPD was due to reduced mortality in this age group, followed by reduced mortality in people aged 0–14 years (about 27%), and those aged 15–49 years (about 23%). In the North Atlantic region, the proportion of the contribution to the decline in PPD from people ages 50–69 years has been about 70% since the 1970s, and even in sub-Saharan Africa this age group contributed the most (40%) to changes in PPD in 2010–19. Success in reducing PPD will require success in reducing the burden of NCDs and injuries that dominate the causes of mortality in middle and older age.

Achieving 50 by 50

Given that data from 2019 are the baseline against which we are measuring progress in PPD, countries have 31 years—ie, from 2019 to 2050—to achieve the goal of 50 by 50. Since 1970, 37 countries halved their PPD in 31 years or less (table 3), including seven of the world's 30 most populous countries: Bangladesh, China, Iran, Italy, Japan, South Korea, and Viet Nam (figure 6). This historical achievement shows that halving PPD within the timeframe of 50 by 50 is possible. Halving of PPD occurred in countries with both a high starting PPD (eg, Viet Nam) and a low starting PPD (eg, Italy).

Between 2010 and 2019, the global PPD declined by 1·3% per year. To halve the PPD by 2050, an annual rate of decline of 2·2% is required. Globally, 33 countries had an annual rate of decline in PPD of at least 2·2% in 2010–19,[16] including seven of the world's 30 most populous countries (table 1). Thus, an acceleration in progress is needed in most countries, including in nine of the 30 most populous countries that had rates of decline in PPD of less than 1% per year—and thus need to more than double the rate of decline to meet 50 by 50.

If countries with a rate of change of 1·0–2·2% annually can achieve the same rate of change as well-performing regional neighbours, halving PPD in each country by 2050 would be feasible. At a rate of decline of 2·2% per year, PPD would fall by 30% by 2035. Thus, a reasonable milestone on the way to the 50-by-50 target would be to reduce PPD from 2019 by 30% before 2035. The appendix (pp 16–17) shows countries that are on track to achieve a 30% reduction by 2035 and a 50% reduction by 2050.

Baseline PPD as of 2019 varies from 12% (eg, in Italy, Japan, and South Korea) to more than 50% (eg, in DR Congo and Nigeria). Although the 50-by-50 goal is feasible (if perhaps only aspirational for some countries, realistically speaking) for almost all baseline PPDs, the health conditions and age groups that should be focused on will vary accordingly. Because there is no historical experience of halving from the current lowest PPD—12%—the goal could be more demanding for these high-performing countries. That said, South Korea's rate of improvement (table 1), is consistent with success in halving.

In part 3, we introduce the 15 priority conditions that cause most premature deaths. Focused attention on tackling these conditions could have an enormous payoff globally. The varying importance of each condition in different countries should be used as the basis for tailoring interventions to achieve 50 by 50. For example, eight infectious and maternal and child health conditions account for half the life expectancy gap between the North Atlantic (ie, the region with the highest life expectancy) and sub-Saharan Africa, where lower respiratory tract infections, tuberculosis, HIV/AIDS, and neonatal conditions are particularly important. Meanwhile, countries where these eight infectious and maternal and child health conditions do not cause substantial mortality can reduce premature mortality by carefully focusing on seven sets of NCDs and injuries, which account for four-fifths of the life expectancy gap between the North Atlantic and China, with more than half the gap accounted for by three conditions: atherosclerotic cardiovascular diseases, haemorrhagic stroke, and tobacco-related NCDs. India is an example of

	Initial PPD	Period during which PPD fell by 50%
Central and Eastern Europe region		
Armenia	65%	1988–2010
Bosnia and Herzegovina	70%	1992–96
Slovenia	36%	1983–2014
China		
China*	61%	1970–2001
Latin America and Caribbean		
Chile	50%	1970–88
Colombia	46%	1985–2013
El Salvador	72%	1980–2008
Guatemala	70%	1982–2011
Middle East and North Africa		
Algeria	74%	1970–97
Bahrain	30%	1991–2022
Iran*	56%	1983–2006
Israel	35%	1973–2004
Kuwait	31%	1983–2014
Lebanon	58%	1975–99
Oman	69%	1970–94
Qatar	42%	1974–2006
Saudi Arabia	61%	1970–2001
Tunisia	60%	1970–98
United Arab Emirates	51%	1970–2000
North Atlantic		
Cyprus	41%	1970–2000
Iceland	30%	1974–2003
Ireland	34%	1979–2010
Italy*	28%	1983–2003
Luxembourg	35%	1977–2008
Malta	36%	1970–2001
Norway	25%	1988–2019
Sub-Saharan Africa		
Cabo Verde	49%	1988–2019
Western Pacific and Southeast Asia		
Australia	38%	1970–99
Bangladesh*	62%	1991–2022
Cambodia	100%	1975–2001
Japan*	33%	1970–2001
Maldives	70%	1970–1999
New Zealand	34%	1977–2008
Singapore	43%	1972–2002
South Korea*	34%	1992–2010
Timor-Leste	95%	1978–2009
Viet Nam*	66%	1972–94

Probability of premature death is defined as the probability that a child born in the indicated year would die before age 70 years if the age-specific death rates prevailing at the year of birth were to continue unchanged. Source: Norheim et al (2014).[16] *Country is among the world's 30 most populous countries.

Table 3: **Countries that reduced the probability of premature death by 50% in 31 years or less between 1970 and 2019**

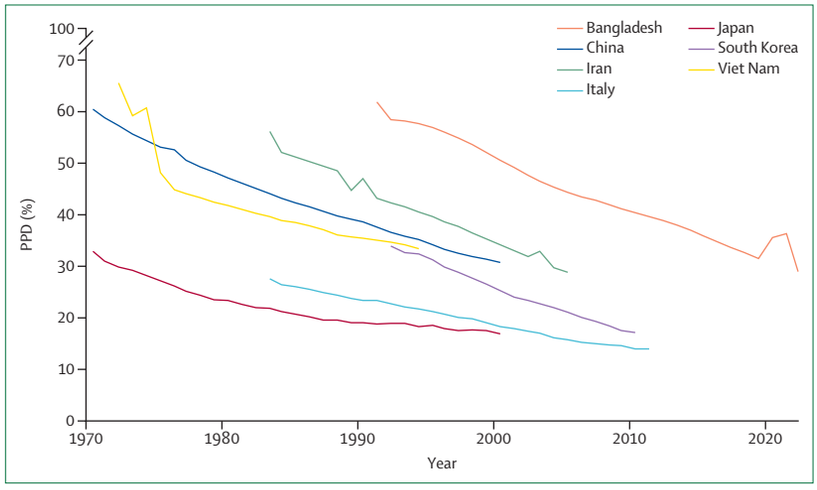

Figure 6: **High-population countries that halved the PPD in 31 years or less, 1970–2019**
Sources: Norheim et al (2024),[16] UN World Population Prospects (2022).[64] PPD=probability of premature death (ie, death before age 70 years).

a country where both sets of conditions contribute substantially to the life expectancy gap: almost a third of the life expectancy gap between India and the North Atlantic is accounted for by the eight infections and maternal and child health conditions (especially neonatal conditions and diarrhoea), and almost half is accounted for by the seven NCDs and injury-related conditions (especially atherosclerotic cardiovascular diseases and tobacco-related NCDs).

In all cases, we argue that focusing on the relevant priority conditions would substantially reduce PPD by 2050. Reductions in PPD would require scaled up investments in the 15 priority health conditions and the rolling out of new health tools (including preventive health interventions), which in turn could be enabled by assigning higher priority for health in government spending and through the use of subsidies and pooled procurement to ensure access to required drugs, vaccines, and commodities, as we will discuss in subsequent sections.

Part 3: The 15 Priority Conditions

We propose that countries focus on preventing and treating 15 priority conditions (eight infectious and maternal health conditions and seven NCD and injury-related conditions) as a concrete step towards reaching 50 by 50 (panel 3). These 15 conditions account for a very large fraction of the life expectancy gaps between the highest-performing regions and other regions, and declines in deaths from these conditions contributed most of the life expectancy gains globally between 2000 and 2019.[65]

To establish the importance of the 15 priority conditions, first we examined the life expectancy gap between the North Atlantic region (which, as of 2019, had a life expectancy at birth of 82 years and a PPD of 15%) and each other region, which varied from 22 years in sub-Saharan Africa to 3 years in the US region. A tiny

***Panel* 3: The 15 priority conditions**

We propose that all countries focus on reducing mortality and morbidity from 15 priority conditions, which include eight infectious and maternal health conditions and seven NCD and injury-related conditions. The eight infectious and maternal health conditions were defined using the WHO Global Health Estimates categories of country-level causes of death: neonatal conditions, lower respiratory tract infections, diarrhoeal diseases, HIV/AIDS, tuberculosis, malaria, childhood cluster diseases, and maternal conditions.[17] The neonatal conditions comprise the Global Health Estimate categories of preterm birth complications, birth asphyxia and birth trauma, neonatal sepsis and infections, and other neonatal conditions (eg, haemorrhagic and haematological disorders, transitory endocrine and metabolic disorders, and digestive disorders). The category of childhood cluster diseases comprises four vaccine-preventable illnesses: whooping cough, diphtheria, measles, and tetanus.

The seven NCD and injury-related conditions are atherosclerotic cardiovascular diseases (ischaemic heart disease and ischaemic stroke), haemorrhagic stroke, NCDs strongly linked to infections, NCDs strongly linked to tobacco use, diabetes (including chronic kidney disease due to diabetes), road injury, and suicide. The NCDs strongly linked to infections are stomach cancer, liver cancer secondary to infection with hepatitis B virus or hepatitis C virus, cervical cancer, rheumatic heart disease, and cirrhosis due to infection with hepatitis B virus or hepatitis C virus. The NCDs strongly linked to tobacco use are chronic obstructive pulmonary disease and cancers of the mouth, oropharynx (lip and oral cavity, nasopharynx, and other pharynx), trachea, bronchus, lung, and larynx. Tobacco-related deaths from atherosclerotic cardiovascular diseases and haemorrhagic stroke are included in those categories.

NCDs=non-communicable diseases.

fraction of the 17 000 unique codes in in ICD-11 accounts for most of the gap in life expectancy. The 15 priority conditions that we have identified contribute to about 80% of the life expectancy gap between most regions and the North Atlantic—eg, 86% of the life expectancy gap between China and the North Atlantic, and 74% of the gap between sub-Saharan Africa and the North Atlantic (figure 7, table 4).

We then compared gains in life expectancy for each region over time. Globally, life expectancy increased by 6·2 years between 2000 and 2019. Changes in the cause-specific mortality rates of the 15 priority conditions accounted for about 86% of this increase (table 5). These 15 priority conditions contributed to 93% of the 9·5-year gain in life expectancy during this period in sub-Saharan Africa (of which 92% was due to reductions in mortality from the eight infectious and maternal health conditions), 86% of the 8·1-year gain in India, 74% of the 5·7-year gain in China, and 82% of the 3·6-year gain in the North Atlantic.

We now examine progress that countries have made in tackling both the infectious and maternal health priority conditions and the NCD and injury-related priority conditions, and assess how the COVID-19 pandemic affected progress on infectious diseases and maternal mortality.

Progress in infectious and maternal health conditions

GH2035 focused on ways to reduce mortality from HIV/AIDS, tuberculosis, malaria, and maternal and child health conditions in all LMICs down to the low rates in the best performing upper-middle-income countries by 2035. That Commission concluded such progress was possible, and our new analysis of the reduction in the life expectancy gap between each region and the North Atlantic region from 2000 to 2019 shows that considerable progress has been made largely as a result of reductions in mortality from infections and maternal health conditions in some regions (appendix p 18).

We consider the eight infectious and maternal health conditions to be a useful aggregate indicator. Globally, rates of decline in mortality from these conditions between 2000 and 2019 were impressive, with performance in 2010–19 slightly better than that in 2000–10. Globally, decline in mortality from the eight infectious and maternal health conditions contributed 3·7 years of the total 6·2-year increase in life expectancy from 2000 to 2019 (table 5). In sub-Saharan Africa, the overall increase in life expectancy was 9·5 years, 8·7 years of which were accounted for by reductions in the eight infectious and maternal health conditions (with declines in HIV/AIDS mortality accounting for the largest share—3·0 years). Reductions in mortality from the eight infectious and maternal health conditions accounted for 6·9 years of the 8·1-year gain in life expectancy in India, where declines in mortality from diarrhoeal disease, neonatal conditions, and tuberculosis were particularly important. Reductions in mortality from the priority infectious and maternal health conditions were also an important driver for life expectancy gains in the Central Asia, Western Pacific and Southeast Asia, and Middle East and North Africa regions.

It is important to note that, by 2000, major gains in life expectancy had already been achieved in much of the world as a result of control of the eight infectious and maternal health conditions. For example, a retrospective assessment of the Expanded Programme on Immunization, which marks its 50th anniversary in 2024, estimated that 40% of the post-1974 decline in infant mortality resulted from the programme.[67] Both figure 2 and table 5 show limited remaining gains since 2000 from tackling childhood cluster conditions (ie, vaccine-preventable conditions) because of substantial previous gains from immunisation globally.

Death rates due to tuberculosis and malaria, maternal mortality, and mortality in children younger than 15 years (hereafter referred to as under-15 mortality) all nearly halved from 2000 to 2019, whereas deaths due to HIV/AIDS fell by two-thirds. Three of the eight 2000–15 Millennium Development Goals focused on child mortality, maternal mortality, and mortality from HIV/AIDS, tuberculosis, and malaria; these goals mobilised action on, and funding for tackling these diseases, including from the Global Fund and Gavi, the Vaccine Alliance.[68–70] From 2010 to 2019, the HIV/AIDS death rate fell by 7% per year, the tuberculosis death rate by 5% per year, and the malaria, maternal, and under-15 death rates by about 3% per year. The rate of decline in tuberculosis, HIV/AIDS, and malaria mortality increased in 2010–19 compared with 2000–09, while the rate of decline in maternal mortality and under-15 mortality slowed (table 6).

Mortality from these eight infectious and maternal health conditions is concentrated in certain countries—eg, in 2019, the three countries with the highest burdens of mortality accounted for around half of all deaths from malaria (ie, Nigeria, DR Congo, and Niger) and tuberculosis (ie, India, Nigeria, and Indonesia), and a fifth of all HIV/AIDS deaths (ie, Nigeria, South Africa, and India). Similarly, around 30% of all maternal deaths and under-15 deaths were concentrated in two countries (Nigeria and India). The appendix (pp 20–24) details the rates of decline in mortality for the 30 countries with the highest number of deaths from each of the eight infectious and maternal health priority conditions, as well as progress on reducing under-15 mortality (p 25). For under-15 mortality, 12 of the 30 highest-burden countries had faster declines in 2010–19 than in 2000–10. The fastest declines in under-15 mortality in 2010–19 were in China, Uganda, India, Angola, and Ethiopia (appendix p 25).

Despite the substantial progress made, infectious and maternal health conditions still account for a large share of the life expectancy gap between sub-Saharan Africa, India, Central Asia, and some other regions and the North Atlantic region. In sub-Saharan Africa, lower respiratory tract infections and tuberculosis each accounted for about 2 years of the life expectancy gap, and HIV/AIDS, neonatal conditions, diarrhoeal diseases, and malaria each contributed roughly 1·5 years to the gap (figure 8). Neonatal conditions, diarrhoeal diseases, and lower respiratory tract infections each accounted for about 1 year of the life expectancy gap between India and the North Atlantic region (figure 8).

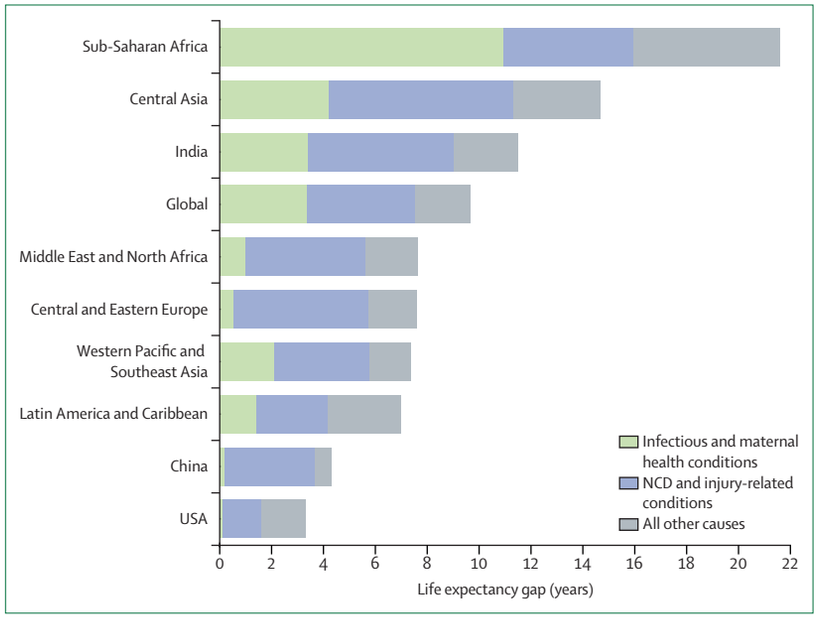

Figure 7: **Gap in life expectancy compared with the North Atlantic region attributable to priority conditions, 2019**

Life expectancy in the North Atlantic region was 82 years in 2019. Pollard's decomposition method was used to calculate the contributions of specific causes of death to differences in life expectancy between regions.[66] Definitions of the priority infectious and maternal health conditions and the priority NCD and injury-related conditions are provided in panel 3. Sources: WHO Global Health Estimates (2021),[17] UN World Population Prospects (2024),[10] and Karlsson et al (2024).[65] NCD=non-communicable disease.

	Gap in life expectancy, years	Proportion of gap in life expectancy		
		Infectious and maternal health priority conditions*	NCD and injury-related priority conditions*	Priority conditions combined
Central and Eastern Europe	7·6	7%	68%	75%
Central Asia	14·7	29%	48%	77%
China	4·3	4%	82%	86%
India	11·5	29%	49%	78%
Latin America and Caribbean	7·0	20%	40%	60%
Middle East and North Africa	7·6	13%	60%	73%
Sub-Saharan Africa	21·6	50%	23%	74%
USA	3·3	3%	44%	48%
Western Pacific and Southeast Asia	7·4	28%	50%	78%
Global	9·6	35%	43%	78%

Adapted from a Commission on Investing in Health background paper.[65] Life expectancy in the North Atlantic region was 82·2 years in 2019. Pollard's decomposition method[66] was used to calculate the share of the life expectancy gap accounted for by each condition based on WHO's Global Health Estimates (2021)[17] and the UN's World Population Prospects (2024).[10] NCD=non-communicable disease. *Definitions of the priority infectious and maternal health conditions and the priority NCD and injury-related conditions are provided in panel 3.

Table 4: **Proportion of gap in life expectancy between the North Atlantic Region and other regions accounted for by the 15 priority conditions, 2019**

Impact of COVID-19 on mortality from infectious and maternal health conditions

The impact of the COVID-19 pandemic on cause-specific mortality rates is difficult to estimate.[71] We rely on data from the WHO Global Health Estimates (GHE), which is considered one of the most reliable data sources for up to 2021. According to the GHE, during the COVID-19

	Global	Sub-Saharan Africa region	India region	China region	North Atlantic region
Infectious and maternal health priority conditions					
Overall	3·68 (59%)	8·71 (92%)	6·85 (85%)	1·69 (30%)	0·25 (7)
Childhood-cluster diseases	0·44 (7%)	0·92 (10%)	0·66 (8%)	0·08 (1%)	0 (0)
Diarrhoeal diseases	0·60 (10%)	1·01 (11%)	1·57 (19%)	0·15 (3%)	–0·01 (<1%)*
HIV/AIDS	0·47 (8%)	2·95 (31%)	0·44 (5%)	0 (0)	0·04 (1%)
Lower respiratory tract infections	0·52 (8%)	0·70 (7%)	0·76 (9%)	0·53 (9%)	0·17 (5%)
Malaria	0·18 (3%)	0·95 (10%)	0·05 (1%)	0 (0)	0 (0)
Maternal conditions	0·09 (2%)	0·34 (4%)	0·21 (3%)	0·02 (<1%)	0 (0)
Neonatal conditions	0·75 (12%)	0·55 (6%)	1·54 (19%)	0·77 (14%)	0·04 (1%)
Tuberculosis	0·62 (10%)	1·30 (14%)	1·63 (20%)	0·15 (3%)	0·01 (<1%)
NCD and injury-related priority conditions					
Overall	1·65 (27%)	0·06 (1%)	0·06 (1%)	2·49 (44%)	2·74 (75%)
Atherosclerotic cardiovascular diseases	0·59 (10%)	–0·03 (<1%)*	–0·21 (–3%)	–0·11 (–2%)	1·71(47%)
Diabetes	–0·04 (–1%)	–0·07 (–1%)	–0·12 (–1%)	0·03 (1%)	0·07 (2%)
Haemorrhagic stroke	0·31 (5%)	0·08 (1%)	0·06 (1%)	0·74 (13%)	0·17 (5%)
Infection-related NCDs	0·24 (4%)	0·05 (1%)	0·17 (2%)	0·45 (8%)	0·16 (4%)
Road injury	0·12 (2%)	0·06 (1%)	0·08 (1%)	0·22 (4%)	0·23 (6%)
Suicide	0·09 (1%)	–0·03 (<1%)*	0·08 (1%)	0·19 (3%)	0·05 (1%)
Tobacco-related NCDs	0·35 (6%)	0 (0)	0 (0)	0·97 (17%)	0·34 (9%)
Other causes	0·88 (14%)	0·72 (8%)	1·13 (14%)	1·49(26%)	0·66 (18%)

Data are changes in life expectancy in years attributable to specific causes of death (proportion of total change attributable to each cause). Pollard's decomposition method[66] was used to calculate the share of the life expectancy change accounted for by each condition based on WHO's Global Health Estimates (2021)[17] and the UN's World Population Prospects (2024).[10] In 2000, life expectancy was 51·2 years in the Sub-Saharan Africa Region, 62·7 years in the India Region, 72·3 years in the China Region, 78·6 years in the North Atlantic region and 66·4 years globally. Between 2000 and 2019, life expectancy increased by 9·5 years in the Sub-Saharan Africa Region, 8·1 years in the India Region, 5·7 years in the China Region, 3·6 years in the North Atlantic region and 6·2 years globally. Negative proportions reflect changes that had deleterious effects (ie, that contributed to reductions in life expectancy). *These percentages have a negative value of between –1% and 0%.

Table 5: **Changes in life expectancy attributable to infectious and maternal health and NCD and injury-related priority conditions, 2000–19**

	Deaths (n)			Death rate*			Annual rate of change in death rate (%)		
	2000	2019	2021	2000	2019	2021	2000–10	2010–19	2019–21
Tuberculosis	2 500 000	1 300 000	1 400 000	41	17	18	–3·9%	–5·2%	1·6%
HIV/AIDS	1 600 000	720 000	650 000	27	9	8	–3·9%	–7·1%	–6·0%
Malaria	870 000	580 000	600 000	14	7	8	–3·2%	–3·5%	1·3%
Maternal deaths	410 000	240 000	260 000	300	170	190	–3·3%	–2·4%	5·8%
Under-15 deaths†	12 000 000	6 700 000	6 300 000	88	47	46	–3·5%	–3·0%	–1·8%

Data were obtained from WHO's Global Health Estimates (2021)[17] and the UN's World Population Prospects (2024),[10] and have been rounded. *For tuberculosis, HIV/AIDS, and malaria, the death rate is per 100 000 population; for maternal deaths the death rate is per 100 000 livebirths, and for under-15 mortality (ie, deaths among children younger than 15 years), the death rate is per 1000 livebirths. †Under-15 deaths are an approximation of deaths from the priority conditions neonatal conditions, diarrhoeal diseases, lower respiratory tract infections, and childhood-cluster diseases.

Table 6: **Global progress against infectious and maternal health priority conditions**

pandemic (specifically between 2020 and 2021), rates of decline in death rates slowed for HIV/AIDS and under-15 mortality, while death rates for tuberculosis, malaria, and maternal mortality increased (table 6). By contrast with these estimates, Global Burden of Disease data suggested that the number of tuberculosis deaths during the pandemic was lower than the number of expected deaths,[72] and that the maternal mortality ratio remained about the same in 2021 as it did in 2019.[73]

In our analysis of the 30 countries with the highest burden of tuberculosis, 24 had either slower declines in mortality or increased mortality during the pandemic (appendix p 20). However, several sub-Saharan African countries (DR Congo, Ethiopia, Nigeria, Tanzania, Uganda, Zambia) recorded annual reductions in tuberculosis deaths of more than 6% even during the pandemic (appendix p 20).

Some countries maintained or accelerated their progress on reducing deaths from HIV/AIDS during the COVID-19 pandemic, and 10 countries achieved annual declines of 10% or more per year (appendix p 21). However, increases in deaths due to HIV/AIDS during

the COVID-19 pandemic were recorded in Brazil, China, Republic of the Congo, Kenya, Pakistan, and Russia (with increases in death rates of 12% per year in Pakistan and 6% in Russia). More than half of the 30 countries with the highest burden of malaria recorded increased malaria deaths during COVID-19, with only five countries (South Sudan, DR Congo, Liberia, Mali, and Benin) recording faster declines in malaria deaths during the pandemic (appendix p 22).

For maternal mortality, an accelerated decline in maternal mortality was noted in Chad, Kenya, South Sudan, and Tanzania, whereas most countries had increased maternal mortality rates during COVID-19. The increase in maternal mortality was highest in Brazil, the Philippines, China, Indonesia, South Africa, and India (appendix pp 23–24). Most of the countries with the highest under-15 mortality experienced a slowing of decline in mortality rates during the COVID-19 pandemic, and Kenya had increased under-15 mortality rates during this period (appendix p 25).

Overall, despite the pandemic, impressive progress continued in tackling infectious and maternal and child health conditions. These trends suggest that a 30% reduction in PPD by 2035 remains feasible through focused attention on these priority conditions, although more time is needed to assess the full impact of the pandemic in 2022, 2023, and thereafter.

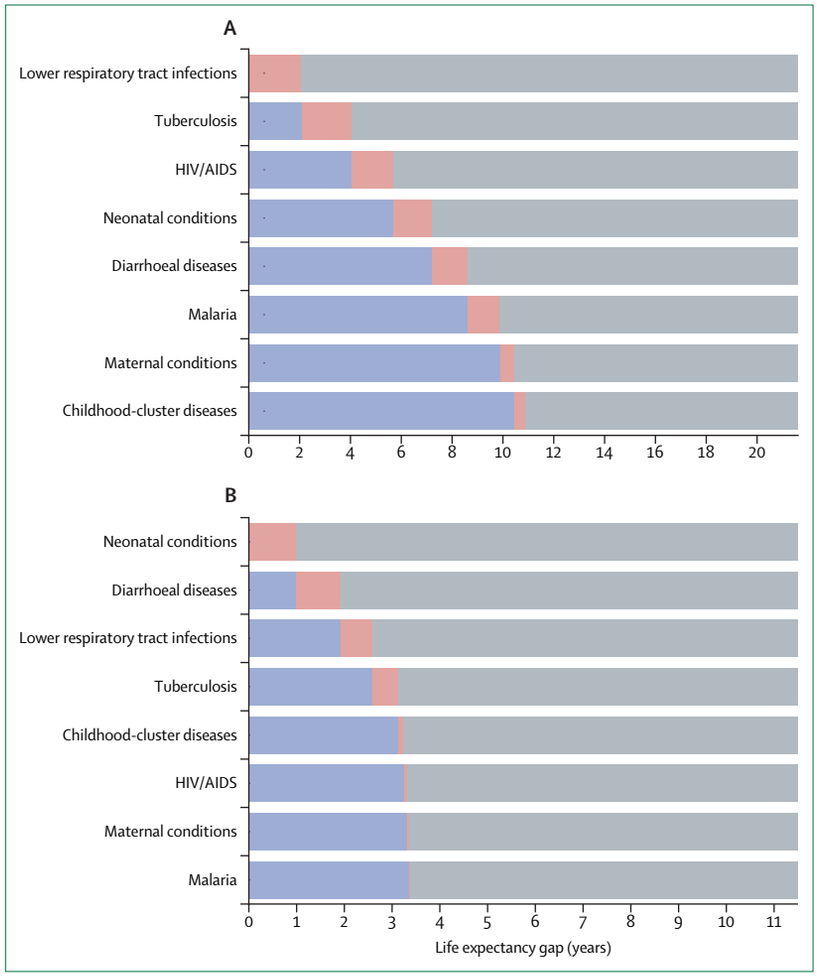

Figure 8: **Gap in life expectancy compared with the North Atlantic region attributable to the infectious and maternal health priority conditions in the Sub-Saharan Africa (A) and India (B) regions, 2019**
Life expectancy in the North Atlantic region was 82·2 years in 2019. Red sections of the bar show the life expectancy gap accounted for by the cause indicated on the y-axis. Blue sections of the bars show the cumulative contribution of the causes above the cause indicated on the y-axis. Pollard's decomposition method was used to calculate the contributions of specific causes of death to differences in life expectancy between regions.[66] Sources: WHO Global Health Estimates (2021),[17] UN World Population Prospects (2024),[10] and Karlsson et al (2024).[65]

Progress in NCDs and injury-related conditions

Achieving a 50% reduction in PPD by 2050 will also require targeted action against NCDs and injury-related priority conditions, which contribute substantially to the life expectancy gap between the North Atlantic region and other regions. In India, for example, atherosclerotic cardiovascular diseases accounted for 2·1 years of the 5·6-year life expectancy gap related to the seven NCD and injury-related priority conditions, and tobacco-related NCDs accounted for 1·6 years (figure 9A).[74] In China, atherosclerotic cardiovascular diseases, haemorrhagic stroke, and tobacco-related NCDs each accounted for about 1 year of the 3·5-year life expectancy gap attributable to the seven NCD and injury-related priority conditions (figure 9B).

Globally, the decrease in death rates for the seven NCD and injury-related priority conditions accounted for about 1·7 years of the 6·2-year gain in life expectancy between 2000 and 2019 (table 5). These reductions in mortality did little to raise life expectancy in India and sub-Saharan Africa (both in absolute and relative terms), but underpinned close to half the life expectancy improvements in China and 75% of life expectancy improvements in the North Atlantic region. In the North Atlantic, reductions in mortality from atherosclerotic cardiovascular disease accounted for 1·7 years of the 3·6-year increase in life expectancy between 2000 and 2019. In China, by contrast, the contribution of reductions in deaths from atherosclerotic cardiovascular diseases was small, although it increased in importance in 2010–19 compared with in 2000–09 (appendix p 30).

Global progress on reducing mortality from the seven NCD and injury-related priority conditions between 2000 and 2019 was mixed (table 7). On the positive side, age-specific mortality rates declined globally, including by 1·5% per year for the critical age group 50–69 years. Rates of decline differed by conditions and region. However, improvements in or stabilising of age-specific death rates are an incomplete measure of success for two reasons. First, and most importantly, our analyses show that population growth and ageing—which are in part a consequence of past successes in reducing deaths from infections and maternal health conditions—are expected to drive up the number of people dying from NCDs and injury-related conditions over time by around 1–2% per year (appendix p 30).[75] This increase would result in a

	All NCD and injury-related conditions	Athero-sclerotic cardiovascular diseases	Diabetes	Haemorrhagic stroke	Infection-associated NCDs	Tobacco-associated NCDs	Road injury	Suicide
Global	−1·5%	−1·2%	0·4%	−2·1%	−2·1%	−1·0%	−1·6%	−2·3%
Central Asia	−2·1%	−2·0%	−0·2%	−2·9%	−2·4%	−0·5%	−2·5%	−2·6%
Central and Eastern Europe	−2·7%	−2·8%	1·2%	−4·2%	−2·4%	−3·2%	−1·8%	−3·6%
China	−2·6%	−0·9%	−1·7%	−3·7%	−3·4%	−1·3%	−3·0%	−4·6%
India	0·3%	0·8%	2·0%	−0·3%	−1·2%	<0·1%	<0·1%*	−0·1%
Latin America and Caribbean	−1·5%	−1·6%	−0·3%	−2·8%	−2·0%	−1·1%	−1·5%	<0·1%*
Middle East and North Africa	−1·5%	−1·7%	0·4%	−3·1%	−1·3%	−1·2%	−1·1%	−1·0%
North Atlantic	−2·5%	−3·9%	−1·9%	−3·4%	−2·3%	−4·0%	−1·2%	−0·4%
Sub-Saharan Africa	−1·0%	−0·7%	<0·1%*	−1·5%	−1·6%	−1·1%	−0·8%	−0·8%
USA	−1·5%	−2·2%	<0·1%	−1·4%	0·1%	−0·3%	−1·9%	2·0%
Western Pacific and Southeast Asia	−0·7%	<0·1%	0·8%	−0·8%	−2·2%	−1·8%	−0·9%	−2·4%

The table shows average annual rates of change in the mortality rate per 100 000 population per year based on data from WHO's Global Health Estimates (2021).[17] A negative average annual rate of change indicates a decline in mortality rates. NCD=non-communicable disease. *These percentages have a negative value of between 0% and −0·1%.

Table 7: **Change in mortality rates from NCD and injury-related priority conditions among people aged 50–69 years, 2000–19**

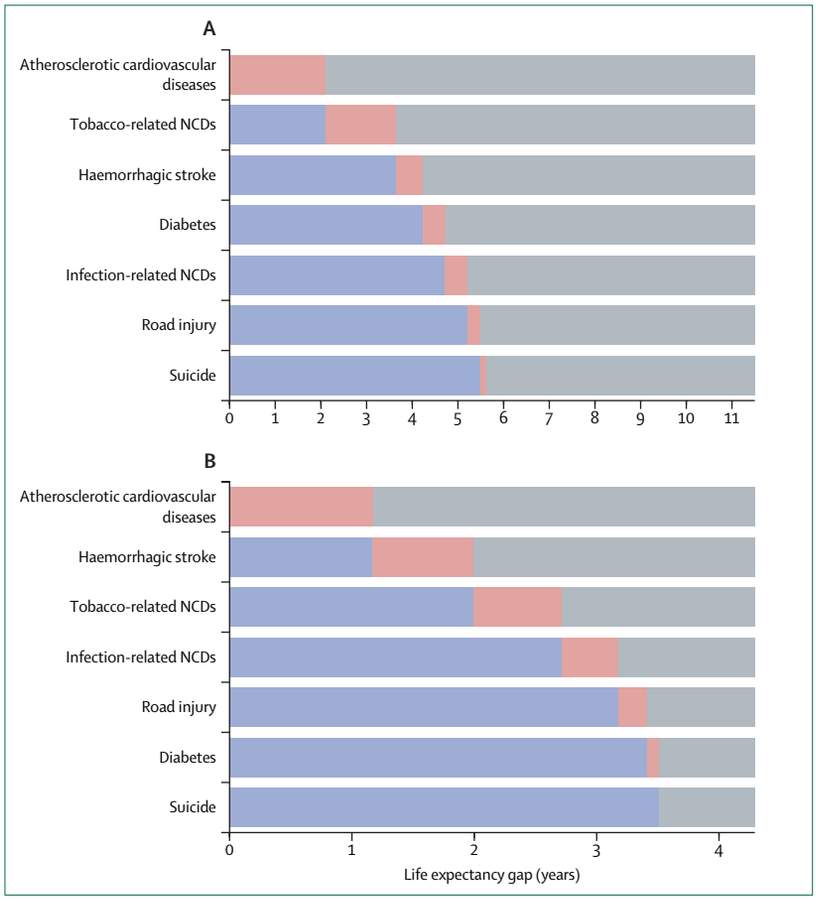

Figure 9: **Gap in life expectancy compared with the North Atlantic attributable to the NCD and injury-related priority conditions in the India (A) and China (B) regions, 2019**

Life expectancy in the North Atlantic was 82·2 years in 2019. Red sections of the bars show the life expectancy gap accounted for by the cause indicated on the y-axis. Blue sections of the bars show the cumulative contribution of the causes above the cause indicated on the y-axis. Pollard's decomposition method was used to calculate the contributions of specific causes of death to differences in life expectancy between regions.[66] Sources: WHO Global Health Estimates (2021),[17] UN World Population Prospects (2024),[10] and Karlsson et al (2024).[65] NCD=non-communicable disease.

near doubling of deaths by 2050 compared with 2019, with associated large rises in incidence and prevalence of the priority conditions, leading to a historically unprecedented increase in demand for related health care. Figure 10 shows the effect of demographic changes and reductions in mortality rates on deaths from haemorrhagic stroke. In high-income countries, adjustments were gradually made across the 20th century to account for epidemiological and demographic shifts and to redesign health-care systems around prevention of and care for NCDs and injuries. However, in the view of the Commission on Investing in Health, LMICs do not have sufficient time or resources to enable the investment in the health sector that would be required to replicate the systems that evolved in high-income countries.

Second, data from WHO's Global Health Estimates suggest that the risk environment of the seven NCD and injury-related priority conditions has deteriorated.[76] This deterioration has been exacerbated by factors such as greater tobacco affordability in middle-income countries, persistent ambient air pollution, rising consumption of harmful quantities of alcohol, rapid industrialisation fostering a sedentary lifestyle, and the proliferation of unhealthy diets worldwide.[76] Without a clear set of policy priorities and the accompanying political courage to implement them in the face of objections from corporate interests, a potential rise in the age-specific incidence of the seven NCD and injury-related priority conditions could place the burden of mortality reduction even more firmly onto health systems.

The challenges, then, are twofold: to maintain a focused approach that emphasises intersectoral action on tobacco control and deployment of the most cost-effective medical interventions (eg, cardiovascular disease prevention), and to use available resources to innovate cost-efficient health-care delivery models with similar or better quality of care as those in high-income

countries. Here, the signs are promising: every year, there are more reports from health researchers in LMICs about the effectiveness of technology-supported, locally informed innovations in delivering care for NCDs and injuries.[77–79] Greater international financial support is needed to enable knowledge sharing and cross-country learning about these innovations.

Low-mortality, high-morbidity conditions

So far, we have focused on mortality indicators, partly because the evidence base for the prevalence of morbidity is weaker (as a result of challenges in collecting data and defining morbidity). However, reducing morbidity and improving health-related quality of life are also important goals. Health indicators that reflect both mortality and morbidity, such as health-adjusted life expectancy and disease-adjusted life years, correlate highly with life expectancy (figure 4). Most interventions that reduce mortality rates result in improvements in health-related quality of life, and in populations with high life expectancy, the proportion of time lived with reduced quality of life tends to increase.[80]

However, as mentioned earlier, there are several conditions that cause substantial suffering and health burdens but do not result in high premature mortality, including mental illness, dementia, and failure to thrive (in countries with high prevalences of infectious diseases and maternal health conditions). Mental illnesses, such as affective disorders and schizophrenia, are leading causes of morbidity globally, and are associated with substantial economic losses from presenteeism and absenteeism.[81,82] National prevalence data for mental illnesses are not produced by WHO, but according to a Global Burden of Disease study, the age-standardised rates of mental illnesses remained fairly stable from 1990 to 2019, although this stability could reflect challenges in collecting prevalence and severity data over time.[83] Ambiguity and imprecision in diagnostic criteria undermine epidemiology and other aspects of psychiatric science.[84] Although genome-wide assessments of disease or risk are promising, as of now they have not been sufficiently developed. The COVID-19 pandemic exacerbated some mental illnesses, and increases in mental illnesses are likely to continue in view of the global climate crisis.[85] Mental illnesses were major contributors to the economic consequences of COVID-19 in the USA in an analysis by Cutler and Summers.[86] Caring for individuals with mental illnesses imposes a large psychological, physical, and financial burden on caregivers.[87,88] Although lists of deaths by cause generally show little contribution from mental illnesses, bipolar illness and schizophrenia are strong risk factors for all-cause mortality—particularly mortality from cardiovascular disease and suicide.[89] Successful interventions to address morbidity from mental illnesses should thus also reduce associated mortality rates.

Dementia is a huge public health challenge, particularly in countries with rapidly ageing populations. It adversely affects cognitive function, and reduces quality of life of both patients and their families. Although not a major cause of premature mortality, dementia is an important cause of death in old age: it was the seventh leading cause of death globally in 2019.[17] The global age-standardised dementia prevalence remained stable between 1990 and 2019 and is expected to remain stable until 2050.[90] However, similar to mental illnesses, there are challenges in collecting rigorous prevalence data and so there is wide uncertainty around prevalence and morbidity estimates.[91] Although some high-income countries have reported declines in age-specific incidence, the absolute number of individuals affected will continue to rise due to demographic changes.[90,92] Beyond its direct health effects, dementia results in substantial long-term care needs. Jin and colleagues[93] projected that the need for long-term dementia care in China by 2050 could cost as much as 6% of the country's gross domestic product (GDP). According to estimates by Chen and colleagues,[94] Alzheimer's disease and other dementias are projected to cost the global economy over 14 trillion international dollars between 2020 and 2050, equivalent to about

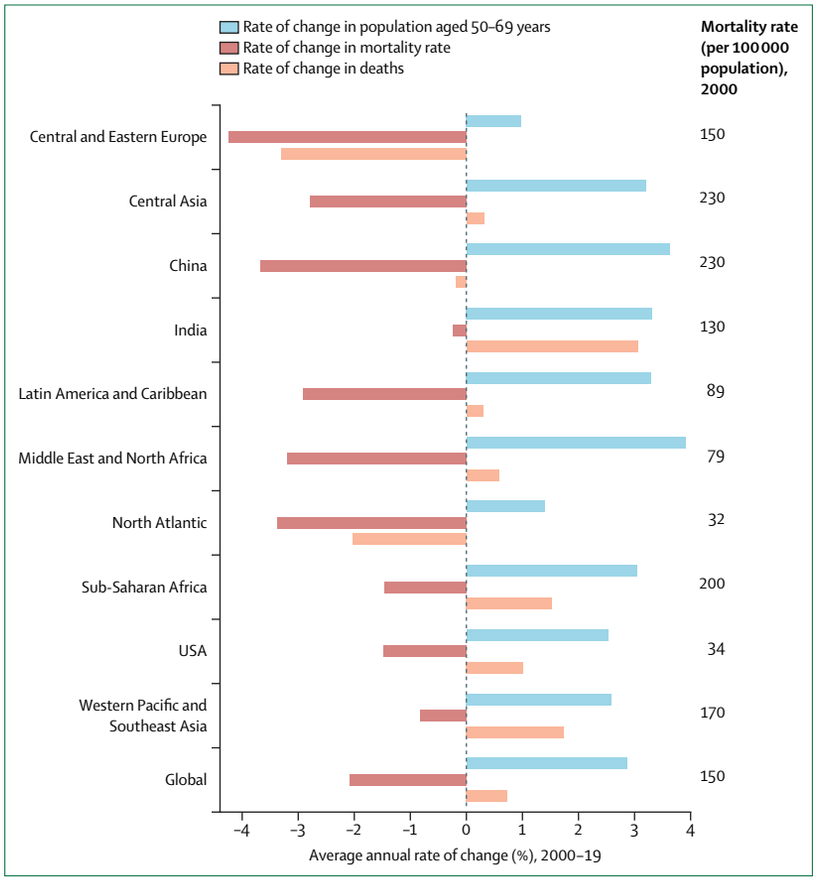

Figure 10: **Sources of change in deaths from haemorrhagic stroke among people aged 50–69 years, 2000–19, by Commission on Investing in Health region**

Negative rates of change indicate a decline and positive rates of change indicate an increase.

0·4% of GDP. The psychological and time burden on caregivers for people with dementia is high, and often disproportionately affects women, exacerbating gender inequalities in health and economic wellbeing.[95]

In countries with a high prevalence of infectious diseases and maternal health conditions, there is a need to shift from an exclusive focus on child survival to child thriving to support the large numbers of children who are not meeting expected targets for healthy physical and cognitive development. Height-for-age and mathematics test scores are important measures of child development and are relatively well measured. The appendix (pp 98–102) highlights newly available data on adolescent height and mathematics skills showing great disparities even between middle-income countries and high-performing countries, let alone between high-income countries and low-income countries, which are currently not included in these comparisons. In Mexico, for example, 12% of females aged 15–19 years attained heights that left them clinically stunted whereas in the UK the corresponding proportion is only 2%. In Saudi Arabia, children at the 90th percentile in mathematics test scores would be only at the 18th percentile in Singapore. Poor physical and cognitive growth throughout childhood and adolescence confers noteworthy lifelong health and economic disadvantages on children, especially those from poor households.[96] Interventions that can address these problems, at least partly, are available, with evidence that cognitive growth can benefit from the same health interventions that affect physical growth.[74] In part 4, we describe a modular approach to health-systems strengthening that includes interventions to promote children's health and to ensure that every child has the opportunity to achieve their full potential.

Part 4: a modular approach to health-systems strengthening

Introducing specificity to the health-systems agenda

The 2023 UHC monitoring report by WHO showed that little progress has been made globally in health-service coverage since the start of the SDG era in 2015 (with the exception of continued progress on HIV treatment).[97] Furthermore, catastrophic health expenditure is becoming more common.[97] Taken together, these data suggest that the UHC agenda has not been driving progress on health outcomes as much as was expected.

Discourse around UHC suggests that an overly broad vision of UHC (eg, in which every health need is fully addressed for every person by 2030) and a general lack of realism about what UHC entails in terms of collective action and fiscal choices could be contributing to slow progress.[3] Relatedly, discourse around health-systems strengthening has focused largely on how to improve the levels of various health-system inputs in resource-poor countries—rather than on how to use limited resources to directly improve population health and build resilient health systems.[98]

We call for a reset of the UHC and health-systems-strengthening agendas. We recommend that national governments maintain their focus on public financing of a core set of interventions that are fully prepaid and available to everyone, starting with the highest value for money interventions (ie, progressive universalism), irrespective of location or financing scheme, and with accompanying social protection programmes. In this section of the Commission, we present a modular approach to health-systems strengthening that would enable building out from an initial focus on the 50-by-50 goal to allow for movement towards more comprehensive UHC over time.

We reviewed recommendations from WHO and the Disease Control Priorities Project to identify cost-effective interventions for major health conditions that would help to achieve the 50% reduction in PPD by 2050 and improve the quality of life at all ages.[99,100] We sought to identify core interventions that were likely to be cost-effective and feasible to implement in countries of all income levels, and grouped these interventions into 19 modules (table 8).[101] In addition to modules that address the 15 priority conditions, there are modules that include interventions that address other major demands on health systems—eg, rehabilitation, child and adolescent development, and palliative care. The inclusion of these interventions—which are frequently neglected by governments and development partners, despite being highly valued by citizens—alongside mortality-focused interventions are crucial additions to our proposed 50-by-50 goal, which thereby includes improved quality of life at all ages.

We grouped related interventions into modules, with each module representing a programme area with a specific set of policies and financing arrangements (table 8). To be clear, we are not advocating for these modules to be vertical programmes in the usual sense of the term. Furthermore, we emphasise that governments can still devote much of their efforts and resources to ensuring the effective implementation of specific health interventions, even within integrated financing and delivery systems (see part 5 for a specific approach to public finance that facilitates implementation within an integrated delivery system).

The modules in table 8 are based on the foundations of health-care systems (eg, treatment of HIV, prevention of cardiovascular disease, family planning), and can be thought of as a checklist for addressing the 15 priority conditions. However, local circumstances will affect adoption, and not every module or intervention will be relevant in every country; the interventions are not a prescription, but rather a starting point for local deliberation. That said, we expect that a substantial subset of the modules will be relevant and important in most countries.

We contend that focused investments to expand the delivery of these interventions could greatly accelerate progress towards the 50-by-50 target. Previous studies of

similar interventions in diverse settings showed potential reductions in premature mortality that are of the order of those required to achieve 50 by 50.[100,102] Hence, there is every reason to believe that substantial implementation of country-appropriate modules would enable achievement of 50 by 50. Additionally, most of the interventions we identify (table 8) are not being fully implemented, even in upper-middle-income and high-income countries—eg, only 31% of Norwegian adults eligible for colorectal cancer screening in 2013–16 underwent a screening test,[103] and only 16% of Chinese adults with hypertension had adequately controlled blood pressure in 2019.[104] Many high-income countries could benefit from a careful review of our intervention recommendations to identify opportunities for improved implementation.

	High-priority interventions	Primary outcome (secondary outcome)	Cost of expanding coverage by 10%*
Community-based primary health-care teams			
Infectious and maternal health conditions			
Routine childhood immunisation	Immunisation against most or all antigens (n=11) recommend by WHO for all countries	Child deaths averted (child height-for-age)	0·2
Treatment of acute childhood illness†	Treatment of enteric and lower respiratory tract infections, malaria, and acute malnutrition	Child deaths averted (child height-for-age)	2·2
Pregnancy and childbirth services‡	Antenatal care, safe delivery, management of complications of labour, routine postpartum care, neonatal care	Maternal deaths averted (stillbirths and neonatal deaths averted)	2·2
Tuberculosis‡	Treatment of infection (including drug-resistant disease), and preventive therapies for contacts and populations at high risk of latent infection	Adult deaths averted	0·9
HIV/AIDS‡	Long-term antiretroviral drug therapy for people with HIV, and preventive therapies for contacts at high risk of infection	Adult deaths averted	4·1
NCD and injury-related conditions			
Basic cardiovascular and respiratory care‡	Combination drug therapy for people at high risk of developing cardiovascular disease (including stroke) and secondary prevention for those with established disease; glycaemic control and monitoring for microvascular complications in people with diabetes; management of asthma and chronic obstructive pulmonary disease	Adult deaths averted	7·1
Mental health care‡	Combination of drug therapy and psychotherapy for severe mood disorders, schizophrenia, and other serious and commonly occurring conditions§	Cases adequately managed for 1 year (suicides averted)	3·6
Health-system interventions			
Family planning	Contraception services appropriate to settings and patient preferences	Unintended pregnancies averted (couple-years of protection)	0·3
School-age child and adolescent development	School-based programmes to deliver deworming, micronutrient supplementation, immunisation (eg, against human papillomavirus), and screening for and response to vision problems and oral health issues¶	Child height-for-age, 15-year-old mathematics scores (glasses coverage)	0·7
Custodial and palliative care	Shared responsibility between health systems and households for providing shelter, food, security, dignity, and symptom management for conditions not amenable to functional integration (eg, dementia, spinal cord injury) or treatment (eg, metastatic ovarian cancer)‖	Cases adequately managed for 1 year	1·5
Public health functions	Population-based interventions to improve disease prevention and control, including case-finding efforts for tuberculosis and HIV, vector-control efforts for malaria, mass drug administration for some neglected tropical diseases, micronutrient supplementation, and measures to identify and isolate infectious people during epidemics	Child and adult deaths averted	1·0
Primary care functions	Integrated approaches to stable, common signs and symptoms (includes essential diagnostics and supportive care)	Enabling interventions—no primary outcomes	1·7
Specialised first-level delivery platforms			
NCD and injury-related conditions			
Primary surgical care	Surgical services at first-level hospitals to address common surgical conditions with a focus on injuries and digestive diseases	Adult deaths averted	3·7
Enhanced cardiovascular and respiratory care	Long-term management of chronic kidney diseases and heart failure, treatment of acute cardiovascular and respiratory complications, secondary prevention of rheumatic heart disease	Adult deaths averted	3·2
Health-system interventions			
Rehabilitation	Essential rehabilitation services focused on post-acute care for cardiovascular disease (including stroke) and injury	People functionally reintegrated into society in 1 year	1·0
Dental care	Treatment of infections and caries, dental extractions	Burden of decayed, missing, or filled teeth reduced	0·5
Emergency care functions	Integrated approaches to common emergency presentations in outpatient and first-level hospital settings (and prehospital care), including treatment of acutely ill people during epidemics**	N/A; enabling interventions	2·2

(Table 8 continues on next page)

	High-priority interventions	Primary outcome (secondary outcome)	Cost of expanding coverage by 10%*
(Continued from previous page)			
Referral clinics and hospitals			
NCD and injury-related conditions			
Basic cancer care	Treatment of pre-cancer and early-stage cervical, breast, colorectal, and oral cancer (with curative intent)	10-year overall survival (adult deaths averted)	1·2
Enhanced cancer care	Organised screening programmes for first-tier cancers, treatment of cancers with potential for long-term remission††	10-year overall survival (adult deaths averted)	13·0

Modular structures for a country or region depend on local epidemiology, system characteristics, and preferences; this table is intended to serve only as an example and a possible starting point. *Incremental annual cost of increasing population coverage of the high-priority interventions for the module by 10%, expressed in basis points (ie, 1% of 1%) of gross domestic product per year; analysis was done only for low-income and lower-middle-income countries (n=82) based on data from Watkins et al (2024).[101] †In many countries, these interventions will be delivered via WHO's Integrated Management of Childhood Illness approach. ‡Facility-based care is an important delivery modality for many of the interventions for these conditions; dedicated facilities or clinics will be needed for enhanced care (eg, to manage people with complex disease and to provide care to key subpopulations, such as people with drug-resistant tuberculosis). §Psychotic disorders, bipolar disorder, depressive disorders, anxiety disorders, trauma disorders, and opioid use disorder, among others. ¶Excludes the provision of food to children at school (ie, school feeding). ||Many countries struggle to finance a generous package of long-term care services, and the cost can be a major economic burden on households. As a result, the responsibility to do unpaid care work tends to fall disproportionately on women and girls. Countries with sufficient resources should consider providing transfer payments to households to offset unpaid care and related expenses. **Includes some long-term care in addition to emergency care. ††These cancers will vary considerably by country and as medical care improves but could include common childhood cancers, prostate cancer, uterine cancer, Hodgkin and selected non-Hodgkin lymphomas (in adults), thyroid cancer, and kidney cancer.

***Table 8*: A modular approach to strengthening health systems to address the 15 priority conditions**

A modular approach to priority setting

Most countries have an official and broadly defined health benefits package (HBP) that specifies the interventions that are guaranteed to be available to all beneficiaries and available at little-to-no out-of-pocket cost. However, in many countries, HBPs are often poorly implemented. A review of experiences in several LMICs suggested that HBPs largely serve as advocacy documents.[105] The costs of implementing HBPs are often much higher than the available resources, and HBPs are often not linked to financing or service-delivery arrangements, hindering their usefulness[106]—which is unfortunate, because HBPs could be a key policy mechanism for allocating scarce resources efficiently and equitably.

We propose an approach to cost-effectiveness analysis for HBPs—modular cost-effectiveness analysis—that adapts to local policy processes, health-system configurations, and financing arrangements, thereby making HBPs easier to implement. This approach is central to our proposal for health-systems strengthening.

Modular cost-effectiveness analysis comprises two stages: defining modules and budget levels across the entire health sector, then optimising the intervention mix within each module. In the first stage, planners would identify a set of modules that correspond to different health sector programmes and activities. Depending on the country's epidemiology, health-service architecture, and window of opportunity for policy change, these modules could be organised around the focus areas of technical working groups (eg, malaria, cardiovascular disease), delivery platforms (eg, outreach services, primary clinical care), payment mechanisms, or other organising principles. The choice of modules would vary by country and over time, depending on the policy context. Xishui county in China, for example, is initiating a planning process based on our modular approach but focused almost exclusively on the seven NCD and injury-related priority conditions, given local epidemiology (panel 4).

As part of the first stage of modular cost-effectiveness analysis, spending on each module should be estimated and plans should be made regarding the ability to expand or reduce funding for each module based on available resources. The allocation of budgets across modules should be based on national health strategies and other policy and political considerations. We have estimated the incremental cost (as a share of GDP) of expanding the coverage of our recommended core interventions for 19 stylised modules (aligned with the 15 priority conditions) to an additional 10% of the population, a realistic increment of expansion within a given policy cycle (table 8).[101] The goal of providing policy makers with the distribution of costs across modules is to help structure conversations about where to invest often-limited incremental resources to support health-system development objectives over time.

Once planners and politicians have set the general direction for HBP reform and the budget space for each module, the second stage of modular cost-effectiveness analysis is a technocratic exercise to optimise value for money within each of the modules. Experts assigned to each module would start by mapping candidate interventions to their module and defining one or more relevant outcomes against which to compare costs. For example, a malaria module might focus on the cost of different intervention mixes per child death averted, whereas a cardiovascular disease module might focus on the cost per premature adult death averted. Some modules, such as family planning or palliative care, might focus

Panel 4: A modular approach to identify key interventions to scale up in Xishui county, Guizhou, China

Xishui county in Guizhou, China has launched a health and social development project based on the modular approach described in this Commission. The project began by adopting an indicator—the loss of expected life-years due to disease—to accurately pinpoint the major health challenges faced by the region and to prioritise health interventions. The predominant health concerns in China are the seven NCD and injury-related priority conditions, which contribute substantially to the lower life expectancy in China compared with the Commission on Investing in Health North Atlantic region (4·6 years lower in males and 4·0 years lower in females). Major contributors to this gap are atherosclerotic cardiovascular diseases (contributing 1·4 years of the gap for males and 1·7 years of the gap for females), haemorrhagic stroke (1·0 years for males, 0·8 years for females); NCDs strongly linked to tobacco (0·9 years for males, 0·7 years for females), and NCDs strongly linked to infection (0·7 years for males, 0·4 years for females).

China's high cardiovascular mortality is associated with risk factors, including high blood pressure, air pollution, poor dietary habits, and tobacco use (high blood pressure alone accounts for 56% of cardiovascular deaths in China).[107] Adults with hypertension in China are less likely to be aware of their condition (45% *vs* 47%), less likely to be treated (30% *vs* 37%), and less likely to have their hypertension under control (7% *vs* 14%), compared with the global average,[108,109] indicating a critical need for enhanced primary and secondary cardiovascular care. Additionally, NCDs strongly linked to tobacco account for 24% of all NCD deaths in China, substantially higher than the global figure of 15%.[110] In particular COPD is a leading cause of health and economic loss in China, and its integrated care capacity in terms of prevention, diagnosis, control, treatment, and rehabilitation urgently needs improvement. Finally, China has a high burden of NCDs strongly linked to infection, including from complications of hepatitis B virus infection, with a mortality rate from complications twice the global average (15·4% *vs* 8·2%).[110]

Applying the modular approach that we outline in this Commission, local teams designed three modules to tackle the seven NCD and injury-related priority conditions.[111] The module for NCDs strongly linked to tobacco includes population-based screening and treatment for COPD and asthma, and digital health interventions for smoking cessation, all of which have been cost-effective. The cardiovascular disease module includes combination drug therapy for people at high cardiovascular risk, glycaemic control and monitoring for microvascular complications in people with diabetes, long-term management of chronic kidney disease and heart failure, and secondary prevention of atherosclerotic cardiovascular disease and rheumatic heart disease in endemic settings. The module for NCDs strongly linked to infection includes interventions targeting *Helicobacter pylori* infection and hepatitis B vaccination to prevent liver disease and liver cancer.

Overall, the aim of this exercise is to ensure that the intervention modules being proposed for Xishui are scientifically grounded, culturally acknowledged, publicly accepted, and politically feasible, enhancing their sustainability and effectiveness. A programme evaluation with a quasi-experimental design is planned in the next 3–5 years to collect routine data in Xishui and other neighbouring counties to assess the effect of the modular approach.

NCDs=non-communicable diseases. COPD=chronic obstructive pulmonary disease.

primarily on outcomes that are not captured in burden-of-disease studies, such as unintended pregnancies or suffering associated with life-limiting illness, respectively. Importantly, the stages of modular cost-effectiveness analysis are not unidirectional: technical analyses might identify opportunities for greater impact within specific modules that could also influence negotiations around budgetary allocations across modules.

The analytical emphasis for modular cost-effectiveness analysis is the systematic identification of synergies or inefficiencies (in terms of costs or outcomes) that might emerge when multiple related interventions are implemented together. The rank ordering of interventions by value for money within modules would account for these interdependencies. For example, treatment of diabetes on its own might not be cost-effective, but when delivered alongside primary prevention drugs for cardiovascular disease by the same provider to the same at-risk individual, the bundle of interventions could become cost-effective.[112] The priority levels of different interventions could also be adjusted according to other criteria besides cost-effectiveness, such as equity impact or financial risk protection afforded.[113]

Implications for health-systems strengthening

The modular approach that we propose could advance discourses around health-systems strengthening in four important ways. First, it could help to shift the focus from health-system inputs and functions towards the 15 priority conditions . A policy process organised around local adaptation of modules could foreground the key outcomes for the health system to track and the actions required to achieve those outcomes at a reasonable cost. Equity could be increased by prioritising interventions and modules (and related service-delivery arrangements) that address the needs of the worst-off populations. Actions to promote and measure health-system quality could be readily aligned and embedded within a modular approach.[114] The range of health needs and outcomes covered in table 8 could help health systems to better respond to emerging challenges and shocks (ie, increase resilience). For example, investments in the emergency care functions module—including in critical components

like oxygen—could save lives during a pandemic.[115]

Second, research on health-systems strengthening is underdeveloped with regard to supply-chain strengthening for key commodities such as drugs and diagnostics.[98] A modular approach that maintains a focus on a limited set of interventions could inform drug formularies and procurement-system reforms. In part 5, we propose a mechanism based on economic principles that could improve access to and affordability of high-priority medicines.

Third, a modular approach could guide national and international conversations around the health workforce. Health workforce development plans, including pre-service and in-service training curriculums, could be aligned with priority interventions. Our approach could help to plan expansions in the primary health-care workforce and, as a complement, quantify the need for specialised health workers (eg, for dental care). Still, health workforce gaps can be attributed in large part to inadequate and inequitable pay, poor working conditions, low retention, and high migration.[116] To deliver on 50 by 50, many national governments will need policies and resources in place to ensure fair compensation and regulations that protect both health workers and patients and that foster trust in the public system.

Fourth, implementation of the modular approach could bring attention to health information systems.[98] By providing a roadmap for health-system development, the modular approach could also inform the sorts of key indicators that need to be routinely collected and digitised, including expenditure data, service utilisation data, and clinical outcomes data concerning the priority conditions. An emerging opportunity is the leveraging of real-world data, such as from the District Health Information System 2 platform, to improve monitoring and implementation of priority interventions.[117] A challenge is that modernising health information systems requires investment in new data platforms and local technical expertise, making it tempting to de-prioritise. A related challenge is that many countries (eg, many in sub-Saharan Africa) do not have available high-quality demographic and cause-of-death data,[118] which hinders attempts to improve regionally derived estimates by using local data.

Most of the interventions that we describe (table 8) could be delivered through primary health-care systems, which, when broadly defined, include community, outpatient, and first-level inpatient care.[3] Countries that have excelled in reducing premature mortality and improving service coverage and financial risk protection indicators for UHC (as defined by WHO and in the SDGs, respectively) have done so using primary health-care systems. For example, Thailand's UHC reforms focused heavily on primary health care, and the country has reduced its PPD almost to the level of the USA (table 1) but at a fraction of the cost.[17] Successful primary health-care initiatives tend to have several elements in common, including: empanelment (ie, assignment of patients to clinics based on geographical proximity), provision of a manageable set of preventive, chronic, and acute services across the lifespan at little or no out-of-pocket cost to patients, and use of community outreach workers who are in regular contact with local households to assess priority health needs and connect individuals to services.[15,119]

Part 5: Health-system financing: a long-term perspective

Cost implications of the modular approach to 50 by 50

Achieving a 50% reduction in PPD by 2050 will require countries to devote sufficient resources to the health sector. We view 50 by 50 as a domestic health agenda and universal public finance as its principal financing mechanism. We estimated the cost required to support full population coverage and prepayment of our recommended interventions for the 15 priority conditions (table 8) in 63 low- and lower-middle-income countries, which account for 87% of the total population in these two income groups.[101] By 2050, low-income and lower-middle-income countries would need to be spending on average 2·5% and 4·1%, respectively, of their GDP (as of 2019) via the public sector on these interventions. These estimates are consistent with previous estimates that low-income and lower-middle-income countries would need to spend about 5% of GDP on health care to make sufficient progress towards UHC.[120]

The average increase in health spending that would be needed to scale up these interventions to full coverage by 2050 would be an additional 1·1% of 2019 GDP in low-income countries and an additional 2·0% of 2019 GDP in lower-middle-income countries. Although this level of incremental spending corresponds to the commitments made by many countries at the 2019 UN High-Level Meeting on UHC to spend an additional 1% of GDP or more on health services,[121] it implies that government health expenditure will need to at least double, and that nearly all of the additional spending will need to be directed towards the priority conditions and interventions. Some of the world's poorest countries will not be able to mobilise sufficient domestic resources to double health spending by 2050, and continued external assistance will be required. There is thus a need to shift the portion of development assistance that goes to direct country support towards these poorest countries to ensure capacity to finance high value-for-money investments.

Our cost estimates for the 50-by-50 interventions are higher than estimates for grand convergence in GH2035,[2] mostly because the range of interventions now includes focused efforts related to NCD and injury-related priority conditions. However, the estimates are lower than those in the 2018 Commission on Investing in Health report,[3] which looked at a comprehensive package of services for UHC systems that includes and goes beyond the interventions for the 15 priority conditions that we focus on in this report. In "Global health 2050", we focus on

the minimum required level of spending on health services to address the 15 priority conditions and a highly focused response to emerging threats. We assume that spending will be concentrated on existing services and commodities, and acknowledge that health-care delivery innovations and the development of cheaper drugs and diagnostics could reduce costs. Conversely, with continued GDP growth, the fraction of GDP spent on these interventions will decrease, unless costs commensurately rise. Unfortunately, economic growth has tended to increase the cost of health care without a commensurate increase in health-sector productivity—the so-called Baumol effect (panel 5). Thoughtful adoption of technologies, such as clinical support tools based on artificial intelligence (AI), might partly counter the Baumol effect by increasing health-sector productivity or reducing costs. One study estimated that AI could realistically reduce health-care costs by 5–10%.[125] However, policy makers need to be made aware that health care expenditure will inevitably account for an increasing proportion of GDP as the economy grows and the government seeks to maximise population welfare.

Countries that choose to adopt the 50-by-50 target and adapt our general intervention recommendations face three interrelated challenges. First, they will need to ramp up domestic government health expenditure despite substantial macro-fiscal headwinds (eg, slowing health expenditure in the face of slowing economic growth and government revenues). Second, progress on 50 by 50 has to be made in the face of ageing populations, posing longer-term threats to the financial sustainability of health spending. Third, although many countries could finance the 50-by-50 target at least partly by shifting funding towards the priority interventions and away from lower-value interventions, to do so could be challenging politically.

Domestic resource mobilisation in a time of economic headwinds

Health financing trends have undergone some important shifts since 2000 (appendix p 63). The period 2000–09 is often referred to as the golden age of global health spending.[126] Fuelled by economic growth, domestic government health expenditure increased considerably, and domestic spending was complemented by a rapid increase in development assistance for health, largely to support the Millennium Development Goals.[126] In countries including China and Thailand, early adopters of UHC reforms, substantial reductions were noted in the proportion of total health expenditure accounted for by out-of-pocket spending.[127] However, the economic slowdown after the 2008 global financial crisis led to a deceleration in growth rates in domestic government health expenditure globally.[127] Political shifts and austerity measures in many high-income countries also led to stagnations in development assistance for health.[127] Additionally, progress on reducing out-of-pocket health spending slowed, albeit with some notable exceptions (appendix p 92).

During the COVID-19 pandemic, most countries increased domestic spending on health, and there was a surge in development assistance, but emerging data suggest these increases were a deviation from the longer-term trend to which many countries have since reverted.[39] The biggest challenge facing the health financing agenda

Panel 5: The Baumol effect

In the mid-1960s, the economists William J Baumol and William G Bowen were trying to understand the economics of the performing arts.[122] Although musicians were not becoming more productive, their wages were rising: a string quartet performing the same piece of music for the same amount of time earned far more on average in 1965 than an equivalent quartet would have in 1865. Their explanation, called the Baumol effect, has profound implications for health-care costs: the salaries of workers in jobs that see no productivity gains (eg, musicians) rise in response to rising salaries in other jobs that did see such gains (eg, manufacturing). As Lee explains in his obituary of Baumol, "An arts institution that insisted on paying musicians 1860s wages in a 1960s economy would find their musicians were constantly quitting to take other jobs."[123] Just as the string quartet cannot increase its productivity by playing faster, many health workers cannot increase their productivity because their human clinical interactions take time and labour. Recorded music does, of course, increase the reach of musicians, but demand remains for the in-person experience, for which there are no productivity gains.

Pablos-Méndez and colleagues argue that, too often, policy makers blame rising health-care costs on ageing populations and expensive new health technologies without taking into account the Baumol effect (also known as Baumol's cost disease).[124] But they note that this effect is caused not only by "differential productivity levels in different sectors of the economy", but also by demand for health care.[124] If people's incomes are growing from productivity gains elsewhere in the economy, "people seem willing to pay the increasingly high prices for health services", which puts an additional upward pressure on the price of such services.[124]

Although new technologies in health can indeed raise costs, they can also decrease them. New vaccines against rotavirus infection, for example, cost far less than treating severe diarrhoea in a clinic or hospital. The "Global Health 2035" Commission stressed the importance of the cost-saving (or outcome-improving) impact of new technology in countering demographic and other pressures, including the Baumol effect, that can lead to rising costs.[2] Looking forwards to 2050, demographic changes (ie, an increasingly older population combined with general rising populations) are likely to be the primary driver of increased health-care costs, which, combined with the Baumol effect, makes preparing for the fiscal fallout of the demographic transition more necessary and urgent.

is tepid economic growth and the long-term damage to many economies in the aftermath of the pandemic. The most recent Global Economic Prospects projects that global economic growth within the next few years will be a bit slower than the 2010–19 average, and only about 4% in emerging economies—substantially lower than that in 2010–19.[128] Although inflation has slowed since the pandemic, it remains higher than desired, and rising debt-servicing costs in many LMICs are hindering increases in public spending.[128] In the absence of strong advocacy efforts and clear asks to finance ministries that face competing demands for resources, these patterns will make it more challenging for health services to get the public resources they need to deliver rapid reductions in premature mortality.

	Deaths (2019)	Deaths relative to 2019 (%)		Crude death rate* (2019)	Crude death rate relative to 2019 (%)	
		2035	2050		2035	2050
Global	58 million	126%	157%	7·5	111%	127%
Central and Eastern Europe	4 million	104%	104%	12·2	112%	120%
Central Asia	2·4 million	125%	164%	6·7	95%	101%
China	10 million	136%	173%	7·1	141%	195%
India	9·3 million	125%	160%	6·7	110%	132%
Latin America and Caribbean	4·1 million	132%	169%	6·4	121%	149%
Middle East and North Africa	2·7 million	140%	196%	4·8	113%	138%
North Atlantic	4·5 million	116%	131%	9·6	113%	129%
Sub-Saharan Africa	10 million	122%	157%	8·8	84%	82%
USA	2·8 million	127%	148%	8·4	118%	131%
Western Pacific and Southeast Asia	8·4 million	131%	160%	7·2	120%	142%

Data are from the UN's World Population Prospects (2024).[10] *Per 1000 population per year.

Table 9: **Deaths and crude death rate in 2035 and 2050 relative to 2019**

	Working-age population (2019)	Working-age population relative to 2019 (%)		Old age dependency ratio (%)		
		2035	2050	2019	2035	2050
Global	5·1 billion	114%	121%	14%	20%	26%
Central and Eastern Europe	220 million	90%	77%	25%	34%	45%
Central Asia	210 million	138%	176%	7%	9%	11%
China	990 million	94%	75%	17%	34%	52%
India	930 million	117%	122%	9%	14%	22%
Latin America and Caribbean	430 million	110%	109%	13%	20%	29%
Middle East and North Africa	360 million	128%	142%	9%	13%	20%
North Atlantic	300 million	96%	90%	31%	44%	52%
Sub-Saharan Africa	620 million	157%	220%	6%	6%	8%
USA	220 million	102%	105%	24%	34%	38%
Western Pacific and Southeast Asia	770 million	109%	108%	15%	22%	30%

Working age is defined as ages 15–64 years. Old-age dependency ratio is defined as the proportion of the total population that is older than 64 years divided by the proportion of the total population that is working age. Data are from the UN's World Population Prospects (2024).[10]

Table 10: **Size of working-age population and old-age dependency ratios in 2035 and 2050 relative to 2019**

In the face of these economic conditions, action is needed from governments seeking to realise rapid health improvements. The first step in many countries would be to increase general government revenue through increased taxation and improved efficiency of tax collection (appendix p 90). The International Monetary Fund has estimated that LMICs could undertake a series of policy and institutional reforms that could increase their tax-to-GDP share by up to 9 percentage points, with a medium-term minimum tax-to-GDP target of 15% of GDP.[129] Of course, higher tax-to-GDP shares would be required in the longer term to finance an expanding set of goals around the SDGs and the climate transition.

Many countries could increase the share of general government expenditure allocated to health. Although we advise against normative targets for the health share of government spending, our cost analyses and country experiences imply that most low-income and lower-middle-income countries will need to devote at least 10–15% of general government expenditure to health, even if they have a tax-to-GDP share of 15%. Bids for increased public finance for health budgets should ideally be linked to clear policies and reforms to steward those additional resources well, including by focusing the additional resources on highly cost-effective interventions targeting the 15 priority conditions we have identified.

In view of constraints on public sector finance and growing private incomes in many countries, rapid growth in private expenditure is likely—both out-of-pocket expenditure and private voluntary insurance. Such growth has been, historically, highly inefficient,[130] and in GH2035,[2] evidence suggested that increased private expenditure on health could raise rather than relieve pressure on public finance. An alternative to unrestrained growth in private expenditure would be the collection of additional taxes from groups such as civil servants, who tend to demand a more generous set of interventions than are included in the HBP. Although such an approach has its shortcomings, it might be a viable option when increased general taxation or mandatory contributions are not feasible.

Many countries have an opportunity to better steward their existing public sector health resources. We recommend three actions that could improve the efficiency of spending. First and foremost, some countries could considerably improve public financial management systems. On average, health ministries in low-income countries do not spend all the money allocated in their budgets to health, returning US$4 per person annually unspent—an amount that is nearly equivalent to the entire budget for primary health care in some countries.[131] Greater international investment is

needed to strengthen and modernise public financial management systems in the poorest countries. Second, procurement of drugs and other commodities is often highly inefficient and duplicative, especially in countries that are heavily dependent on aid and where donors are incentivised to set up siloed procurement systems.[132] Coordination and consolidation of procurement efforts, potentially as part of a broader one-plan, one-report, and one-budget agenda,[133] could free up resources and improve access to a range of commodities. Third, countries could strengthen their priority-setting processes and establish institutions to guide spending towards interventions that provide more health for a given level of spending.[106] We propose two approaches that could facilitate spending on priority interventions and programmes: modular cost effectiveness analysis, as already discussed, and the Arrow mechanism for public financing of critical drugs, which we will discuss later in this part.

Domestic resource mobilisation in an ageing world

Changes in fertility and mortality rates have dramatically reshaped the demographic makeup of most countries. For the first time in recent history, the crude death rate—a broad indicator of demand on the health system—is on the rise in nearly all regions, especially China, Latin America and the Caribbean, and the Western Pacific and Southeast Asia (table 9). If UN Population Division projections[10] for 2050 hold true, the global number of deaths will be 1·6 times higher in 2050 than in 2019, implying a surge in demand for health care driven by an increasingly older population (table 9). Although population ageing undeniably increases demands on health-care systems, the broader context is, of course, potentially highly positive, with people living healthier for longer.[134]

Meanwhile, working-age populations, who are the major contributors to the tax base and crucial to providing care for older populations, are likely to grow only moderately globally. In some regions, including China, Central and Eastern Europe, and the North Atlantic, working-age populations are projected to decline in the coming decades (table 10). The UN projected that the old-age dependency ratio (ie, the proportion of the total population that is older than 64 years divided by the proportion of the total population that is working age) will increase globally from 14% in 2019 to 20% in 2035, and to 26% by 2050.[10] The UN also projected that, by 2050, the old-age dependency ratio will be higher than 50% in both China and the North Atlantic, 45% in Central and Eastern Europe, and 38% in the USA.

We used a metric that combines crude death rate with the size of the working-age population—deaths per 1000 people in the working-age population—to explore these trends. In China, the crude death rate per 1000 working-age people is projected to grow from about eight deaths in 2010 to about 23 in 2050—a much more rapid growth than that for the general crude death rate. Figure 11 shows projected growth in crude death rates for several regions.

Compared with the UN Population Division projections, full implementation of the recommended interventions to achieve 50 by 50 is expected to accelerate the demographic transition in emerging economies, increasing the size and median age of the population, as well as the old-age dependency ratio. In these regions, substantial improvements in domestic resource mobilisation will be required to ensure stable and adequate funding. Countries will need to explore all possible financing options, including a blend of general revenue taxation and obligatory social health insurance. Countries that rely heavily on social health insurance will probably need supplemental financing through general revenue taxation to adapt to a shrinking labour force and to buffer against cyclical variations in contributions. Countries that rely heavily on

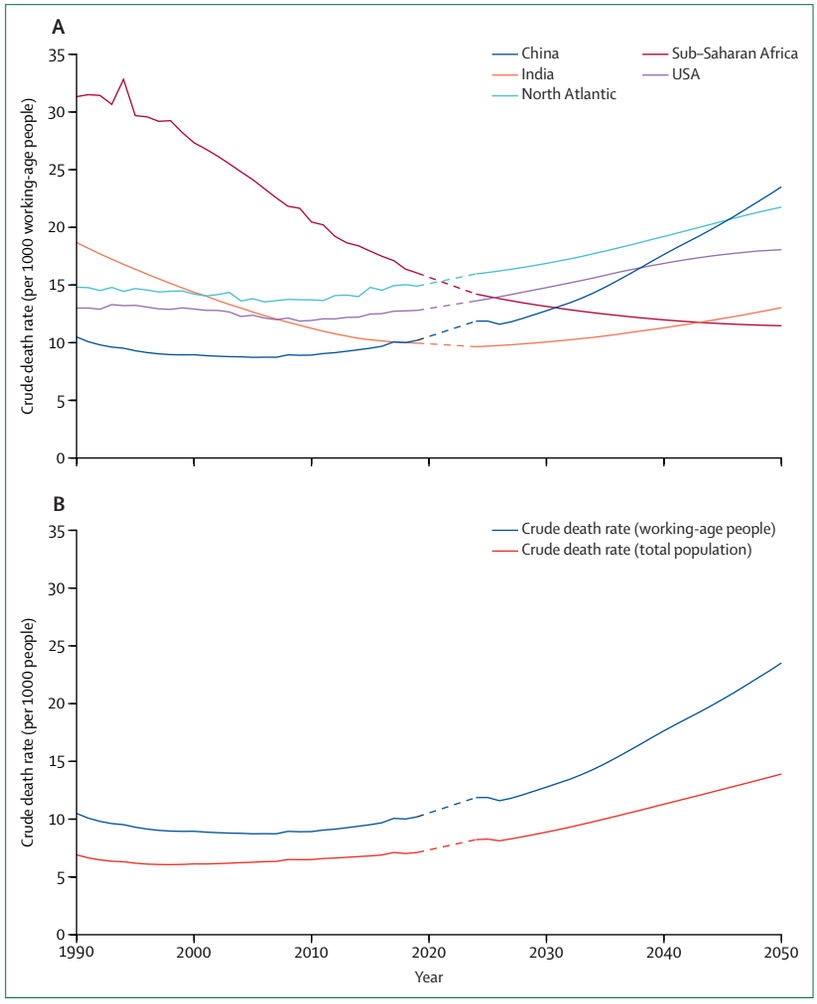

Figure 11: **Crude death rate per 1000 working-age people 1990–2023, with projections to 2050 (A) and per 1000 population and per 1000 working-age people 1990–2023, with projections to 2050, in China (B)**
The dashed sections of each trend line represent the COVID-19 emergency phase (ie, Jan 30, 2020, to May 4, 2023), for which data were omitted. Working age is defined as age 15–64 years. Sources: UN World Population Prospects (2024).[10]

general revenue taxation will probably need supplemental financing through novel social health insurance schemes, especially if large increases in general revenue taxation are politically or fiscally unfeasible and the alternatives are increased out-of-pocket spending or voluntary health insurance. Assessment of a major programme introducing rural health insurance in China showed the potential for health gains and expanded financial protection with the expansion of insurance coverage, with important implications for serving ageing populations.[135,136]

Research is needed to understand how health and social care systems can adapt to an ageing world. Middle-income countries with rapidly ageing populations could benefit from greater cross-country collaboration to build an evidence base for action in the face of limited public resources. Previous work by the World Bank[137,138] has identified several key measures that countries could consider. Most of these policies are outside the health sector—eg, labour market policies to help parents balance career and family formation goals. Nonetheless, the health sector has an important role to play in promoting healthy ageing, especially through interventions like smoking cessation and hypertension treatment that reduce the incidence of disabling and costly NCDs, and measures to control unproductive cost escalation, such as reference pricing and capitation.[2] The WHO Kobe Centre for Health Development has identified several best practices for sustainable financing of long-term care services, including the design of benefits and benefits packages for older populations.[139,140] Heller has drawn lessons from Japan that emphasise early action to address the macroeconomics of ageing and to avoid enshrining specific age categories in which specific benefits are automatically provided.[141]

	Domestic private health expenditure per person (2021 constant US$)	Domestic private health expenditure relative to gross domestic product per capita	Total drug expenditure relative to total health expenditure	Proportion of drug expenditure accounted for by domestic private health expenditure
Afghanistan (2017)	26	5·1%	41%	>90%
Armenia (2021)	193	3·9%	32%	>90%
Canada (2021)	504	1·0%	13%	60%
Costa Rica (2021)	78	0·6%	8%	>90%
Dominican Republic (2019)	49	0·6%	18%	80%
Egypt (2021)	52	1·3%	29%	>90%
Fiji (2019)	20	0·3%	8%	>90%
India (2020)	15	0·7%	21%	>90%
Malaysia (2021)	32	0·3%	7%	>90%
Mexico (2021)	132	1·3%	22%	>90%
Nepal (2021)	21	1·8%	33%	>90%
North Macedonia (2021)	93	1·4%	23%	72%
Qatar (2017)	40	0·1%	8%	22%
Moldova (2021)	71	1·3%	21%	84%
Sri Lanka (2017)	17	0·4%	13%	>90%
Suriname (2019)	34	0·5%	11%	56%
Uzbekistan (2018)	34	1·8%	36%	>90%

Total drug expenditures include costs of both prescribed drugs and over-the-counter drugs; only countries reporting both total expenditure and domestic private health expenditure for both prescription and over-the-counter drugs are included. Private health expenditure is used to estimate out-of-pocket payments because out-of-pocket payment data specifically for drugs are not available. We report data for the most recent year available in WHO's Global Health Expenditure Database.[127]

Table 11: **Domestic private health expenditure payments for drugs**

Domestic financing of drugs for priority interventions

In part 4, we proposed modular cost-effectiveness analysis as a means of prioritising specific interventions and shifting budget allocations towards the delivery systems for these interventions. Yet many countries struggle to fully cover the cost of essential interventions, including essential medicines and other services listed in HBPs (appendix p 91). As a result, some or all of the cost of these interventions has to be financed out of pocket, creating a major barrier to health-care access and a source of financial risk.

The rise in out-of-pocket spending on health care worldwide over the past decade is a major concern (appendix p 63). However, not all out-of-pocket spending is of equal concern. We argue that the focus should be on avoiding out-of-pocket spending on interventions that are included in HBPs. It is not possible to maximise health and minimise out-of-pocket and associated catastrophic and impoverishing health expenditures at the same time with the same set of interventions; there will always be trade-offs depending on how much a population values financial protection versus health.[142] Government attempts to provide universal public finance for high-cost, low-value-for-money health interventions should be thought of with the same rationale (if any) that would underlie subsidisation of any consumer good. An area of concern for the Commission is the increasing adoption of high-cost technologies (eg, chronic haemodialysis, novel cancer drugs) in countries that still have suboptimal implementation of, and high out-of-pocket costs for, core interventions for the 15 priority conditions. Although an HBP might include some high-cost interventions on general subsidy grounds, the opportunity cost (eg, in terms of excess child or maternal deaths) of funding these interventions should ideally be made explicit.

Irrespective of income levels or financing mechanisms, private health expenditure or out-of-pocket expenditure remains a primary source of financing for essential drugs in many countries. In Canada, Egypt, Mexico, and Nepal, private expenses for drugs in the past 3–7 years have exceeded 1% of GDP (table 11). A study in Brazil showed that out-of-pocket spending on drugs accounted for two-thirds of catastrophic health expenditure in 2016.[143] Furthermore, in many countries, the disease-specific financial burden resulting from out-of-pocket spending on drugs is substantial (appendix p 66)—for example, an estimated 3 million US people with diabetes (ie, 10% out of

the US population with diabetes) incurred catastrophic spending on diabetes drugs in 2020.[144] We acknowledge that uncertainty persists with regard to the level and the public–private mix of finance for drugs to support intervention against the 15 priority conditions (and, indeed, for all drugs and commodities). Yet our judgement in light of available evidence is that when drug costs are borne privately, access to priority interventions is sharply constrained and many households experience major financial distress.

Inadequate access to essential medicines and high out-of-pocket costs are major threats to the 50-by-50 goal (appendix p 64). A pattern emerges across many interventions in many countries.[145] Often, the government promises that an intervention (eg, treatment of drug-sensitive tuberculosis) will be free and available at public sector facilities. Although the consultation, if available, might be free because the health worker's salary is paid by the government, the actual treatment (in this case, tuberculosis drugs) is often not free. Such treatments are

Panel 6: The AMFm—a model for drug subsidies for non-communicable diseases?

The AMFm, which ran from 2009 to 2012, was an innovative package of financing and incentives to expand access to affordable ACTs and to displace oral artemisinin monotherapies from the market. The purpose of introducing a multidrug combination was to forestall resistance to artemisinin in such a way that assured availability and affordability of ACTs. Hosted by the Global Fund to Fight AIDS, Tuberculosis and Malaria, AMFm operated through the private (both for-profit and not-for-profit) and public sectors.[147,148]

The design of AMFm incorporated three elements: price reductions through negotiations with manufacturers of ACTs, a buyer subsidy via a co-payment at the top of the global supply chain, and managerial and administrative interventions to promote appropriate use of ACTs. In practical terms, the AMFm sought to reduce the retail price of ACTs in the private sector from as much as US$11 per treatment to the same price as chloroquine or sulfadoxine-pyrimethamine (about $0·50 per treatment) and to less than the cost of oral artemisinin monotherapy ($3–7). Patients who received malaria treatment through public-sector clinics and not-for-profit services would also benefit from increased access to free or low-cost ACTs. An independent assessment of the effect of AMFm on quality-assured ACT price, availability, and market share was conducted 6–15 months after the delivery of subsidised ACTs in Ghana, Kenya, Madagascar, Niger, Nigeria, Uganda, and Tanzania (including Zanzibar).[146] Large increases in ACT availability (of 25·8–51·9 percentage points) and market share (15·9–40·3 percentage points), driven mainly by changes in the private for-profit sector, were noted everywhere except for Niger and Madagascar. Large falls in median price for ACTs (reductions of $1·28–4·82) per adult equivalent dose were noted in the private for-profit sector in six locations. The market share of oral artemisinin monotherapies decreased in Nigeria and Zanzibar, the two locations where market share was more than 5% at baseline. The assessment concluded that subsidies combined with supportive interventions could effectively and rapidly improve availability, price, and market share of quality-assured ACTs, particularly in the private for-profit sector. Nevertheless, the Board of the Global Fund subsequently ended the AMFm.

Several studies[149,150] have assessed post-AMFm trends in access to, and the market for, ACTs in countries where malaria is endemic. After the reduction or termination of subsidies for ACTs in Uganda and Nigeria, retail prices of ACTs increased and retail prices of non-quality-assured ACTs decreased.[151] These developments are likely to have resulted in greater availability and increased use of non-quality-assured ACTs.

With the epidemiological transition, shifting disease burdens, and pressures on publicly funded health services, it is worth exploring if the AMFm experience could be an approach to improving access to affordable and quality-assured drugs and other commodities for non-communicable diseases. One possibility is to adapt the AMFm's design for country-level or regional-level subsidies for non-communicable disease commodities, with countries' ministries of finance (not donors) as the purchasers or payers of the subsidy, and with payments going directly to manufacturers. For the ministry of finance, these payments could count as either part of the health budget or additional funding. Since the expenditure would not be managed by the ministry of health, the mechanism would provide the finance ministry with assurances of no capture (at least in the upstream part of the supply chain). For the ministry of health, if the subsidy counted as part of its budget (and assuming that the budget remained constant after adjusting for inflation), it would constrain the ministry's room for allocating resources within the publicly financed health sector—and might be unattractive for that reason. However, if the subsidy were additional, the reduced price of drugs could effectively increase the health ministry's purchasing power compared with the status quo.

There are potential objections to this approach. For example, a country-level subsidy could cause major price differences across porous borders, leading to predictable price arbitrage. Unlike the case for communicable diseases, such arbitrage would not be viewed as potentially a net positive because the benefits of treatment accrue to the individual, with no positive externalities. Second, there are risks of price gouging by middlemen and retailers. However, such price gouging fears proved mostly unfounded during the AMFm because middlemen and retailers appeared satisfied with a change from low-volume, and high-margin sales to higher-volume, lower-margin sales.

AMFm=Affordable Medicines Facility—malaria. ACTs=artemisinin-based combination therapies.

commonly out of stock, and the patient is then forced to pay themselves at a private retail pharmacy, or simply do without. Diagnostics essential for deciding on a treatment course might also not be freely available.

One of our main conclusions in this report is that the Global Fund offers valuable lessons for how a national government subsidy for priority drugs and other commodities would offer a pragmatic workaround for steering resources to priority interventions and reducing out-of-pocket expenditure on health care. We call this approach the Arrow mechanism, named for the late Kenneth Arrow, the Nobel Prize-winning economist and GH2035 author who developed the mechanism to be applied to malaria drugs. The Arrow mechanism involves four key components, the first two of which draw directly on the experience of the Global Fund. The four components are redirection of general budget transfers to ministries of health to line-item budget transfers for specific priority drugs; pooled purchasing, quality assurance, and a long-term commitment to manufacturers to ensure a steady supply of medications; procurement in sufficient quantities to ensure availability; and use and strengthening of existing supply chains, both public and private. Such a mechanism was implemented through the Affordable Medicines Facility—malaria, a highly successful development assistance initiative that improved the availability of quality-assured artemisinin-based combination therapy—partly by leveraging private-sector delivery networks—and reduced the prices of such therapy at the point of use while increasing availability.[146] An elegant feature of the Arrow mechanism is that implementation does not require sophisticated financing arrangements. The approach can be effective in most countries that use line-item budgeting, where it might be the quickest and most direct way to increase access to essential medicines. The Arrow mechanism also engages the private sector in the implementation of HBPs, potentially increasing effective coverage.

Panel 6 reflects on how a domestic mechanism similar to the Affordable Medicines Facility—malaria could be developed for drugs to treat NCDs, which are often the therapies that are the least available and unnecessarily expensive in many countries. Of course, countries have additional policy options beyond the Arrow mechanism to improve the affordability of, and access to, essential medicines.[152] As we will discuss in part 8, a proportion of development assistance for health could be allocated to fostering collective action on essential medicines, including but not limited to re-establishment of an Arrow mechanism for critical drugs and commodities.

Part 6: Pandemic prevention, preparedness, and response

As a result of globalisation, the increasing human population, climate change, and other factors, global vulnerabilities to emerging diseases, including pandemics, are growing. In 2011, Nathan Wolfe warned that pandemics with devastating effects, such as the 1918 influenza pandemic, could occur frequently in the 21st century.[153] COVID-19 was estimated to have been associated with more than 23 million excess deaths globally (appendix pp 71–76), and caused enormous economic losses and setbacks to student learning, among other adverse consequences. In the past 20 years, many individual countries and the international community have invested in pandemic prevention, preparedness, and response; the COVID-19 pandemic highlighted major deficiencies in most but not all countries.[154]

COVID-19 was very different from previous pandemics, and the next pandemic might be very different from COVID-19. Therefore, there cannot be a one-size-fits-all approach to pandemic prevention, preparedness, and response. Although important lessons were learned from COVID-19, including that outcomes differed substantially across countries due to the different quality of their pandemic responses, it is important not to learn the wrong lessons. For example, our analyses suggest that expected annual losses from an influenza pandemic would be about twice as high as those from a pandemic caused by a pathogen from the coronavirus family. Furthermore, deaths from a future influenza pandemic are likely to occur at much younger ages than from COVID-19, with substantial policy implications.

The COVID-19 pandemic

On May 5, 2023, WHO Director-General Tedros Adhanom Ghebreyesus declared an end to the emergency phase of COVID-19.[155] He made it clear, however, that this declaration did not mean an end to the damage caused by SARS-CoV-2, whose effects had first been observed in Wuhan, China in December, 2019. Rather, May 5, 2023, marked a transition to a phase of enduring endemicity. Additionally, Tedros noted that morbidity from post-COVID-19 condition would continue long after the emergency phase ended.

After the 2014–16 Ebola epidemic in west Africa, various analyses and assessments were published.[156,157] Similarly, multiple examinations of and reports on COVID-19 have been released, including the *Lancet* Commission on lessons for the future from the COVID-19 pandemic,[158] a WHO-convened independent panel,[159] and a book by *The Lancet*'s Editor, Richard Horton.[160] These retrospective analyses have laid out a broad range of valuable conclusions (panel 7). The context surrounding pandemic preparedness remains, however, unhopeful. In a June, 2024, update to their WHO-convened independent report, panel chairs Helen Clark and Ellen Johnson Sirleaf pointed to the failure of negotiations for a pandemic treaty and an atmosphere of ill will and mistrust among countries, concluding that "too many gaps and vulnerabilities remain, and pathogens have an ample opportunity to spill over, slip through, and spread fast."[166]

More than a year has passed since the end of the emergency phase of COVID-19, and preliminary statistics

Panel 7: An agenda for pandemic prevention, preparedness, and response

Prevention

With the growing likelihood of pandemics, increased investment is needed in pre-emptive interventions to minimise the risk. Because most pandemics are zoonotic diseases, risk-reduction interventions should address the human–animal interface, including improving animal husbandry practices and regulating wild animal trade. Human livelihoods depend on these practices, and both as a matter of aligning incentives and as simple justice, it will be important to compensate these individuals' losses and facilitate their transition to other lines of work. Strengthening biosafety and biosecurity is also essential to prevent the risk of spill-over transmission in laboratories. The pandemic risk from already-circulating strains of microorganisms in domestic and wild animals needs to be better understood. Enhancing animal surveillance via new technologies such as deep sequencing and environmental surveillance could contribute to mapping of pandemic risk. It is especially important to focus on viruses that cross species barriers and cause disease in new species, as has occurred with H5N1 influenza in many mammalian species, including cattle, in the past few years.[161] These activities should be implemented as part of the One Health approach.[162]

In addition, surveillance of people with fevers of unknown origin, and particularly of those with severe acute respiratory illnesses, is crucial. Before a zoonotic virus mutates to transmit readily from person to person, it typically causes occasional infections in humans, acquired from an infected animal (eg, H5N1 human infections from birds and cattle). Such viruses are far more likely to further evolve to spread readily between humans than are viruses that are not yet even capable of infecting people. Thus, surveillance should be focused on people with known zoonotic exposures and fevers of unknown origin. Ideally, strengthened national laboratories would link into global systems that included, for example, aircraft waste-water surveillance.

Preparedness

Preparedness involves being ready for infectious disease events, from a small outbreak to a global pandemic, through improved global, national, and local resilience, including the updating of pandemic preparedness plans. Countries need to be prepared for various scenarios.

For rapid containment of an outbreak, a country should try to reduce spread completely, if possible, irrespective of the mode of transmission. As long as containment is possible, it should be the very highest priority and all countries and regions should be prepared to deploy this approach. New pathogens can only be contained with non-specific tools, but pathogen-specific tools could be available for previously described pathogens (eg, Ebola vaccines). For rapid containment to be possible, detailed plans need to be in place for a range of possible presentations, and health-care and public health staff need to be trained and available to respond, if not at the national level then with regional support (eg, training from regional health bodies, such as the Africa Centres for Disease Control and Prevention). Preparedness should encompass how to care for people with a new pathogen, how to isolate these people and quarantine their contacts, and how to reduce the probability of spread (such as through shelter-in-place orders) as all efforts are made to contain the pathogen. For outbreaks of known pathogens, regional and global stockpiling of pathogen-specific drugs and vaccines could be critical to the success of early-containment efforts.

For a pandemic that cannot be excluded from the population, rapid epidemiological characterisation is essential so that protection efforts can be focused on people most at risk and so that protection can be relaxed for those at minimal risk, thus reducing the secondary harms caused by strict protection measures. Plans should be in place that consider different phases of the pandemic (eg, the phase before an effective vaccine is available and the phase when an effective vaccine is available). In the COVID-19 pandemic, many countries did not adequately protect the most vulnerable people (eg, poor people, elderly people living in care institutions, people who are incarcerated) and excessively protected people at minimal risk (ie, young children) to their detriment.[163] The provision of adequate capacity for non-specific supportive care in first-level hospitals was a substantial challenge during the COVID-19 pandemic. Inadequate critical-care capacity, such as insufficient numbers of beds in intensive care units and mechanical ventilators, was a serious issue even in high-income countries. In low-income and middle-income countries, lack of access to essential clinical therapies such as oxygen was also an important contributing factor to high death rates. Rose and colleagues have discussed investing in clinical capacity to reduce pandemic mortality.[115]

Development of medical countermeasures, including vaccines, therapeutics, and diagnostics, is crucial to ensure pandemic preparedness. Global systems to ensure equitable access to such measures should also be strengthened. In view of possible disruption of global supply chains should a pandemic break out, stockpiling of essential commodities such as personal protective equipment is essential. Stockpiling of antivirals for influenza could be useful in case of an influenza pandemic. Many high-income countries have such stockpiles, but no low-income or middle-income countries do.

Response

There are three strategic objectives for pandemic response: containment, suppression, and mitigation. Containment interrupts all chains of transmission and usually requires aggressive measures, suppression minimises transmission to low levels, and mitigation slows the spread to reduce the peak incidence (also referred to as flattening the curve). Responses can be divided into two phases: early and late. Early response starts after detection of a pathogen with pandemic potential and lasts until widespread community transmission is documented. Local or global containment might be feasible if

(Continues on next page)

(Panel 7 continued from previous page)

early signs of a pandemic are detected. Severe acute respiratory syndrome was successfully contained globally within 6 months of recognition of the outbreak. COVID-19 was much more difficult to contain, but containment or suppression was achieved in many western Asia-Pacific countries during the early phase of the pandemic. Various public health and social measures were implemented during the COVID-19 pandemic in most countries. Some of these measures, such as stay-at-home orders and school closures, which has enormous negative social and economic impacts,[164] were implemented for extended periods in some countries. More research into public health and social measures is needed to provide science-based guidance, including, importantly, on the extent to which such measures are population-initiated (ie, the extent to which individual members of the population stop using public transport or going to work before government guidance or regulation, as was widespread in Europe and the USA in the early months of COVID-19),[165] and the timing and means for safely ending these measures. Whether shutdowns are initiated by individual or public action, research is required into when and how to end them. Early response to enable containment or suppression is likely to rely on public health and social measures, because vaccines will not be available in the early stage of a pandemic. Therapeutics might also not be available in the very early stage of the pandemic except for antivirals for an influenza pandemic. Diagnostics should be rapidly developed, validated, and distributed to enable early detection and isolation of cases. Public health and social measures, medical countermeasures, and proper clinical management can mitigate the effects of a pandemic in the early phases, whereas vaccines are likely to have essential roles in mitigation in later phases.

are now available to enable assessment of the consequences of the pandemic at a country level. For our analyses of the COVID-19 pandemic, we present estimated deaths beyond what would be expected in the absence of the pandemic—excess deaths—and excess deaths as a percentage of expected deaths, or P-scores. Estimates of excess deaths are still being developed, and no peer-reviewed data exist for most countries for 2022–23. WHO has data for all countries but only for 2020–21, and the UN has data for 2022–23, but only for some countries.[63,167] Therefore, we used estimates of excess deaths from *The Economist*, which were available for 2020–23 for almost all countries.[168] We acknowledge the limitations of using a non-standard data source. However, *The Economist* has a dedicated data science team with widely used estimates, and all the methods are thoroughly documented and publicly available.[169] Furthermore, the excess-deaths estimates from *The Economist* correlate highly with both the 2020–21 WHO estimates (Pearson's r 0·96) and the 2022–23 UN estimates (0·94). Our estimated P-scores also correlate highly with those from WHO (0·85) and the UN (0·78). However, as with all current estimates of excess deaths during the COVID-19 pandemic, our discussion of country performance should be interpreted as preliminary.

Estimates from *The Economist* are, on average, 3% greater than the 2020–21 WHO estimates and 20% greater than the 2022–23 UN estimates, for the same years and countries (specifically among countries with a P-score >1%). For some countries, the discrepancies are much larger—eg, according to the UN and WHO data, Bangladesh had around 160 000 excess deaths in 2020–21, whereas data from *The Economist* suggest that there were more than 400 000 excess deaths in the same period. Furthermore, since data from *The Economist* do not include expected deaths (the denominator used to calculate P-scores), we calculated expected deaths by subtracting excess deaths as estimated by *The Economist* from estimated total deaths obtained from the UN, which leads to further discrepancies between data sources.

Table 12 ranks the 30 most populous countries according to the P-score, a reasonable overall metric of performance in tackling COVID-19; the appendix (pp 71–76) includes data for all countries. The P-score is derived from excess deaths during the emergency phase of the COVID-19 (ie, Jan 30, 2020–May 4, 2023) pandemic as a proportion of the number of deaths that would reasonably have been expected had the pandemic not occurred. By taking the baseline number of expected deaths into account, the P-score potentially adjusts for other factors, such as age distribution, and so it is our preferred measure.

We estimate that there were more than 23 million excess deaths globally during the emergency phase of COVID-19, corresponding to roughly 13% of the number of deaths that would otherwise have been expected to occur—ie, a P-score of 12% (table 12). Japan's P-score of 4% was the lowest (ie, the best) among the 30 most populous countries, and China's was second lowest (table 12). Mexico had the highest P-score (25%). The appendix (pp 71–76) includes estimates of P-scores and excess deaths for all countries. Perhaps the single most striking thing about our findings is the huge range in performance among the world's most populous countries. Table 12 also shows P-scores for 2020 and 2021 individually, and for Jan 30, 2022, to May 4, 2023. Country performance varied much more widely in 2020 than over the total COVID-19 emergency phase. Pablos Mendez and colleagues[170] and Jamison and Wu[171] have pointed to an East–West divide in excess deaths in 2020, with a 100-times difference in performance separating the best-performing and worst-performing countries. Early

response in many Western Pacific countries, including serious efforts to isolate infectious individuals,[172] effectively controlled spread of the virus that originated in Wuhan, China in late 2019. The first academic publication on SARS-CoV-2 from China was published in *The Lancet* on Jan 24, 2020,[173] and warned of a pandemic risk. China, Thailand, Hong Kong, Taiwan, and Japan had all initiated serious responses by the time of publication. In sharp contrast, as Clark and Johnson Sirleaf noted, even in February, 2020, countries in Western Europe and North America did not take the opportunity to act to curtail transmission.[159] Failure to control transmission created opportunities for SARS-CoV-2 to mutate into far more transmissible variants. The approaches to control that worked well for the original, less transmissible virus appear to have worked less well later in the pandemic, leading to major increases in deaths in China and Japan from the more transmissible variants that originated elsewhere.[174]

Although we believe that the P-score for the emergency phase of the COVID-19 pandemic provides a good overall measure of country performance, it summarises the different potential values for different periods and age groups into a single value. The appendix (p 93) shows variation in P-scores over time in China, Italy, Japan, and the USA—information that could be highly relevant to understanding different waves or the timing of different response policies. Japan and China had remarkably good control early in the pandemic but performance declined as more transmissible variants came to dominate (appendix p 93). Fine-grained assessment could complement the broader picture provided by aggregate P-scores. Likewise, age-disaggregated analyses are likely to prove informative.

Economists measure the welfare loss associated with mortality in monetary terms by assessing empirically the value that individuals assign to reducing by small amounts the mortality risks that they might face. Full income, discussed earlier in this Commission, incorporates the value of reductions in mortality risk. Table 12 reports an estimate of the value of mortality loss—only mortality—associated with the COVID-19 pandemic. For the world as a whole, the value of loss from the emergency phase of the pandemic reached about 34% of the value of global income in 2019.

Loss of GDP constitutes only part of overall loss in full income, but is an important metric for the functioning of economies. In 2022, the International Monetary Fund provided an early estimate of GDP loss for the world that was as high as $13·8 trillion,[175] and in an early assessment of the economic consequences of the pandemic for the USA, Cutler and Summers estimated a loss of $16 trillion over 10 years, of which about $7·5 trillion was loss of GDP.[86] Since 2022, the IMF has slightly reduced its estimates of the impact of the pandemic on annual economic output in most parts of the world,[29,176] except for low-income countries, where the IMF now estimates that

	P-score				Economic value of welfare loss relative to gross national income (2019)§
	Overall (2020–23)*	2020	2021	2022–23‡	
Japan	4%	··†	2%	10%	26%
China	5%	··†	4%	10%	10%
Nigeria	5%	3%	8%	5%	28%
South Korea	7%	··†	2%	14%	10%
France	7%	9%	7%	6%	13%
Germany	8%	5%	8%	10%	19%
DR Congo	8%	2%	11%	11%	32%
Thailand	9%	··†	12%	13%	28%
Indonesia	10%	3%	20%	7%	38%
Kenya	11%	3%	15%	13%	41%
Myanmar	11%	5%	20%	10%	33%
UK	11%	14%	11%	10%	26%
Philippines	13%	··†	37%	5%	27%
Tanzania	13%	7%	22%	12%	32%
Italy	13%	18%	13%	10%	33%
USA	14%	17%	18%	8%	42%
Sudan	14%	14%	20%	9%	32%
Pakistan	14%	16%	24%	6%	36%
Ethiopia	15%	5%	22%	17%	36%
South Africa	16%	10%	33%	6%	58%
Egypt	17%	18%	31%	7%	38%
Viet Nam	17%	··†	14%	37%	30%
India	18%	12%	27%	14%	47%
Türkiye	18%	14%	24%	17%	37%
Brazil	18%	14%	38%	9%	44%
Colombia	20%	19%	37%	7%	39%
Iran	21%	27%	33%	6%	38%
Russia	24%	21%	40%	14%	103%
Bangladesh	25%	18%	33%	24%	48%
Mexico	25%	44%	39%	2%	62%
Global	12%	8%	18%	10%	34%

P-scores are calculated by dividing excess deaths by expected deaths for a given period, with a low score suggesting good performance (countries are listed in descending order of performance throughout the pandemic). Estimates for excess deaths are from *The Economist* (2024).[168] Because this source did not provide data for expected deaths for all countries, we calculated expected deaths by subtracting excess deaths from data for total deaths from the UN's World Population Prospects (2024).[10] *Data are for Jan 30, 2020, to May 4, 2023 (ie, the COVID-19 emergency phase, as defined by WHO). †These countries had negative P-scores— ie, a reduction in mortality relative to baseline—which could have resulted, for example, from reduced mortality from road crashes because shutdowns led to reduced driving. ‡Data are for Jan 1, 2022, to May 4, 2023). §Data represent the loss for the entire emergency phase of the pandemic period (ie, Jan 30, 2020, to May 4, 2023). Economic value of mortality loss was calculated by separately calculating excess death rates among people younger than 75 years and those aged 75 years or older for each country. Because the data from *The Economist* were not age-disaggregated, we first estimated the proportion of deaths occurring in each age group from the 2020–21 WHO data[63] and applied them to the excess deaths estimates from *The Economist*, assuming the same age distribution in 2022–23 as in 2021. A value per statistical life-to-income ratio of 160 was applied for deaths among people younger than 75 years in line with the Harvard Benefit-Cost Analysis Reference Case Guidelines.[22] The value of excess death rates in the older age group was adjusted from 160 by the ratio of the remaining life expectancy of 80-year-olds to 40-year-olds.[21] Economic value is expressed as a percentage of gross national income per capita constant international dollars—ie, dollars adjusted for purchasing power.

Table 12: **P-score for COVID-19 outcomes in the 30 most populous countries**

2024 GDP will be more than 7% lower than it otherwise would have been.

Future pandemic risk

Between the great influenza pandemic of 1918 and COVID-19, at least four influenza pandemics and two global coronavirus outbreaks occurred. Each of these pandemics was deadly, although far less so than COVID-19. Additionally, there were more geographically limited epidemics of viral haemorrhagic fevers, such as the Ebola virus outbreak in 2014–16. Although epidemics of viral haemorrhagic fevers were not as widespread and caused fewer deaths, they nonetheless caused widespread fear and economic disruption. Although we do not deal explicitly with viral haemorrhagic fevers or similarly geographically limited epidemics, many of our recommendations on pandemic preparation and response also apply to these risks. The message is clear: the risk of future pandemics remains. But how big are the risks that the world faces?

Madhav and colleagues, in an assessment prepared for this Commission and the Disease Control Priorities Project, applied the techniques of quantitative disaster modelling to provide insight into the magnitude of the risk.[37] They attempt to quantify the probability of the sparking of a pandemic—typically the point of transition to humans from another animal host—and the probability of its subsequent spread by using historical and biological data to simulate tens of thousands of possible evolutions of global respiratory pandemics caused by viruses in either the influenza or coronavirus families. Each of these simulated pandemics differs in its transmission and mortality characteristics and in the level of mortality that ensues. For example, COVID-19 was distinctive in the extent to which elderly people were at increased risk for mortality and children far less so. However, the next pandemic could have a very different age distribution of mortality. Aggregating the simulations provides a picture of the relationship between the potential mortality level of a pandemic and its likelihood—the so-called exceedance probability function.

	1-year probability	5-year probability	10-year probability	25-year probability
≥1 million deaths	6%	28%	48%	80%
≥10 million deaths	4%	19%	35%	66%
≥25 million deaths	3%	12%	23%	48%
≥100 million deaths	1%	3%	6%	14%

During the emergency phase of the COVID-19 pandemic (ie, Jan 30, 2020, to May 4, 2023), an estimated 23 million excess deaths occurred globally that were almost entirely attributable (directly or indirectly) to COVID-19. Probabilities were estimated by Madhov et al (2023).[37]

Table 13: **The likelihood of global influenza or coronavirus pandemics causing at least 1 million deaths**

	Pandemic deaths per year*	Effect on PPD (percentage points)	Effect on life expectancy, years	Economic value of predicted pandemic deaths†
Global	2 500 000	1·4	−0·77	5·1%
Central and Eastern Europe	82 000	1·4	−0·78	4·0%
Central Asia	160 000	1·2	−0·64	7·0%
China	340 000	1·7	−0·85	3·8%
India	450 000	1·3	−0·71	5·1%
Latin America and Caribbean	180 000	1·5	−0·79	4·5%
Middle East and North Africa	160 000	1·5	−0·77	4·8%
North Atlantic	100 000	1·8	−0·97	3·7%
Sub-Saharan Africa	580 000	1·0	−0·55	8·0%
USA	71 000	1·6	−0·90	3·5%
Western Pacific and Southeast Asia	340 000	1·5	−0·82	4·8%

PPD=probability of premature death (ie, death before age 70 years). *Long-term average, based on Madhav et al (2023).[37] †The economic value of predicted pandemic deaths is given as a percentage of the region's 2019 gross national income expressed in 2021 international dollars—ie, dollars adjusted for purchasing power. For calculations and methods, see Chang et al (2024).[21]

Table 14: **Predicted annual deaths and economic loss from pandemic risk**

Table 13 summarises Madhav and colleagues' results with four points on the exceedance probability function, expressed as annual risks. Their simulations point to a more than 6% probability of a pandemic within 12 months of their projections involving a million or more deaths, and a 3% probability of a pandemic involving 25 million or more deaths (table 13). They also suggest a greater than 20% chance in the next 10 years of a pandemic that kills at least 25 million people (equivalent to the number of deaths associated with COVID-19; table 13). It is useful to think of these results as conveying that, on average, there would be 2·5 million pandemic-related deaths per year (with no deaths in most years). Of these deaths, 1·6 million would be expected to be from an influenza pandemic and 0·9 million from a coronavirus pandemic. To place the predicted 2·5 million deaths per year in context, it is roughly the same number of deaths that are occurring annually from HIV/AIDS, tuberculosis, and malaria combined (appendix pp 20–22), and much higher than the number of annual climate change deaths projected in even very pessimistic scenarios in coming decades (appendix pp 95–97).

There is substantial uncertainty associated with the modelling assumptions of future pandemic mortality estimates. Madhav and colleagues' results should be used to broadly position and inform thinking about the high risk of future pandemics rather than being interpreted as accurate estimates. One element of uncertainty concerns the rate at which pandemic risk is likely to increase in coming years. Madhav and colleagues acknowledge that most experts judge that risk to be increasing, but nonetheless they chose to construct conservative estimates on the basis of non-increasing risk.

Fan and colleagues assessed the expected economic value of losses associated with earlier estimates of

pandemic risk.[177] We have updated those estimates in light of Madhav and colleagues' estimates of expected annual deaths.[37] Table 14 shows the implications of those annual average deaths in terms of years of life expectancy lost, increases in the PPD, and the value (as a percent of gross national income) of expected annual economic losses.

Pandemic prevention, preparation and response

There are many possible scenarios for the next pandemic. One possibility is a pandemic similar to severe acute respiratory syndrome (SARS). SARS had a high case fatality ratio (CFR) of about 10%.[178] However, containment was feasible for SARS because of its epidemiological characteristics, including that there was no or very little pre-symptomatic transmission of the causative coronavirus, SARS-CoV-1.[179] SARS was successfully contained without vaccines or antivirals within 6 months of initial recognition, mainly by public health and social measures, including active case finding and contact tracing.[180] If a SARS-like pandemic were to occur—ie, high case fatality ratio and containment feasible—the aim should be for rapid containment with public health and social measures without waiting for a vaccine to be developed. Another possible scenario is one akin to the 1918–20 influenza pandemic, which was estimated to have killed about 50 million people.[181] Unlike COVID-19 most deaths in this influenza pandemic occurred in young adults and children.[182] Public health measures, particularly lockdown measures, implemented for COVID-19 reduced transmission of SARS-CoV-2 and saved lives, especially among elderly populations.[183] However, these measures can have intergenerational impacts. A World Bank study estimated that "in low-income countries, a lockdown can potentially lead to 1·76 children's lives lost due to the economic contraction per COVID-19 fatality averted".[184] The intergenerational mortality trade-off would be very different for a pandemic akin to the 1918–20 Spanish influenza pandemic, which particularly affected young people. School closures would be likely to play a much more useful role in this type of pandemic.

Figure 12 shows a framework for the unfolding phase of a pandemic and corresponding points of intervention: prevention, preparedness, response, recovery, and reconstruction. Various capacities and systems are required for each phase.[185] Panel 7 brings together the substantial list of generally agreed elements for how a country, and the world, could prepare for a pandemic. Several critical components of pandemic prevention, preparation, and response, such as national preparedness plans, basic stockpiling of critical drugs and equipment, and surveillance for monitoring, are considered national public goods.[35] However, other components, particularly those necessary for risk reduction and early response, should be regarded as global public goods. Such global public goods include interventions at the human–animal interface, mapping of the pandemic risk, research and development of (and subsequent equitable access to) medical countermeasures, surveillance for early warning, and systems that enable early response.

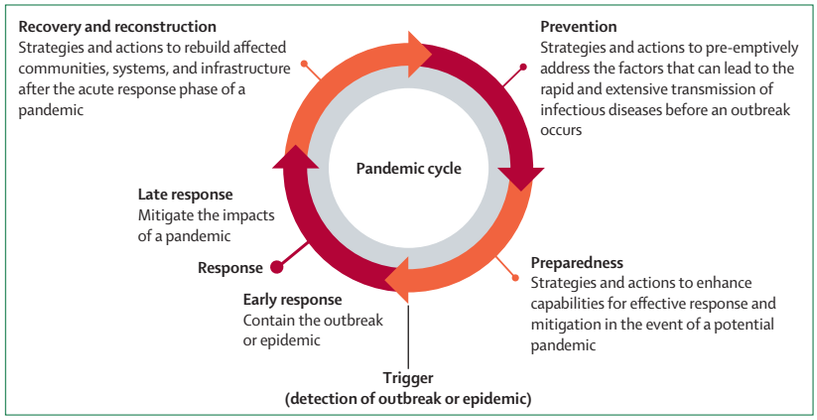

Figure 12: **Framework for the phases of the pandemic cycle**

Centralised stockpiles of drugs, vaccines, and personal protective equipment can be important preparation for viral haemorrhagic fever epidemics. Global financing mechanisms should be sought for these items, including potential provision to middle-income countries, which tend to be a low priority for official development assistance. Likewise, many countries, particularly those with small populations and those with low incomes, might reasonably see little benefit in using national resources for global public goods. It is reasonable to expect that if high-income countries do not support worthwhile pandemic prevention and surveillance efforts in poorer, low-population countries, then the countries themselves would also not do so—given that most of the benefits lie outside their borders. Even high-income, low-population countries might have suboptimal incentives to invest in pandemic preparation given that most benefits for them, also, would accrue in other countries.

In March, 2022, in an analysis prepared for the G20 Joint Financing and Health Taskforce, WHO and the World Bank estimated that the total annual financing need for the pandemic prevention, preparation, and response system is $31·1 billion.[186] Their analysis noted that "at least an additional US$ 10·5 billion per year in international financing will be needed to fund a fit-for purpose" architecture.[186] The WHO-convened independent panel suggested that at least $10 billion per year are needed for agricultural (One Health) measures,[166] and Glennerster and colleagues point to very high probable benefit-to-cost ratios from such investments.[187] At the 2022 Global Pandemic Preparedness Summit, governments committed to investing in prevention, preparation, and response, including in the 100 Days Mission—a plan to develop diagnostics, therapeutics, and vaccines within 100 days of the start of the next pandemic.[188] However, the limited investments are heavily

focused on vaccine research and development, whereas research into therapeutics and diagnostics is underfunded. Public health and social measures are critical to pandemic containment, yet there is insufficient investment into strengthening them and studying their effectiveness. WHO and the World Bank also stressed the importance of surveillance and early warning systems.[186]

Although the focus on vaccine research and development is understandable, to neglect preventive and other aspects of public health and social measures is dangerous. Without containment or suppression efforts, most deaths in the next pandemic might occur within the first 3–6 months. Even hitting the 100 Days Mission target for vaccine development might not be fast enough to save a huge number of lives. And although multiple safe and highly effective COVID-19 vaccines were developed in less than a year, there is no guarantee that safe, effective vaccines will be developed this quickly—or even at all—in the next pandemic. Vaccine nationalism could also prevent the international system from accessing and procuring vaccines and distributing them equitably worldwide. Such vaccine nationalism was a major constraint to the efforts of the COVID-19 Vaccines Global Access organisation (COVAX) to achieve international vaccine equity.[34,154] Essential elements of the vaccine-development process include ensuring that protection and sharing of intellectual property reflects both societal needs and the often-substantial public investments being made, as discussed by the WHO Council on the Economics of Health for All.[189]

There is a high risk that one or more major pandemics could kill millions of people in the timeframes considered in our report, with a potential one in seven risk of a pandemic killing 100 million people or more by 2050 (table 13). Global responses to this level of risk, however, reflect no sense of urgency.[190] For example, in 2024, evidence appeared of widespread infection of cattle in the USA with H5N1 influenza. Transmission among mammals raises the dangerous prospect of viral evolution resulting in efficient human-to-human transmission. Yet responses have been weak. On April 24, 2024, Zeynep Tufekci wrote in the *New York Times* that, "having spent the past two weeks trying to get answers from our nation's public health authorities, I'm shocked by how little they seem to know about what's going on and how little of what they do know is being shared in a timely manner".[191] It seems that even if an individual country commits to being prepared for another pandemic, it will need to account for the fact that the broader world is not prepared.

Part 7: Accelerating progress via taxation

In this part, we argue that complementary fiscal, regulatory, and information interventions could play a crucial role in accelerating progress towards the goal of 50 by 50. The most important of these interventions is raising taxes on tobacco.

In a chapter on intersectoral policy priorities for health for Disease Control Priorities 3, Watkins and colleagues argued that "policies initiated by or in collaboration with other sectors, such as agriculture, energy, and transportation" can have a large effect in reducing the incidence of disease and injury.[192] They identified a package of 29 intersectoral policies targeting a wide range of conditions from the 15 priority conditions that we identified (appendix pp 77–78). Although these interventions are intersectoral, ministries of health could play key analytic and advocacy roles, fulfilling their mandate across government departments.

Intersectoral interventions make use of four main types of policy instruments. The first is legal instruments—regulations and laws, such as halting the use of unprocessed coal and kerosene as household fuels to reduce indoor air pollution and regulation of the advertising, promotion, packaging, and availability of tobacco (with enforcement), to curb tobacco use. An important and neglected example is regulation to control lead pollution and its often-severe consequences on domains ranging from child cognition to cardiovascular risk.[193,194] Silverman Bonnifield and colleagues provide an up-to-date overview of lead pollution and the role of regulation in addressing this problem.[193] The second is engineering instruments to improve the built environment, such as building roads that separate vehicles from vulnerable pedestrians, so as to reduce road injuries. The third is focused public health information and education, such as providing consumer education to reduce excessive salt and sugar intake and the risk of sexually transmitted infections. Research that generates epidemiological knowledge and is disseminated via media and social networks can be considered a key tool of government support for information. The fourth policy instrument, and the focus of this part of the Commission, is fiscal instruments—ie, taxes and subsidies.

As in GH2035, we advocate particularly for the use of economic policies—especially changing the prices of potentially harmful products through taxes and the removal of subsidies. These policies are a powerful and enormously underused lever for improving public health. We focus on several of the most important risk factors that are amenable to such policies: smoking, alcohol, ambient air pollution, and possibly diet. Of these risk factors, tobacco use is by far the most important in most countries and the most actionable, given that extensive data show the effectiveness and feasibility of large excise tax increases.[195–197] We do not discuss broader social determinants of health, such as income and education, which were discussed in detail in GH2035, with the broad conclusion that low mortality can be achieved at low income levels.[2]

Tobacco taxation

Although it is common to describe other risk factors as the new tobacco or the new smoking—eg, "sugar is the new tobacco",[198] "sitting is the new smoking"[199]—we

believe that tobacco is the new tobacco. Smoking remains the biggest avoidable cause of death in many populations worldwide and NCDs strongly linked to tobacco are among the most important of our NCD and injury-related priority conditions. Smokers who start early in life and do not quit can expect to lose at least 10–13 years of life compared to otherwise-similar never-smokers.[200,201]

In 2001, Peto and Lopez estimated that if prevailing smoking patterns persisted, tobacco would kill about a billion people this century.[202] About 40% of the world's cigarettes are consumed in China, almost entirely by men, and smoking already causes around 20% of all deaths in middle-age in Chinese men.[203] Worldwide, people with low incomes disproportionately experience the health and economic consequences of tobacco,[204] with smoking accounting for about half the differences in mortality risk between men of lower and higher social strata.[205,206]

To reduce tobacco-attributed mortality by 2050, the key goal is smoking cessation among current smokers; avoidance of initiation will help to reduce mortality predominantly in the second half of this century. The benefits of cessation emerge surprisingly quickly: smokers who quit before age 40 years avoid more than 90% of the excess mortality risk during their next few decades of life compared with those who continue to smoke.[205] However, cessation rates are low in several countries with large populations, including China, India, Indonesia, Russia, and several countries in central Europe, such as Hungary and Poland.[205]

The most effective way to promote smoking cessation, prevent initiation of smoking, and drive down tobacco use is to impose excise taxes on tobacco, a policy tool that is still greatly underused (complementary regulatory and informational measures are also important).[195–197] In its 2019 report, the Taskforce on Fiscal Health Policy noted that "raising taxes on tobacco can do more to reduce premature mortality than any other single health policy".[195] The Taskforce's analysis suggested that a steep rise in tobacco prices could avert more than half a million tobacco-related deaths per year during the next 50 years.[195]

Panel 8: Benefits of taxes on tobacco, alcohol, and sugar-sweetened beverages

Effective interventions such as the introduction of smoke-free environments, bans on tobacco advertising, and taxing cigarettes have been forcefully implemented under the Framework Convention on Tobacco Control,[196] ratification of which, in combination with large tax increases, has yielded substantial reductions in young adult smoking and has increased smoking cessation in implementing countries.[196] Yet tobacco taxes remain the least implemented of the six tobacco control interventions included in the MPOWER package, an intervention package aligned with the Framework Convention on Tobacco Control (the interventions include tobacco taxation, monitoring tobacco use and prevention policies, and protecting people from tobacco smoke). In 2022, only 40 countries (home to around 10% of the world's population) were enforcing taxation on a par with the recommended tax rates of 75% or more of cigarette prices.[212]

Opponents of tobacco tax increases, including those from the tobacco industry, argue that such taxes hurt poor people—ie, they claim that such taxes are regressive.[213] Taxes are considered regressive when the expenditures incurred by poor people account for a greater proportion of their income compared with those incurred by wealthy people.[214] In other words, if tobacco taxes were regressive, increased tobacco taxes would lead to a proportionally greater ratio of net cigarette expenditures relative to income among poor versus rich smokers. However, poorer smokers are more sensitive to tobacco price hikes than richer ones. The ensuing reductions in smoking participation and tobacco consumption could thus be far greater among poor than among rich people.[215] With large price increases, the distribution in net cigarette expenditures relative to income could well be progressive.[213,216]

In addition, the classic definition of regressivity solely examines net cigarette consumption relative to income and does not account for the full array of health and financial consequences of tax hikes. Anticipation of the comprehensive impacts of increased taxes among poor compared with rich people is therefore paramount. Increased tobacco taxes can be progressive in terms of their effects on health, since they lead to large reductions in premature mortality and morbidity. Through preventing and controlling tobacco-related diseases (eg, cancers, heart disease, stroke, pulmonary disease), tobacco taxes can eventually eliminate public health-care costs and out-of-pocket expenditures linked to the treatment of these diseases, and eliminate substantial productivity losses.[216–221] As a result, they reduce medical impoverishment and deliver financial risk protection, especially for poor people and when pre-existing levels of public finance and health insurance are low.[216–221] Several extended cost-effectiveness analyses have established that the overall impact of increased tobacco taxes is progressive when accounting for outcomes of health benefits and financial risk protection.[216–221]

Although less commonly examined, other health taxes, such as on sugar-sweetened beverages or alcohol, could have similar effects[196,212–224]—ie, progressivity in health benefits (eg, reductions in morbidity and mortality associated with diabetes or liver cirrhosis) would mimic the pre-tax distribution in risk factors (eg, obesity, consumption of sugar-sweetened beverages or alcohol) across income groups. Likewise, the progressivity in public cost savings and financial risk protection gains would depend on the underlying organisational mix of public versus private financing of health care among the different socioeconomic groups in the population. Therefore, the overall progressive or regressive nature of such increased health taxes on health benefits and financial protection would greatly depend on a country's epidemiological and health-system context.

A 100% increase in the price of tobacco in LMICs results in substantial declines in consumption, including about 20% of smokers quitting and 20% reducing their daily use.[207] Many countries have used large excise taxes to successfully reduce consumption and raise revenues, including Brazil, Colombia, and the Philippines.[206] Increasing tobacco prices can reduce illness and death, including cardiovascular, respiratory, and cancer deaths, the severity of childhood asthma, and hospitalisation for heart failure.[208–210]

That claim that tobacco taxation disproportionately targets poor people is a myth.[211] Tobacco taxes are highly progressive (panel 8). People with low incomes are more price-responsive, so are more likely to reduce their tobacco consumption or to quit when taxes are raised than people with higher incomes.[196] As a result, "they benefit disproportionately from longer healthier lives, reduced spending on healthcare, fewer lost days of work, and longer working lives", argue Pareje and colleagues.[196] In 36 countries, revenues raised from tobacco taxation have been spent on programmes that benefit poor people.[212] Cigarette taxation is unrelated to smuggling,[207] and large-scale smuggling occurs only with active tobacco industry encouragement; new track and trace

Panel 9: Secure track-and-trace technology to fight the illicit trade in cigarettes

In most countries, cigarettes are subject to excise duty, making these products less affordable, which in turn drives smoking cessation and discourages initiation. Tobacco industry profits were about US$50 billion in 2010,[201] and profit is a strong incentive for the industry to try to keep taxes as low as possible. High levels of tobacco taxation have not been linked to smuggling at large scale, which occurs only when the tobacco industry plays an active role.[207] The tobacco industry smuggles its own products to maintain market share of its brands and to intimidate finance ministries.[207] For example, international tobacco companies organised smuggling in the mid-1990s from the USA into Canada, which led to a short-term reduction in tax rates and most notably a large increase of about 30–40 billion excess cigarettes.[225] These excess cigarettes are likely to eventually cause about 30 000–40 000 excess deaths from smoking.

Traditional measures to fight fraud consist of having tax inspectors stationed at key points of the supply chain (manufacturing plants and warehouses) and observing the production and movement of goods. However, these controls require strong overall customs and revenue capacity that are resistant to corruption pressures.

Secure track-and-trace solutions are increasingly being adopted to strengthen controls and complement the work done by inspectors. Such solutions are part of the tracking-and-tracing obligations under the Protocol to Eliminate Illicit Trade in Tobacco Products, "an international treaty with the objective of eliminating all forms of illicit trade in tobacco products through a package of measures to be taken by countries acting in cooperation with each other".[226] An example of such technology is SICPATRACE, a solution available for governments that uses sophisticated tax stamps with track-and-trace capability, production-monitoring equipment on manufacturing lines, hand-held personal readers for law enforcement, and a centralised data-based management system tracking tens of billions of products each year. SICPATRACE can control the flow of tobacco products, alcoholic beverages (which are also subject to excise duty), sugar-sweetened beverages (to potentially reduce obesity and diabetes), and fuels (to prevent smuggling and alteration using molecular tags). This solution applies fiscal markings on each product item, using security inks integrating multiple material-based security elements that cannot be counterfeited and a unique identification number to enable traceability represented by a barcode.

The use of the SICPATRACE technology has had a dramatic effect in many countries. For example, Kenya had a revenue increase of 53% due to increased tax compliance in the first year of implementation,[227] and Chile had a 23% increase.[228,229] Even in high-income countries, such as the USA, the implementation of a new encrypted track-and-trace system in California has been followed by a 37% reduction in cigarette tax evasion.[230] The World Bank and the International Monetary Fund[229,231] have recognised the effectiveness of these solutions, which need to be implemented by all 67 governments that have ratified the Protocol to Eliminate Illicit Trade in Tobacco Products.

The tobacco industry has responded to this market need by offering their own tracing system, Codentify, which was conceived by the industry and then offered through third-party companies that contributed to its development. However, there are serious concerns about the effectiveness of controls originating from an industry that itself must be controlled (the Protocol clearly defines that obligations assigned to a party shall not be performed by or delegated to the tobacco industry). Moreover, solutions promoted by the tobacco industry rely entirely on digital track-and-trace technology without the use of material security features, such as tax stamps, which protect and authenticate each duty-paid product. Controls can thus easily be circumvented by the industry, reducing the ability of government authorities to identify gaps and enforce compliance in the market.

30 countries that are signatories to the Protocol do not yet have a track or trace system in place. Putting in place state-of-the-art, secure, and independent track-and-trace systems in all countries with effective enforcement and increasing taxes is the best strategy to reduce smoking and illicit trade in tobacco. These approaches have the added advantage of providing a reliable source of financing for countries that are paying the health cost of tobacco consumption. Such secure track-and-trace systems could also be adapted for use in managing counterfeit pharmaceuticals.

technologies are being used to combat such fraud (panel 9).

Removal of subsidies for fossil fuels

Similar to how tobacco taxation reduces illness and death, raises revenue, and benefits poor people, the removal of subsidies for the production and consumption of fossil fuel is a broadly beneficial fiscal policy lever for curbing climate change. Removal of such subsidies could slow global warming, reduce ambient air pollution, and improve government finance.[232] Action against coal emissions is the highest priority, given that coal power plants are the largest single source of greenhouse gas emissions.[233]

At the UN Climate Change Conference in Glasgow, UK, in 2021, nations adopted the Glasgow Climate Pact, which called on all countries to "phase-out ... inefficient fossil fuel subsidies, while providing targeted support to the poorest and most vulnerable".[234] The Organization for Economic Co-operation and Development and the International Energy Agency estimated that, in 2019, ministries of finance around the world collectively provided $468 billion in subsidies for fossil fuels, the bulk of which was on oil products.[235]

In GH2035, we noted that energy subsidies on coal, petroleum, and diesel "encourage excessive energy consumption and production of ambient particulate matter pollution and other pollutants that cause lower respiratory tract infections in children, and cancers, heart diseases, and chronic obstructive pulmonary disease in adults".[2] These subsidies also divert public resources away from spending that would benefit poor people, such as on health, education, and social protection. Indeed, many countries spend more public resources on energy subsidies than on health and education combined.[236] Removing fossil fuel subsidies therefore remains an urgent priority for tackling air pollution, climate change, and associated health effects. We recognise that ending such subsidies might not be politically popular: some countries, such as Chile and France, experienced protests and other social unrest when fuel prices rose.[237,238] However, the value of removing such subsidies is now widely accepted by health and finance ministries and many nations have successfully phased out explicit subsidies, including India, Morocco, Saudi Arabia, and Ukraine.[239]

Taxation of unhealthy food and drinks

Obesity is a major determinant of premature adult mortality in many populations, and is likely to become so in many others by 2050 if trends continue.[240] WHO estimates that in 2022, 2·5 billion people had overweight (ie, BMI 25 to <30 kg/m²), of whom 809 million had obesity (ie, BMI >30 kg/m²).[241] At the same time, underweight and dietary inadequacy remain important in South Asia and parts of Africa.[242]

To examine the relationship between overweight, obesity, and all-cause mortality, the Global BMI Mortality Collaboration conducted a meta-analysis of 239 prospective studies that had individual participant data for 10·6 million people across four continents.[243] To reduce the possibility of confounding and reverse causality, they restricted the analysis to the 4 million never-smokers without chronic diseases at recruitment. In this group, each 5 kg/m² increase in BMI above 25 kg/m² was associated with 31% higher all-cause mortality and 42% higher cardiovascular mortality. Obesity was associated with higher risks in men than in women: the excess risk of premature death was about three times higher for men with obesity than for women with obesity.[243] Nevertheless, in nearly all countries and at nearly all ages, the prevalence of obesity is higher in women than in men.[243]

Increasing evidence suggests that the relationship between BMI and mortality might differ in different populations. For example, in a study of more than 1·1 million people recruited in 19 cohorts in Asia, Zheng and colleagues found an excess risk of death associated with a high BMI in east Asia but not in India or Bangladesh.[244] Although two small studies[245,246] had suggested there was no association between overweight or obesity and higher all-cause mortality in Hispanic adults in the US, a large prospective study of 150 000 people in Mexico showed that "general, and particularly abdominal, adiposity were strongly associated with mortality".[240]

Additionally, there is strong evidence that dietary practice affects risk of premature mortality. In a study[247] of the consequences of adherence to the dietary recommendations of the 2019 EAT–*Lancet* Commission,[248] Bui and colleagues used data from a 34-year cohort study of around 200 000 health professionals to show that all-cause mortality in the study was 23% lower in the quintile most closely following a planetary health diet (ie, a diet rich in whole grains, fruits, vegetables, nuts, and legumes; the highest quintile) than in the lowest quintile.

Obesity can emerge in a population within 30–50 years, as occurred in Pacific Island nations like Nauru and the Cook Islands.[249] WHO recommends that member states use targeted fiscal policies to reduce obesity—particularly taxation of sugar-sweetened beverages and energy-dense foods and subsidising foods that contribute to a healthy diet. Taxation of sugar-sweetened beverages, which has been implemented in at least 117 countries and territories, leads to substantial decreases in sales,[250] although the associated impact on obesity remains unclear.

For the **countries and territories that have implemented taxes** on sugar-sweetened beverages see https://ssbtax.worldbank.org/

Although there is ample evidence of excise taxes reducing tobacco consumption, there is less, but generally robust, evidence that excise taxes reduce consumption of alcohol and sugar-sweetened beverages.[195] In countries with a high prevalence of heavy episodic drinking and low alcohol taxes, increasing taxes could generate substantial reductions in death and disability from a range of conditions, including liver disease and cancer, suicide, and gender-based violence.[195] These taxes can also increase general government revenues.

Taxing energy-dense food has not been widely adopted, although there have been some successes, including in Denmark, Ethiopia, Hungary, Mexico, and Tonga.[251] Colombia, where 56% of the population has overweight, was one of the first countries to introduce a junk food tax—ie, a tax on foods high in salt and saturated fat—to reduce obesity.[252] Some countries have invested revenues from taxation of unhealthy food and sugar-sweetened beverages in programmes that benefit poor people—eg, Malaysia uses revenues to provide free, healthy breakfasts for primary school children.[253]

Ultra-processed foods—ie, industrially manufactured, pre-packaged, ready-to-eat products—have become a target for taxation (Colombia's junk food tax includes ultra-processed foods). An umbrella review of epidemiological meta-analyses suggested an association between ultra-processed foods and obesity,[254] and ecological studies in sub-Saharan Africa suggest that taxes on ultra-processed foods could reduce consumption and obesity.[255]

More generally, although the possibility of population-level reversal in obesity prevalence is plausible, there are no examples of even modest success. Indeed, the relation of diet and dietary interventions to obesity and disease is constantly being reassessed and it could be premature to conclude that effect sizes are as large as widely believed. Health systems will thus need to cope with the consequences of a high prevalence of obesity. Hormonal peptide inhibitors are an important breakthrough in treating obesity,[256] but practical evidence of population effects over time can only be established when prices fall sufficiently to allow widespread uptake.

Finally, ending subsidies on meat and dairy could have multiple benefits—including reducing greenhouse gases, curbing the destruction of biodiversity, and assisting the transition away from diets heavy in meat and towards plant-based diets. Meat and dairy production, which uses an area as large as the entirety of the Americas (38 million km²),[257] is the primary driver of biodiversity destruction and accounts for about 15% of greenhouse gas emissions.[258] The International Monetary Fund notes that in many countries, "large amounts of taxpayers' money are spent on subsidies that encourage otherwise unprofitable, unsustainable meat and dairy production predicated on the systematic inhumane treatment of farmed animals".[258] Reducing such subsidies or redirecting them towards sustainable farms that produce plant-based protein for human consumption could have favourable health and fiscal consequences. In Poland, ending subsidies in the late 1980s for butter and substitution of vegetable fats from expanded market access was associated with a marked reduction in vascular disease.[259]

Part 8: International collective action for health

In 1993, the World Bank's report "Investing in health" pointed to the particular importance of using development assistance for health to finance global health research and development.[1] But it did not make a more general case that, as LMICs grow economically, international resources should, over time, move away from routine support of country health-system strengthening and disease control, which are national responsibilities, towards international collective action for health, including research and development, pandemic prevention, preparedness, and response, and tackling antimicrobial resistance. GH2035 argued strongly for this transition, an argument that was developed further in the second Commission on Investing in Health.[3] Commission on Investing in Health authors have undertaken work that has led to a better empirical knowledge of what fraction of development assistance for health goes to global goods, the sources of finance (including non-traditional sources), and what those resources are spent on.[260,261]

Investments in international collective action

GH2035 highlighted the underfunding of the global functions of health, which address health challenges that go beyond the boundaries of individual nation states.[2] Global functions were divided into three categories: provision of global public goods, such as product development for neglected diseases as defined by Policy Cures Research;[262] management of cross-border externalities, such as pandemic prevention, preparedness, and response; and fostering leadership and stewardship, such as convening for consensus building. Funding for global functions reaps transnational health benefits regionally and globally, by contrast with country-specific functions—eg, funding country-specific health-system strengthening and disease-control activities (eg, reductions in maternal mortality)—which benefit the specific country only. As Jamison and colleagues have stated, country-specific functions tackle "time limited problems within individual countries that justify international collective action because of highly constrained national capacity".[263] These problems require richer countries to show solidarity with poorer countries.

We advocate that expenditures on global public goods need to pass reasonable benefit–cost tests, like any other health development assistance expenditure.[264] Not all global public goods will pass those tests. However, studies[40,42,262,265] suggest that investments in global health research and development promise substantial public health and economic returns and that these returns would be even larger if the full efficiency potential in the global ecosystem were leveraged (panel 10). In addition, the COVID-19 pandemic clearly showed that investments in pandemic preparedness pay off, while, at the same time, the costs of inaction are massive.

GH2035 recommended that a greater proportion of annual development assistance for health should be directed towards global functions. However, available data did not provide evidence on the extent to which

resources were targeted at global functions, so in 2015 members of the Commission on Investing in Health developed a new method to estimate the proportion of development assistance for health directed to global functions and to country-specific functions.[260] In that publication,[260] a broader concept of health aid, development assistance for health + (DAH+), was introduced. DAH+ captures additional public spending on product development for neglected diseases from agencies such as the US National Institutes of Health that is usually excluded in studies that track development assistance for health. As of 2015, global functions accounted for $7·5 billion (23%) of the $32·5 billion in DAH+ disbursements in 2013 (in 2021 US$, a conversion that we performed), and $25·0 billion (77%) was allocated towards country-specific activities.[260] In a follow-up study, authors stated that donors are prone to "cycles of panic and neglect".[261] In response to the 2014–16 Ebola epidemic in west Africa, the share of funding for global functions grew to 29% in 2015 during the so-called panic phase, driven by a reactive increase in outbreak response funding (figure 13). This initial increase was followed by a neglect phase: donors did not sustain preparedness funding after the outbreak, and the share of funding for global functions dropped to 24% in 2017.[261]

In a new analysis for this Commission, we extended these assessments until the end of 2022 (ie, well into the COVID-19 pandemic).[268] DAH+ disbursements reached $44·9 billion in 2021 and $47·6 billion in 2022, the highest ever level (figure 13). Despite justified criticism of the behaviour of high-income countries during the COVID-19 pandemic, especially regarding the hoarding of vaccine doses,[34,154] the pandemic led to a substantial increase in DAH+. In addition, the proportion of DAH+ targeted at global functions grew from $8·8 billion (24%) of $36·7 billion in 2017 to $16·5 billion (35%) of $47·6 billion in 2022 (figure 13). Response to the COVID-19 pandemic clearly drove this increase, but funding for

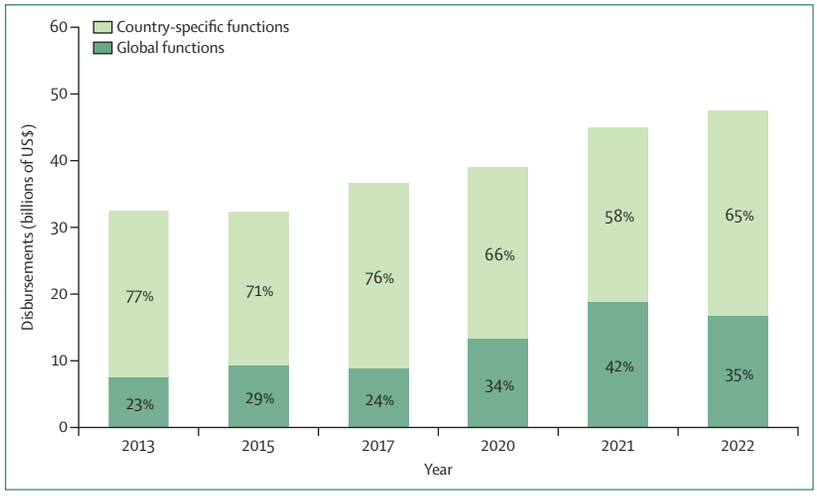

Figure 13: **Proportion of DAH+ disbursements for global *vs* country-specific functions, 2013–2022**
Data are gross disbursements in constant 2021 prices. DAH+ refers to official development assistance for health and private (ie, philanthropic) development finance to health as defined by the Organisation for Economic Co-operation and Development's Development Assistance Committee, and also includes donor funding for neglected disease product development. Sources: Organisation for Economic Co-operation and Development (2024),[266] Policy Cures Research (2024),[267] and Schäferhoff et al (2024).[41] DAH+=development assistance for health +.

Panel 10: Investments in global health innovations pay off

Investments in global health product development have substantial returns. For example, a study by Jamison and colleagues showed that about 80% of the decline in mortality in children younger than 5 years from 1970 to 2000 across 95 low-income and middle-income countries can be attributed to the dissemination of new health technologies.[40] Policy Cures Research showed that 183 new neglected diseases therapies have been approved by a regulatory agency or prequalified by WHO since 1999, which already have saved more than 8 million lives.[262] With respect to economic benefits, Schäferhoff and colleagues estimated that the returns on investment in late-stage clinical trials and manufacturing in three middle-income countries (India, Kenya, and South Africa) would be as high as about US$21–67 per dollar invested.[265]

New cutting-edge technologies are on the horizon. Ogbuoji and co-workers found that there are currently 1498 candidate drugs, vaccines, and diagnostics in the product development pipeline for neglected diseases, emerging infectious diseases, and maternal health conditions.[42] They estimated that investing in research and development to advance these candidates would yield 453 product launches between 2023 and 2044 under a conservative base-case scenario. Many of these products target the eight infectious and maternal health priority conditions that we have identified (panel 3; appendix pp 82–87). With better coordination, an even larger number of products could be launched. The incremental cost beyond current spending on research and development, would be $1·4–7 billion annually,[42] depending on the complexity of the product candidates being launched. Substantial cost savings could be achieved—about $9 billion from 2023 to 2044—if ecosystem efficiencies, such as artificial intelligence and smart clinical trial designs, were to be implemented.[42]

However, the development of these new tools requires additional investments in product development, especially in light of the rising costs of late-stage clinical trials and high trial attrition rates. The decline in funding for basic research and product development for neglected diseases is therefore a concern. There needs to be sufficient investment to deliver the potential new products in the pipeline.

There are multiple, potentially game-changing candidates in the pipeline that address the seven non-communicable disease and injury-related priority conditions that we identified, including for cardiovascular diseases and diabetes (panel 3; appendix pp 82–87). Sustained efforts will be required to ensure pricing policies and delivery mechanisms that enable these advances to serve the needs of people in low-income settings.

other global functions also contributed. Funding for the control of cross-border disease movement, which includes funding for regional programmes and polio eradication, grew compared with previous years (table 15).

However, there are also some concerning trends. First, the share of funding from donor governments channelled through multilateral agencies increased from 23% in 2020, to 30% in 2021, whereas the share of funding directly provided to recipient governments fell from 38% to 33%. DAH+ disbursements to low-income countries did not increase in 2021 compared with 2020, suggesting that the additional funding made available by donors in 2021 did not reach low-income countries.[269]

Second, funding for basic research and product development for neglected diseases fell from $3·8 billion in 2021 to $3·3 billion in 2022. Funding for neglected disease research and development refers to funding for the 42 diseases that are in scope of Policy Cures' G-FINDER survey.[262] Several of the eight infectious and maternal health priority conditions are neglected diseases according to this definition: bacterial pneumonia, diarrhoeal diseases, HIV/AIDS, malaria, and tuberculosis. This decrease in funding comes at a time when there is a pressing need to increase investment to achieve a 30% reduction in PPD by 2035 and a 50% reduction by 2050 and to leverage new approaches to reduce development costs. Given the potential to drive major efficiencies, there is huge interest in applying AI to global health product development, including for neglected diseases and antimicrobial resistance (appendix pp 107–08). AI tools have been applied across the whole therapeutic development spectrum, including for the identification of new targets, selection of drug candidates, prediction of protein structures, design and optimisation of molecular compounds, and design, conduct, and analysis of clinical trials.[41] These tools can accelerate research, reduce costs, and improve discovery through accelerated and more comprehensive screening, resulting in more high-quality therapies to be tested in clinical research.[41] Finally, there is pressure on resources within the international system because the health sector has to compete with other important priorities.

	2020 (millions of US$)	2021 (millions of US$)	2022 (millions of US$)
Global public goods	4700	4600	4000
Product development	3800	3800	3300
Development or harmonisation of health regulations	85	110	96
Knowledge generation	750	710	620
Intellectual property	0	<1	<1
Externalities	8200	14 000	12 000
Outbreak preparedness and response	5500	11 000	9300
COVID-19	4400	8800	5800
Antimicrobial resistance	230	320	160
Responses to marketing of unhealthful products*	110	130	100
Control of cross-border disease movement	2400	2400	2600
Leadership and stewardship	420	440	360
Health advocacy	390	420	350
Aid effectiveness and accountability	30	24	14
Country-specific functions	26 000	26 000	31 000
Priority infections and maternal health conditions	21 000	20 000	24 000
NCDs and health-systems strengthening	4600	5700	7400
NCDs	250	270	230
Health-systems strengthening	4300	5400	7200
Total	39 000	45 000	48 000

Data are gross disbursements in constant 2021 prices. Source: Schäferhoff et al (2024).[41] *Tobacco, alcohol, and processed food.

Table 15: **Funding for global functions, 2020–22**

Aid for health faces an uncertain future. Even after the worst pandemic in a century, donor funding for pandemic prevention, preparedness, and response has fallen, a new phase of neglect. This neglect is exemplified by the Pandemic Fund's struggle to mobilise funding, which seems unrelated to potential shortcomings in its design,[270] although the Fund could mobilise finance in its upcoming replenishment cycle.[271] Other international crises have led to major shifts in the global aid landscape and major donors have announced cuts to their aid budgets, which are likely to also affect the health sector (panel 11).

These adverse trends are to some extent being counterbalanced by the rise of regional agencies. The COVID-19 pandemic led to unprecedented regional action, such as the launch of the African Union's Africa Vaccine Acquisition Trust and the Asian Development Bank's Asia Pacific Vaccine Access Facility. During COVID-19, these two initiatives complemented COVAX, which helped to achieve the fastest vaccine rollout in history[273] and provided 74% of all COVID-19 vaccine doses to low-income countries. COVAX was hindered by pharmaceutical companies and high-income nations making bilateral deals that gave priority access to wealthy countries,[34] pushing COVAX to the back of the queue, which shows the importance of strong sovereign national and regional buying power.

Scholars have called[274,275] for the global health architecture to become more decentralised. Some aspects of their calls were echoed by Anders Nordström, Sweden's former ambassador for global health.[276] Using development assistance for health to support regional structures, such as the African Centres for Disease Control, or regional public development banks, including for improving access to medicines and vaccines via demand creation, pooled procurement, and delivery, is very much in line with our support for global functions.

Furthermore, countries that are not part of the Organisation for Economic Co-operation and Development (and thus do not necessarily report their development finance) are becoming increasingly important in development finance. An analysis[277] published in 2024 suggested that China uses multilateral processes to inform its development assistance for health priorities, and AidData's Global Chinese Official Finance dataset estimates that the Chinese Government funded more than 13 000 development projects worth $843 billion across 165 countries between 2000 and 2017.[278] About 1% of all the international development funding that China provided was for health projects.[278] China was also a major provider of effective vaccines during the COVID-19 pandemic.[279] China has become an important provider of aid to African countries, and increasingly to Asian countries too (although many of these projects are funded through some type of World Bank-style lending or commercial arrangements),[280] and its influence in these regions will likely continue to grow. Although 2017 is the latest year for which data on China's development assistance are available, longer-term trends support the encouraging observation in GH2035 that China's rising development assistance could run counter to the otherwise rather adverse trends in development assistance for health.[280,281]

Investments in infectious and maternal health priority conditions

We argue for the importance of investing in global functions, particularly in pandemic prevention, preparedness, and response and in research and product development for the 15 priority conditions. These investments should include support for important global public goods that WHO provides, such as setting global norms and standards, assessing health trends, and developing regulations and conventions.[282] The WHO Council on the Economics of Health for All[189] highlighted WHO's role in the overarching governance of the multilateral global health system (such governance is also an important global public good). An investment case published this year points to the high benefits relative to costs of the world's modest potential expenditures on WHO.[189]

But what, then, is the role of direct-to-country DAH+— ie, provision of support for disease control and health-system strengthening directly to low-income countries? Funding for country-specific functions should be focused on the eight infectious and maternal health priority conditions to achieve a 30% reduction in PPD by 2035. Our analysis shows that, in 2022, $23·7 billion (76%) of the $31·0 billion targeted at country-specific functions addressed these priority conditions, with $7·2 billion allocated for broader health-systems support and only $0·2 billion for NCDs. Although, overall, country-specific aid is strongly targeted at the infectious and maternal health priority conditions, the funding is unevenly distributed across the conditions. Between 2020 and 2022, $25·3 billion (39%) of the $64·9 billion total funding for priority infections and maternal health conditions was for HIV, with more than half the HIV funding ($12·7 billion) targeting middle-income countries. Low-income countries received only $5·7 billion (23%) of the HIV funding (the remaining $6·7 billion was not allocable by income group). Funding for maternal and newborn

Panel 11: Official development assistance under pressure

From 2020 to 2023, the world experienced major shocks, including the COVID-19 pandemic and its global economic impacts, rising geopolitical tensions, new and intensifying armed conflicts, and humanitarian crises. These events led to substantial shifts in official development assistance.[268]

Between 2021 and 2022, total disbursements for official development assistance grew by nearly 22%, from US$228 billion to a record high of US$277 billion.[268] However, the growth in official development assistance largely resulted from two factors—support to Ukraine and funding for hosting refugees in donor countries. If these two factors are deducted, official development assistance increased by only 3%, to $235 billion. Official development assistance for Ukraine increased from $2 billion in 2021, to $29 billion in 2022, making Ukraine the largest ever recipient. Preliminary 2023 data indicate that aid to Ukraine grew further to US$40 billion. As such, Ukraine received more aid in 2023 than did sub-Saharan Africa as a whole.[268] Increases in vitally important humanitarian aid and refugee support went predominantly to Ukraine. The support to Ukraine also contributed to the highest ever level of humanitarian aid—$37 billion in 2022. The costs for hosting refugees in donor countries have increased substantially since 2020. The 29 member countries of the Development Assistance Committee of the Organisation for Economic Co-operation and Development used $31 billion (18%) of their bilateral official development assistance budget of $177 billion for hosting refugees in 2022, compared with $9 billion (7%) of the 2020 budget of $132 billion.[268]

The share of official development assistance for the least developed countries dropped from 36% in 2020 to 25% in 2022, leading to an absolute reduction in official development assistance. The poorest countries are still experiencing the adverse impact of the COVID-19 pandemic: the negative economic effects of the pandemic resulted in the largest surge in extreme poverty globally in decades.[272] A World Bank analysis suggests that middle-income countries have recovered from the economic setback, but poverty levels in the low-income countries are still worse than before the pandemic.[272]

In addition to these major reallocations of aid, many large aid donors, such as France and Germany, have announced cuts to their budgets for official development assistance, threatening overall global funding.[30–32]

health accounted for $11·0 billion (17%) of the total funding for infectious and maternal health priority conditions between 2020 and 2022, malaria accounted for $7·2 billion (11%), and tuberculosis for $3·3 billion (5%). The remainder was directed to the diarrhoea, childhood-cluster diseases, and lower respiratory tract infections (collectively $8·0 billion [12%]), and to integrated service delivery ($10·2 billion [16%]; figure 14).

Our analysis shows that country-specific funding for several priority conditions—notably tuberculosis—is low, whereas HIV accounts for a substantial share. Much of the HIV funding is driven by the need to maintain people on antiretroviral drugs. Major donors to HIV programmes, including PEPFAR, have recognised that countries they support—particularly middle-income countries—should finance antiretrovirals domestically, as a pathway to sustainability.[283] However, more resources for the eight infectious and maternal health priority conditions will probably be needed to achieve a 30% reduction in PPD by 2035 in low-income countries.

As highlighted in previous DAH+ analyses, although the benefits of supporting global functions are transnational, these investments can be made at different levels of the global health system.[261,282] Examples include funding to individual LMICs for pandemic prevention, preparedness, and response, polio eradication, and responses to antimicrobial resistance that at the same time ensure access to effective treatment.[284] Although DAH+ should be used to support middle-income countries, the instruments used, such as blended financing, should also incentivise (not substitute for) domestic allocations to these areas.

Funding for country-specific disease control and health-system strengthening should focus on the countries that most need it. Between 2020 and 2022, $23·0 billion (28%) of the total $82·5 billion country-specific funding was channelled to low-income countries, $34·0 billion (41%) to lower-middle-income countries and $7·5 billion (9%) to upper-middle-income countries (the remaining $18·0 billion [22%] was not allocable by income group). In the same period, $18·5 billion (29%) of the $64·9 billion total funding for the eight infectious and maternal health priority conditions was directed to low-income countries, $24·9 billion (38%) to lower-middle-income countries, and $5·3 billion (8%) to upper-middle-income countries ($16·4 billion [25%] not allocable by income group). These data suggest that funding for the infectious and maternal health priority conditions was not well targeted, with around half the funding going to middle-income countries with the potential to finance their health systems domestically (there is substantial evidence[285] that donor funding can lead to aid substitution, also known as fungibility, whereby country-specific health aid leads to reduced domestic public finance for health). There is potential to shift more of the available funding to low-income settings.

Implementation efforts should focus on ensuring affordable drug availability to address the infectious and maternal health priority conditions. One of the best ways that donors can support the goal of reducing PPD by 30% by 2035 is by reducing drug prices through market shaping—ie, by pooling demand and purchasing for multiple countries, and by subsidising drug prices.[119] Prices for major childhood vaccines have fallen through Gavi's market-shaping interventions and through UNICEF's pooled procurement.[3] The Global Fund plays an important role in shaping global markets for drugs and technologies that prevent, diagnose, and treat HIV, tuberculosis, and malaria. About three-quarters ($1·5 billion) of the $2 billion that the Global Fund invests every year for key drugs and health products is purchased through the Global Fund's pooled procurement mechanism.[286,287] Through the market-shaping activities of the Global Fund and its partners (eg, PEPFAR), prices for first-line HIV treatment dropped to less than $45 per person per year by 2023, compared with an annual treatment price per person of over $10 000 in 2002 when the Global Fund started to finance antiretroviral drugs for HIV.[287] In 2023, the price of drugs for multidrug-resistant tuberculosis fell by more than 55%, but the cost of these drugs remain substantially higher than that of first-line HIV treatments.[288,289] A key rationale for donors to fully resource Gavi and the Global Fund at their next replenishments is to ensure that their market-shaping power for priority infections and maternal health conditions can be fully leveraged.

We also advocate for the use of development assistance for health to support the Arrow mechanism, which was initially implemented through the Affordable Medicines Facility—malaria (panel 6). The Arrow mechanism goes beyond subsidies and pooled procurement by centring a

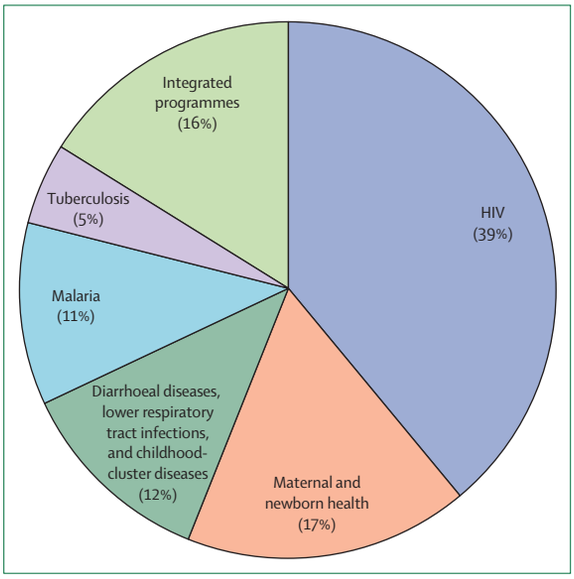

Figure 14: **Country-specific funding for the infectious and maternal health priority conditions**
The chart shows gross disbursements in constant 2021 prices (US$). Sources: Our World in Data (2024)[10] and Schäferhoff et al (2024).[41]

high volume of supply to ensure widespread availability at affordable prices and encouraging reliance on domestic supply chains (both public and private). As discussed in part 5 the Affordable Medicines Facility—malaria subsidised artemisinin-based combination therapies bought directly from manufacturers to undercut prices for monotherapies to avoid development of resistance. This approach quickly and effectively helped to remove monotherapies from the market in pilot countries.[146] Due to the continued need for access to affordable drugs, including for NCDs, the Arrow mechanism is more important than ever. Subsidies that will reduce the price for buyers can be funded in various ways, not just by donors. Funding could happen at the regional or even country level, supplied by domestic resources from LMICs, with payments going directly to manufacturers, or potentially being used to develop domestic or regional manufacturing capacity.

There is also a need to address the growing debt burden of LMICs—a challenge central to Brazil's G20 presidency. Building on the experience of debt swaps in the environmental and climate sectors,[290] the Global Fund introduced the Debt-to-Health initiative in 2007, under which a creditor country waives its rights to outstanding debt repayments on the condition that the debtor country commits this repayment to domestic health programmes.[291,292] Debt swaps provide an important opportunity for countries to reduce debts and strengthen domestic health investment at the same time. To date, 12 such transactions have generated $226 million for ten debtor countries, with $373 million in debt cancelled through the Debt-to-Health initiative. The initiative has proven its potential to create fiscal space for increased domestic health investments, although these are small amounts and, quantitatively, this potential remains to be realised.

Funding for the NCD and injury-related priority conditions

About $200–300 million per year in donor funding is allocated to NCDs (table 15). The global health architecture largely lacks NCD market-shaping mechanisms. An exception is the Pan American Health Organization's Strategic Fund, a pooled procurement mechanism that countries in the Americas have used to purchase drugs for cardiovascular diseases, cancer, and diabetes.[293] Another example is the partnership between the non-profit organisation Resolve to Save Lives, multilateral agencies such as WHO, and country governments to expand access to hypertension drugs, including in India and Latin America.[294] In view of the growing burden of NCDs, establishing market-shaping mechanisms for NCD therapies, especially those for the seven NCD and injury-related priority conditions, will become increasingly important for LMICs. These mechanisms need to be developed in a way that allows middle-income countries to benefit from them.

GH2035 stated that more investments are needed for population, policy, and implementation research,[2] which involves both the emerging field of implementation science and health policy and systems research, with the goal of identifying best practices and facilitating their dissemination across countries. However, individual governments have insufficiently strong incentives to invest in such knowledge-generating activities that have value beyond their borders. Given the shifts in the global burden of disease, population, policy, and implementation research is likely to be particularly important for NCDs. Global health donors could fund this research for NCDs to identify and facilitate transfer of best practices in addressing the NCD and injury-related priority conditions.

Funding for pandemic prevention, preparedness, and response

As discussed in part 6, there is greater than 20% chance of a pandemic that kills as many people as COVID-19 in the next 10 years.[37] Despite this risk, the world remains largely unprepared and is massively underinvesting in preparedness, including in pandemic vaccine development (of both a pan-coronavirus vaccine protective against multiple strains[295] and a universal influenza vaccine).

Currently, each strain of influenza virus requires its own vaccine, with a new vaccine developed each year to target the circulating strain. Thus, it could take a year or more for a vaccine against an emergent pandemic influenza strain to become widely available. A universal influenza vaccine would be of enormous value for both pandemic and seasonal influenza. Various efforts are underway to develop such a vaccine, but they are modest in size. Given our estimates of the high risk of pandemic influenza, we believe that the returns from accelerated development of a universal influenza vaccine would likewise be potentially very high. Widely used vaccines against measles, polio, and tuberculosis have shown potential effectiveness against both influenza viruses and coronaviruses.[296,297] A more complete and up-to-date understanding of this scientific potential, including trials, when appropriate, would be valuable.

Vaccine-related investments of only several billion dollars per year promise expected returns in health security of ten or more times the investment: when it comes to pandemic vaccine research and development, "not only is the cost–benefit ratio unbeatable, but not to undertake this spending is to court disaster".[298] Yet this funding has yet to fully materialise. The Coalition for Epidemic Preparedness Innovations (CEPI) asked funders for $3·5 billion in 2021 to prepare for known pandemic threats but was only able to mobilise $2 billion by the end of 2022.[188] Development of new health tools—medicines, vaccines, and diagnostics—for the next pandemic is also important. Advances in AI could enable quick and effective modelling of potential viral vaccine and drug targets, which is important for pandemic preparedness. CEPI intends to store AI-derived antigen

designs in a vaccine library to accelerate development of vaccine candidates in the event of a new pathogenic threat. CEPI has also funded research to map potential antigenic targets for ten priority virus families with epidemic or pandemic potential.[299]

Surveillance, early warning, and prevention capacities are important globally, but there is little justification for low-income countries to allocate domestic resources to developing these capacities. International resources are required. Development assistance for health will play a crucial role in supporting day-zero financing of the pandemic response—ie, pre-committed funding that is made available immediately when the next pandemic hits to support development and equitable deployment of medical countermeasures.[300] In December 2023, Gavi's board approved a $500 million investment in a First Response Fund as part of a broader Day Zero Financing Facility.[301]

Overall, a new approach to collective financing of pandemic prevention, preparedness, and response is needed. One such approach is Global Public Investment,[302] in which all countries contribute through a fair-share mechanism over time sustainably, equitably, and predictably.

Manufacturing capacity

In addition to large-scale investments in research and development, global manufacturing capacity needs to be strengthened. Low vaccine-production capacity was a major barrier during the COVID-19 pandemic.[303] LMICs need to be able to manufacture basic drugs and other material inputs without barriers imposed by dominant global manufacturers and high-income countries. Since GH2035 was published, we have emphasised the importance of building regional manufacturing hubs for vaccines, therapeutics, and diagnostics. The pandemic has led to several new manufacturing initiatives, an important development.[41] These initiatives have a strong focus on mRNA vaccine production, which is important and should continue, but diversified manufacturing is also needed to enable production of non-mRNA vaccines in LMICs. To create sustainable markets, funders need to support local or regional manufacturing when there is reasonable expectation of success. Intrinsic economies of scale and demands on technical and managerial resources require long-term commitments to succeed. The increasing unreliability of global supply chains makes investment in national and regional capacity potentially worthwhile even when narrow economic considerations might suggest otherwise. There are encouraging signs on this front—for example, Gavi has committed $1 billion to support vaccine manufacturing in Africa through a new African Vaccine Manufacturing Accelerator.[301] Adeyi and colleagues have discussed the importance of the African Union's goal that 60% of Africa's vaccine needs are produced on the continent by 2040.[274] At least as important as capacity for vaccines is capacity for priority drugs, diagnostics, and equipment.

The extent to which these new initiatives fundamentally transfer technology to emerging manufacturers in LMICs beyond fill and finish (ie, beyond just filling vials with vaccine and packaging them for distribution) should be monitored. Several criteria could be used to assess the strategic and operational value proposition of such initiatives across vaccines, drugs, and diagnostics. For example, one criterion is whether these initiatives fit with the country and regional strategies of LMICs. A second is the importance of focusing on drugs and commodities to address the 15 priority conditions. A third concerns how long it will take until diverse LMICs are truly able to develop manufacturing capacity free of intellectual property constraints on products or processes. For the 15 priority conditions, intellectual property could prove to be a less important consideration than growing a technical workforce.

A high value investment for development assistance for health is to help establish stronger clinical-trial networks in LMICs that can work in conjunction with manufacturing capacity. The HIV Prevention Trials Network is a model for the value of such networks: when the COVID-19 pandemic hit, it rapidly pivoted to conducting COVID-19 vaccine trials, and during the 2022 mpox (formerly known as monkeypox) outbreak, it pivoted to mpox vaccine trials.[41]

New global financing via strengthening the international system

A report on the future of multilateral development banks from an independent expert group commissioned during the Indian G20 presidency concluded that radically reformed and strengthened multilateral development banks are essential to address global challenges.[304] The report made three recommendations to leverage the potential of these banks.[304] First, multilateral development banks should adopt a triple agenda of eliminating extreme poverty, boosting shared prosperity, and contributing to global public goods. Second, lending by multilateral development banks should be tripled by 2030 (the independent expert group estimated that $500 billion in additional annual official external financing would be needed). Multilateral development banks should provide an incremental $260 billion of the additional annual official financing (of which $160 billion would be concessional lending). Third, a global challenges funding mechanism, which would have flexible and innovative arrangements for engaging with investors willing to support elements of the agenda for meeting global challenges, should be developed.

Although the report advanced a constructive agenda, these aspirations were situated in the context of what the authors viewed as a drastic failure of the global system in 2023. This failure, they argued, resulted in major reverse resource transfers out of LMICs, as we have already discussed.[28] A clear implication is that, although LMICs and regional institutions might hope for

multilateral reform, they would be unwise to plan on it. That said, regional multilateral development banks substantially increased their health financing during the COVID-19 pandemic, and they should be used to provide additional concessional and non-concessional funding for health. Their reach could be further enhanced by expanding the health investments of all public development banks. There are at least 330 such banks that collectively provide more than $2·3 trillion per year of funding for public investments in LMICs.[305] During the COVID-19 pandemic, the African Export–Import Bank provided financing for vaccines through the African Vaccine Acquisition Trust mechanism[306] and the Corporación Andina de Fomento Development Bank of Latin America and the Caribbean[307] funded vaccines for Latin American countries.

We also agree that multilateral development banks, especially the World Bank institutions, should embrace a global public goods agenda. Building on the Evolution Roadmap, the World Bank has approved a new framework for financial incentives to promote investments in projects that generate positive cross-border externalities.[308] Further reform of the financial architecture for health will be required, including to catalyse more domestic finance, a key recommendation of the Future of Global Health Initiatives (a time-bound, multi-stakeholder process, co-chaired by the Kenyan and Norwegian Governments, that aimed to accelerate shifts in the global health ecosystem to support country-led trajectories towards UHC).[309] Adeyi and Nonvignon have argued that the Future of Global Health Initiatives should have recommended an even more decisive shift from the status quo.[274] Important as domestic financial mobilisation is, a key test of proposed reforms of multilateral development banks will be the extent to which they mobilise substantial new resources for concessional lending in low-income countries. Adequate replenishments for the World Bank's International Development Association are essential.

In addition to multilateral development banks, international institutions—prominently WHO—are essential in providing international public goods for health. As discussed previously, a recent investment case points to some of the domains we have identified as important earlier in this part of the Commission.[189] The price is small for the returns realised, and enhanced support is a priority.

Finally, we support the Brazilian G20 presidency's call for an international agreement on a minimum income tax on billionaires.[310] This tax could generate additional funding for global public goods.

Conclusion

In this Commission, we have reached seven conclusions. First, dramatic improvements in human welfare are achievable everywhere by 2050 with the right health investments. Countries that choose to make these investments can halve their PPD—ie death before age 70 years—by 2050 (the 50-by-50 goal). Historical experience and continued scientific advances indicate the feasibility of achieving this goal, which is also likely to reduce morbidity and disability at all ages (in addition to reductions in premature death).

Second, rapid, sharp mortality declines and associated declines in morbidity can be achieved early on the pathway to full UHC. The 50-by-50 goal can be reached through tackling 15 priority conditions, eight related to infectious diseases and maternal health and seven related to NCDs and injuries.

Third, a modular approach to health-system strengthening supports an initial tight focus on these 15 priority conditions and a gradual broadening of effort as the priority conditions are more fully addressed. Adopting this modular approach also addresses major morbidities, such as psychiatric illness, which are not already covered by mortality-reducing interventions. Value for money can be assessed through a two-step process: assessment of technical cost-effectiveness to gauge how best to achieve module-specific goals and political assessment of trade-offs in investing in expanding module coverage.

Fourth, public financing of a few drugs and other commodities can steer health systems towards delivering high-priority health interventions. Countries should focus a substantial and increasing fraction of public resources for health on making available and affordable the specific drugs, vaccines, diagnostics, and other commodities required for control of the 15 priority conditions. The Arrow mechanism that we describe includes direct subsidising of drugs, pooled purchasing, quality assurance, and a long-term commitment to manufacturers to ensure availability of therapies.

Fifth, tobacco control is by far the most important intersectoral policy to help to achieve the 50-by-50 goal, in view of the number of deaths caused by tobacco and the established and improving capacity of governments to implement tobacco policy. A high level of tobacco taxation is valuable in the short-to-medium term for public finance, and should be accompanied by a package of other tobacco-control policies.

Sixth, the huge variation across countries in excess deaths during the COVID-19 pandemic, particularly before vaccines were developed, suggests that lessons can be learned from successful countries about public health basics (eg, rapid response, isolation of infected individuals, quarantine of people potentially exposed to infection, and social and financial support for people isolating or quarantining). In the next pandemic, these fundamentals will help to avert mortality while waiting for vaccine development and deployment.

These six conclusions are primarily aimed at national governments. The seventh and final conclusion is aimed at the development assistance community. We conclude that official development assistance should focus on two broad purposes. The first is provision of direct financial

and technical support to countries with the least resources to help to control diseases and develop health systems. The second is financing of global public goods, including reducing the development and spread of antimicrobial resistance, preventing and responding to pandemics, identifying and spreading best practices, and developing and deploying new health technologies. For both of these purposes, focusing efforts on the 15 priority conditions would best contribute to achieving a 50% reduction in PPD by 2050.

We acknowledge that rising geopolitical tensions, increasingly manifest climate change, growth in nationalistic populism, slowed progress towards UHC, and rising health-care costs are all having an impact on global health progress. Despite these challenges, our analysis shows that a practical pathway to halving PPD by 2050 is within reach. By focusing resources on a narrow set of conditions and scaling up financing to develop new health technologies, we believe that the global health landscape can be utterly transformed within our lifetimes.

GH2035 provided systematic evidence for the high value of mortality declines in much of the world—a value that was often a substantial fraction of GDP growth. We have updated those findings up to 2019 and reiterate the high economic value of actually experienced mortality declines. Today, the case is better than ever for the value of investing in health for reducing mortality and morbidity, alleviating poverty, and improving human welfare.

Contributors

The report was prepared under the leadership of the chair, LHS, and co-chair, DTJ. The first draft was written by a core writing team comprising AYC, DTJ, OK, WM, OFN, OO, MS, DW, and GY. Data were analysed by the writing team, together with SB, AF, and SV. All commissioners contributed fully to the overall report structure and concepts, the writing and editing of subsequent drafts, and the conclusions.

Declaration of interests

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Commission on Investing in Health Advisory Committee

The Commission on Investing in Health formed an advisory committee to advise on the first draft of the report and on its dissemination and use. Members of the committee provided their inputs in writing and at a meeting in Oslo, Norway, June 5–7, 2024, which was hosted by the Government of Norway. Members served in their personal, not institutional, capacities. The committee was chaired by John-Arne Røttingen (Wellcome Trust, London, UK). The other committee members were Samira Asma (WHO, Geneva, Switzerland; observer role), Cristoph Benn (Joep Lange Institute, Geneva, Switzerland), Mark Blecher (National Treasury of South Africa, Pretoria, South Africa), Helen Clark (Partnership for Maternal, Newborn and Child Health, Geneva, Switzerland), Satoshi Ezoe (Ministry of Foreign Affairs, Tokyo, Japan), Senait Fisseha (Susan Thompson Buffett Foundation, Ann Arbor, MI, USA), Helga Fogstad (UNICEF, New York, NY, USA), Julio Frenk (University of Miami, Miami, FL, USA), Atul Gawande (US Agency for International Development, Washington, DC, USA), Gargee Ghosh (Gates Foundation, Seattle, WA, USA), Richard Horton (*The Lancet*, London, UK), Gabriel Leung (University of Hong Kong, Hong Kong, China), Mosa Moshabela (University of Cape Town, Cape Town, South Africa), Serina Ng (G20 Joint Finance and Health Task Force, Geneva, Switzerland), Justice Nonvignon (Management Sciences for Health, Arlington, VA, USA), Muhammad Ali Pate (Federal Ministry of Health and Social Welfare, Abuja, Nigeria), Peter Sands (Global Fund to Fight AIDS, Tuberculosis and Malaria, Geneva, Switzerland), Olive Shisana (Evidence Based Solutions, Cape Town, South Africa), Vera Songwe (Africa Growth Initiative, Brookings Institution, Washington, DC, USA), Viroj Tangcharoensathien (Ministry of Public Health, Nonthaburi, Thailand), and Juan Pablo Uribe (World Bank, Washington, DC, USA).

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