

# Financing Global Health 2021

Global Health Priorities in a Time of Change



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# Contents

Acronyms.....	7
Acknowledgments .....	8
About IHME .....	9
Call for collaborators.....	9
Executive summary.....	11
Introduction.....	15
What’s new in Financing Global Health 2021.....	15
COVID-19 and health spending .....	17
Part One: Funding today’s priorities .....	21
Total health spending through 2019.....	21
Development assistance for health through 2021.....	24
Part Two: Meeting tomorrow’s challenges.....	37
Future spending on health .....	37
Funding for pandemic preparedness and response .....	39
Conclusion.....	45
Global health financing focus area profiles.....	49
COVID-19 .....	50
HIV/AIDS .....	52
Tuberculosis.....	54
Malaria.....	56
Other infectious diseases .....	58
Reproductive, maternal, newborn, and child health .....	60
Non-communicable diseases.....	62
References.....	65
Annex: Methods.....	67

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# Figures

FIGURE 1 COVID-19 daily deaths by Global Burden of Disease super-region, January 2020–October 2022 .....	17
FIGURE 2 Overall development assistance for health, 1990–2021 <sup>*</sup> .....	18
FIGURE 3 Total health spending by source of financing, 1995–2019 .....	22
FIGURE 4 Health spending, population, and disability-adjusted life years by World Bank income group, 2019.....	23
FIGURE 5 Government health spending as a fraction of total health spending, 2019.....	24
FIGURE 6 Development assistance for health and COVID-19 by source of funding, 1990–2021.....	25
FIGURE 7 Development assistance for health by health focus area, 1990–2021.....	26
FIGURE 8 Development assistance for health by channel of assistance, 1990–2021 .....	27
FIGURE 9 Flows of development assistance for health for COVID-19 from source to channel to program area, 2021.....	28
FIGURE 10 Annualized rate of change in development assistance for health disbursed by source, 2000–2015, 2015–2019, and 2019–2021 <sup>*</sup> .....	29
FIGURE 11 Annualized rate of change in development assistance for health disbursed by channel, 2000–2015, 2015–2019, and 2019–2021 <sup>*</sup> .....	30
FIGURE 12 Annualized rate of change in development assistance for health disbursed, by health focus area, 2000–2015, 2015–2019, and 2019–2021 <sup>*</sup> .....	31
FIGURE 13 The share of development assistance for health allocated by health focus area, 1990–2021 .....	32
FIGURE 14 Development assistance for health targeting COVID-19 and deaths from COVID-19, 2020–2021 <sup>*</sup> .....	33
FIGURE 15 Global COVID-19 vaccine coverage, August 2022.....	34
FIGURE 16 Percentage of development assistance for health for COVID-19, 2020–2021.....	35
FIGURE 17 Forecasted total health spending per person, 2050 .....	37
FIGURE 18 Forecasted development assistance for health, 2015–2050 .....	38
FIGURE 19 Development assistance for pandemic preparedness and response by source of funding, 1990–2021 .....	40
FIGURE 20 Development assistance for pandemic preparedness and response by disbursing entity, 1990–2021.....	41
FIGURE 21 Development assistance for pandemic preparedness and COVID-19, 1995–2026.....	42

Source for all figures and tables unless otherwise indicated: *Financing Global Health Database 2021*

# Tables

TABLE 1 Total health spending and health spending by source, global and by income group, 2019.....	12
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# Boxes

BOX 1 This report's peer-reviewed foundation.....	15
BOX 2 Health financing terms defined .....	16
BOX 3 Development assistance for health terms defined .....	22

# Acronyms

COVAX	COVID-19 Vaccines Global Access Facility
DAH	Development assistance for health
DALY	Disability-adjusted life year
GBD	Global Burden of Diseases, Injuries, and Risk Factors Study
GDP	Gross domestic product
ICU	Intensive care unit
IHME	Institute for Health Metrics and Evaluation
MDGs	Millennium Development Goals
NCDs	Non-communicable diseases
PPR	Pandemic preparedness and response
RMH	Reproductive and maternal health
SDGs	Sustainable Development Goals
SWAps	Sector-wide approaches
UHC	Universal health coverage
UNICEF	United Nations Children's Fund
UNOCHA	United Nations Office of Humanitarian Assistance

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The analysis of development assistance for health, COVID-19, and other sources of health spending presented in *Financing Global Health 2021* draw in part on data and analysis presented in "Global investments in pandemic preparedness and COVID-19: tracking development assistance and domestic spending on health, 1990–2026," published this year in *The Lancet Global Health*. We also thank the 2021 Global Burden of Disease Health Financing Collaborator Network for feedback on data, methods, and preliminary results.

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## About IHME

An independent population health research organization based at the University of Washington School of Medicine, the Institute for Health Metrics and Evaluation (IHME) works with collaborators around the world to develop timely, relevant, and scientifically valid evidence that illuminates the state of health everywhere. In making our research available and approachable, we aim to inform health policy and practice in pursuit of our vision: all people living long lives in full health. For more information about IHME and its work, please visit [www.healthdata.org](http://www.healthdata.org).

## Call for collaborators

In addition to conducting the Financing Global Health study, IHME coordinates the Global Burden of Diseases, Injuries, and Risk Factors (GBD) Study, a comprehensive effort to measure epidemiological levels and trends worldwide. (More information on GBD is available at [www.healthdata.org/gbd](http://www.healthdata.org/gbd).) The GBD study relies on a worldwide network of more than 8,000 collaborators in over 150 countries. Current collaborator areas of expertise include epidemiology, public health, demography, statistics, and other related fields. IHME has expanded the scope of GBD to encompass quantification of health resource flows, health system attributes, and the performance of health systems. To that end, IHME is seeking GBD collaborators who are experts in health financing and health systems. GBD collaborators – many of whom have co-authored GBD or Financing Global Health publications – provide timely feedback related to the interpretation of GBD and Financing Global Health results, data sources, and methodological approaches pertaining to their areas of expertise. We invite researchers and analysts with expertise in health financing to join the GBD Collaborator Network. Potential collaborators may apply at [www.healthdata.org/gbd/call-for-collaborators](http://www.healthdata.org/gbd/call-for-collaborators).

# Executive summary

*Financing Global Health 2021* provides estimates of total spending on health, development assistance for health, and projections of future health spending. Much global progress has been made since the previous edition of *Financing Global Health*, which was written and produced during some of the worst days of the pandemic. In many parts of the world, COVID-19 deaths and hospitalizations have decreased dramatically, and some no longer consider the pandemic to be a global emergency. Reported global daily deaths from COVID-19 have dropped from above 16,000 per day on January 24, 2021, to approximately 1,600 as of mid-December 2022. Likewise, global hospital resource use has dropped precipitously from its peak in April 2021.<sup>1</sup>

Financing for vaccine development and distribution has been integral to these gains. According to WHO, almost 200 COVID-19 vaccines have been developed globally since the start of the pandemic,<sup>2</sup> and nearly 13 billion doses<sup>3</sup> have been administered to date.

However, challenges loom. COVID-19 vaccine distribution has been far from equal, with high-income countries receiving the majority of available vaccines to date. Health conditions like mpox – and now the resurgence of polio – are also issues of concern. Another is the war in Ukraine, which is proving to have wide global repercussions, from food insecurity to energy and economic implications. Finally, there is the increasing possibility of a global recession driven by inflation, the aftereffects of COVID-19, the war in Ukraine, and downturns in several economies. As much health spending originates from tax revenue, funding both government spending and development assistance, economic uncertainty and recession could have large impacts on global health.

A year underscored by major gains and losses highlights the importance of tracking spending on health. The health spending tracking and estimates in *Financing Global Health* show patterns across income groups and regions, as well as over time, and highlight variations between countries, which can identify where more resources are needed most. *Financing Global Health 2021's* health spending estimates cover 204 countries from 1995 to 2019, while for development assistance for health (DAH), we present estimates from 1990 to 2021 for 137 low- and middle-income countries.<sup>4</sup> Our future health spending scenarios cover 204 countries for the period from 2020 to 2050.

Two particular focuses of this year's report are development assistance for COVID-19 and the historical lack of funding for pandemic preparedness. Understanding how much is being spent on health to fight COVID-19 is integral to both managing the current pandemic and preparing for the next one.

We estimate that total global health spending increased to \$9.2 trillion (95% uncertainty interval 9.1–9.3) in 2019. This constitutes a 3.1% increase over the 2018 total. Table 1 shows total 2019 spending and 2019 spending by source.

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<sup>4</sup>2021 DAH estimates are projections.

**TABLE 1** Total health spending and health spending by source, global and by income group, 2019

	Health spending per person (USD)	Health spending per person (\$PPP)	Health spending per GDP (%)	Government health spending per total health spending (%)	Out-of-pocket spending per total health spending (%)	Prepaid private spending per total health spending (%)	Development assistance for health per total health spending (%)
Global	1,183 (1,171 to 1,195)	1,518 (1,505 to 1,531)	9.7% (9.6 to 9.8)	59.8% (59.8 to 59.8)	18.2% (17.9 to 18.5)	21.5% (21.1 to 21.9)	0.5% (0.5 to 0.5)
<b>WORLD BANK INCOME GROUP</b>							
High-income	5,938 (5,876 to 6,004)	6,469 (6,405 to 6,535)	12.4% (12.2 to 12.5)	62.0% (61.4 to 62.7)	13.7% (13.3 to 14.3)	24.3% (23.6 to 24.9)	0.0% (0.0 to 0.0)
Upper-middle-income	575 (561 to 590)	1,085 (1,062 to 1,108)	5.7% (5.6 to 5.9)	56.0% (54.6 to 57.4)	32.6% (31.5 to 33.7)	11.2% (10.4 to 12.2)	0.2% (0.1 to 0.2)
Lower-middle-income	117 (114 to 121)	300 (291 to 309)	4.1% (3.9 to 4.2)	39.9% (38.7 to 41.1)	47.3% (45.9 to 48.6)	10.6% (9.7 to 11.6)	2.2% (2.2 to 2.3)
Low-income	37 (36 to 38)	145 (140 to 150)	4.9% (4.7 to 5.2)	23.0% (22.1 to 23.8)	43.8% (42.6 to 44.9)	4.7% (4.3 to 5.2)	28.5% (28.0 to 29.1)

\*Estimates in parentheses are 95% uncertainty intervals.

Development assistance for health includes both financial and in-kind contributions for activities aimed at improving health in low- and middle-income countries.

PPP = Purchasing power parity

According to our preliminary estimates, there was \$67.4 billion in DAH in 2021. Between 2020 and 2021, total DAH increased 8.6%; \$37.8 billion was directed to DAH for COVID-19 between 2020 and 2021. Despite a plateauing in DAH growth in the years immediately preceding the pandemic, the increase in DAH between 2019 and 2020 – when DAH grew 43.9% – as a result of COVID-19 was unprecedented. So the continued increase between 2020 and 2021, while not as dramatic as 2019–2020, continues this trend. Notably, the \$37.8 billion that has been spent on DAH for COVID-19 is 810% more than total spending on DAH for pandemic preparedness between 2000 and 2019, which totaled \$4.2 billion.

DAH for health focus areas other than COVID-19 reached \$45.6 billion in 2021, about 0.9% lower than the non-COVID-19 total in 2020, although 5.8% higher than 2019. By health focus area, our preliminary estimates suggest that DAH for non-communicable diseases (NCDs), reproductive and maternal health (RMH), and sector-wide approaches (SWAPs) and health systems strengthening decreased between 2020 and 2021, going down by 2.8%, 6.7%, and 11.1%, respectively. Conversely, DAH for newborn and child health (10.3%), HIV/AIDS (2.2%), malaria (13.6%), other infectious diseases (which includes COVID-19) (26.1%), and tuberculosis (2.1%) increased between 2020 and 2021.

The pandemic has skewed development spending: DAH has increased 56.3% since 2019, largely due to COVID-19. And while it is positive that our preliminary estimates suggest DAH for a number of non-COVID health focus areas grew between 2020 and 2021 after declining between 2019 and 2020, that spending on areas like NCDs and reproductive and maternal health seems to have declined is a cause for concern. According to the most recent Global Burden of Disease study, in 2019, six of the top 10 Level 3\* causes of disease burden (as measured by age-standardized disability-adjusted life

\*For information about GBD cause levels, please visit <https://www.healthdata.org/node/7849>.

years) were NCDs, and there were nearly 200,000 deaths from maternal disorders.<sup>4</sup>

Low-income countries are most reliant on DAH, where it makes up 28.5% (28.0–29.1) of 2019 total health spending, while lower-middle-income countries rely on out-of-pocket spending to finance health care, amounting to 47.3% (45.9–48.6) of 2019 health spending. Government and prepaid private spending were the largest contributors to health spending in high-income countries (86.3% [85.0–87.5] of 2019 health spending), and in upper-middle-income countries, government and prepaid private spending constituted 56.0% (54.6–57.4) and 11.2% (10.4–12.2) of 2019 spending on health, respectively.

*Financing Global Health 2021's* estimates of future health spending from 2020 to 2050 estimate spending will grow to \$16.9 trillion (16.1–17.8) by 2050. Global disparities will likely remain, as high-income country spending is projected to grow to \$10,141 per person (9,546–10,737) by 2050, while low-income country spending is only projected to grow from \$42 per person (42–43) in 2020 (less than 1% of 2019 high-income spending) to \$56 per person (53–60) in 2050, remaining less than 1% of the per person spending rate across high-income countries.

Overall, *Financing Global Health 2021* is focused on pandemic preparedness and response spending, specifically as it relates to COVID-19. This year's report also includes updated estimates of overall global domestic spending, now through 2019, updated estimates of contributions to DAH, including preliminary estimates through 2021, and updated estimates of future health spending, to 2050. Last but hardly least, also included in *Financing Global Health 2021* are up-to-date financing profiles for seven health focus areas: COVID-19; HIV/AIDS; tuberculosis; malaria; other infectious diseases; reproductive, maternal, newborn, and child health; and NCDs.

# Introduction

The Institute for Health Metrics and Evaluation is pleased to present *Financing Global Health 2021*, the 13<sup>th</sup> in the report series that tracks global health spending. Each issue in the series is a product of the notable global events that form the context of the report. This year the dramatic impacts of COVID-19 remain close, influencing this report and underscoring the need for continuing to publish retrospective health spending tracking, as well as forward-looking estimates and analyses of health spending. Global challenges both directly and indirectly related to health – like outbreaks of mpox and Ebola, as well as Russia’s invasion of Ukraine and the subsequent economic and political fallout – only emphasize this need.

COVID-19 has had a major effect on global health financing. While much progress has been made in the fight against COVID-19, the reported COVID-19 death toll is almost 7.2 million. Estimates from the Institute for Health Metrics and Evaluation indicate that as of mid-December 2022, there have been 17.8 million deaths in some way attributable to COVID-19.<sup>1</sup> And despite many successes, it is clear that the COVID-19 vaccine rollout has been notably unequal, and many low-income countries have far lower vaccine coverage percentages than wealthier countries.

To inform decision-making to address these and other issues, we present estimates of current and future health spending, split into two parts: Part One is focused on funding today’s priorities and includes estimates of total health spending for 204 countries, from 1995 to 2019, as well as detailed estimates of DAH from 1990 to 2021. Part Two of *Financing Global Health 2021* is concerned with the future and includes estimates of both domestic spending and DAH, to 2050.

## What’s new in Financing Global Health 2021

*Financing Global Health* has been published continuously since 2009, and with every edition we seek to improve upon the previous year’s work. Here is what’s new in *Financing Global Health 2021*:

- **A focus on pandemic preparedness and response (PPR) spending**
  - We present retrospective estimates of DAH for PPR from 1990 to 2021. We also look ahead at the next five years – to 2026 – and forecast the availability of DAH as it relates to the need estimates published by the G20’s High Level Independent Panel (HLIP) on pandemic preparedness.
- **Revised future health spending projections to 2050**
  - We have updated our projections of future health spending for 204 countries to 2050, assuming historical spending patterns and relationships persist.

### BOX 1 This report’s peer-reviewed foundation

The work presented in *Financing Global Health 2021* draws in part on a peer-reviewed research article published on January 24, 2023:

Global investments in pandemic preparedness and COVID-19: tracking development assistance and domestic spending on health, 1990–2026

## BOX 2 Health financing terms defined

**Annualized rate of change:** This is the growth rate needed each year (i.e., annualized) to go from the observed amount in one year to an observed amount in a different year. Also known as compound growth rate (with annual compounding).

**Development assistance for health:** Financial and in-kind resources that are transferred through international development agencies (such as United Nations Children's Fund [UNICEF], the United Kingdom's Department for International Development, or the Bill & Melinda Gates Foundation) to low- and middle-income countries with the primary purpose of maintaining or improving health.

**Disability-adjusted life year (DALY):** One DALY is equivalent to one lost year of "healthy" life. The sum of these DALYs across the population, or the health loss, is a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability.

**Global Burden of Disease super-regions:** Seven regions which group sub-regions based on cause of death patterns. Super-regions are as follows: GBD high-income; Latin America and the Caribbean; sub-Saharan Africa; Southeast Asia, East Asia, and Oceania; Central Europe, Eastern Europe, and Central Asia; South Asia; and North Africa and the Middle East.

**Government health spending:** Spending for health care that is derived from domestic sources and is mutually exclusive from out-of-pocket, prepaid private, and DAH spending. Government spending includes spending on public health system infrastructure and government-provided social health insurance.

**Health financing transition:** The shift that countries experience from an early period in which health spending is low and primarily out-of-pocket to a later period in which health spending is high and primarily pooled.

**Out-of-pocket health spending:** Payments made by individuals for health maintenance, restoration, or enhancement at or after the time of health care delivery, including health insurance copayments or payments devoted to deductibles. Health insurance premiums are not considered out-of-pocket.

**Prepaid private health spending:** Health spending sources from non-public programs that are funded prior to obtaining health care, such as private health insurance and services provided for free by non-governmental agencies.

**Total health spending:** The sum of government health spending, prepaid private health spending, out-of-pocket health spending, and DAH. Total health spending does not include indirect health spending, such as lost wages due to illness or transportation costs; informal care (spending on care provided by a family member or by traditional healers); or illegal transactions.

**Universal health coverage:** The goal of universal health coverage is to ensure that all people have access to effective health services and may partake of these services without financial hardship.

**World Bank income group:** The World Bank classifies countries using gross national income (GNI) per person. This report uses the fiscal year 2023 World Bank income groups, which are high-income (GNI per person greater than \$13,205), upper-middle-income (\$4,256 to \$13,205), lower-middle-income (\$1,086 to \$4,255), and low-income (\$1,085 or less).<sup>‡</sup>

<sup>‡</sup>Source: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>

## • Updated global health focus area profiles

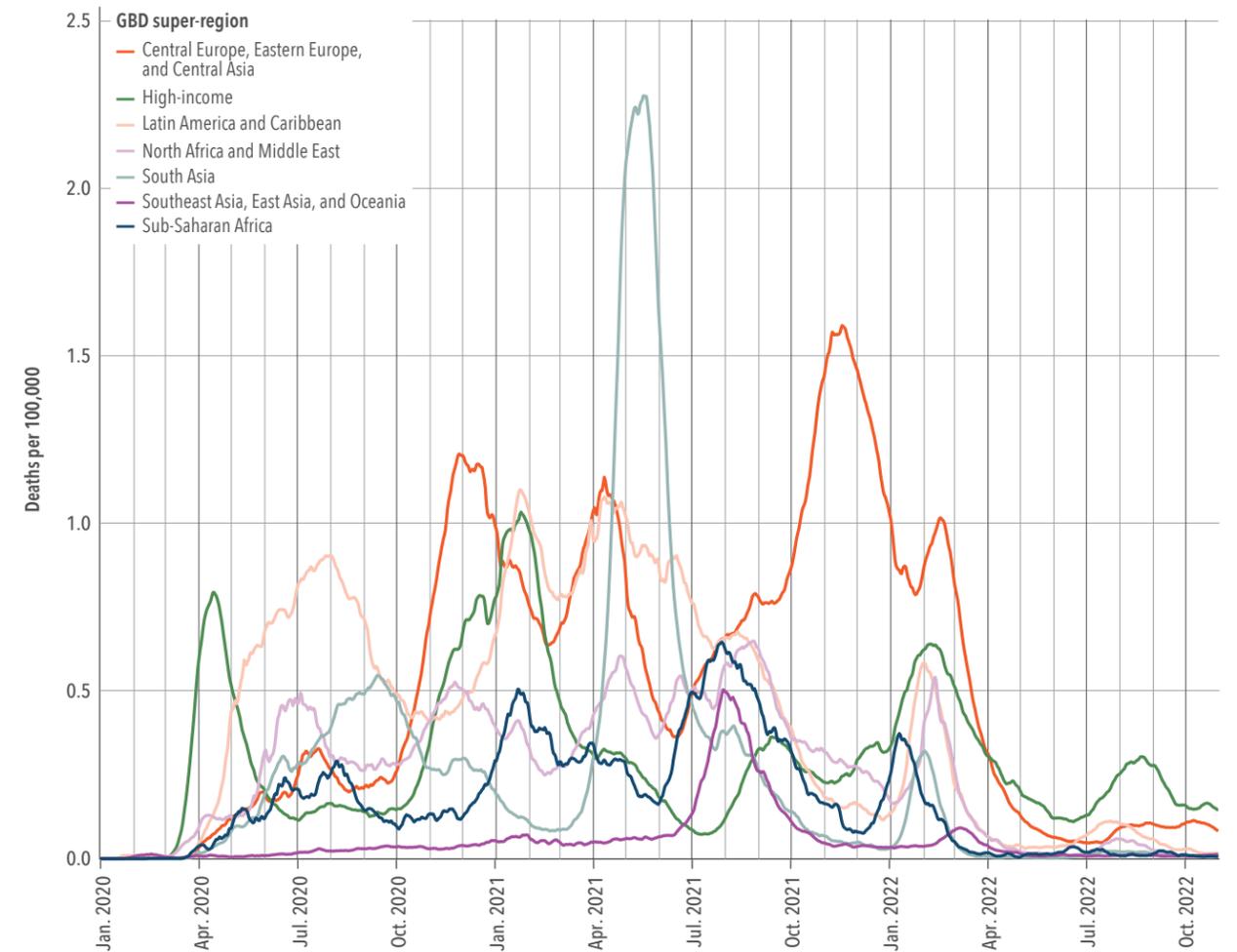
- Initially introduced in 2019, the profiles allow stakeholders to easily access information on a number of health focus areas. In addition to being available as a section of *Financing Global Health 2021*, the profiles can be viewed and downloaded individually on [healthdata.org](http://healthdata.org).

## COVID-19 and health spending

Figure 1 shows how COVID-19's impact on regions has changed over the course of the pandemic, through October 2022.<sup>\*\*</sup> During its early days, the impact was initially on high-income nations, but over time the regional hot spots shifted, so that, for example, by the fall of 2020, COVID was deadliest, in terms of deaths per capita, in the Central Europe, Eastern Europe, and Central Asia super-region.

<sup>\*\*</sup> Examining any data by region can lead to an easily misinterpreted view of that data. For example, by World Bank region, cumulative deaths per capita are highest in North America because of one country in that region – the US.

FIGURE 1 COVID-19 daily deaths by Global Burden of Disease super-region, January 2020–October 2022



Source: Global Burden of Disease 2019 study and IHME COVID team

Though projections of infections and deaths are far lower than their peaks in early 2021 and early 2022,<sup>1</sup> the pandemic is not yet over. Indeed, the G20 HLIP on Financing the Global Commons for Pandemic Preparedness and Response pointed out that “without urgent and concerted actions” and “significant additional funding,” the likelihood of additional variants emerging remains likely, posing “a risk to every country.” So more spending is needed both to prevent COVID-19 from getting any worse, and to prevent the next pandemic.

Nonetheless, the dramatic effect COVID-19 has already had on health spending cannot be overemphasized. For example, though development assistance for health has grown since 1990 – between 2011 and 2019, it grew at an annual rate of 11.0% – there has never been an increase in DAH of the magnitude of the one observed between 2019 and 2020, when DAH grew \$18.9 billion, or 43.9%. And it has continued to rise: overall DAH grew 8.6% between 2020 and 2021 (or \$5.3 billion more). Even this slowed growth is greater than any other year-over-year increase between 1990 and 2019. The change – and then sudden rise – in DAH between 1990 and 2020 is shown in Figure 2.

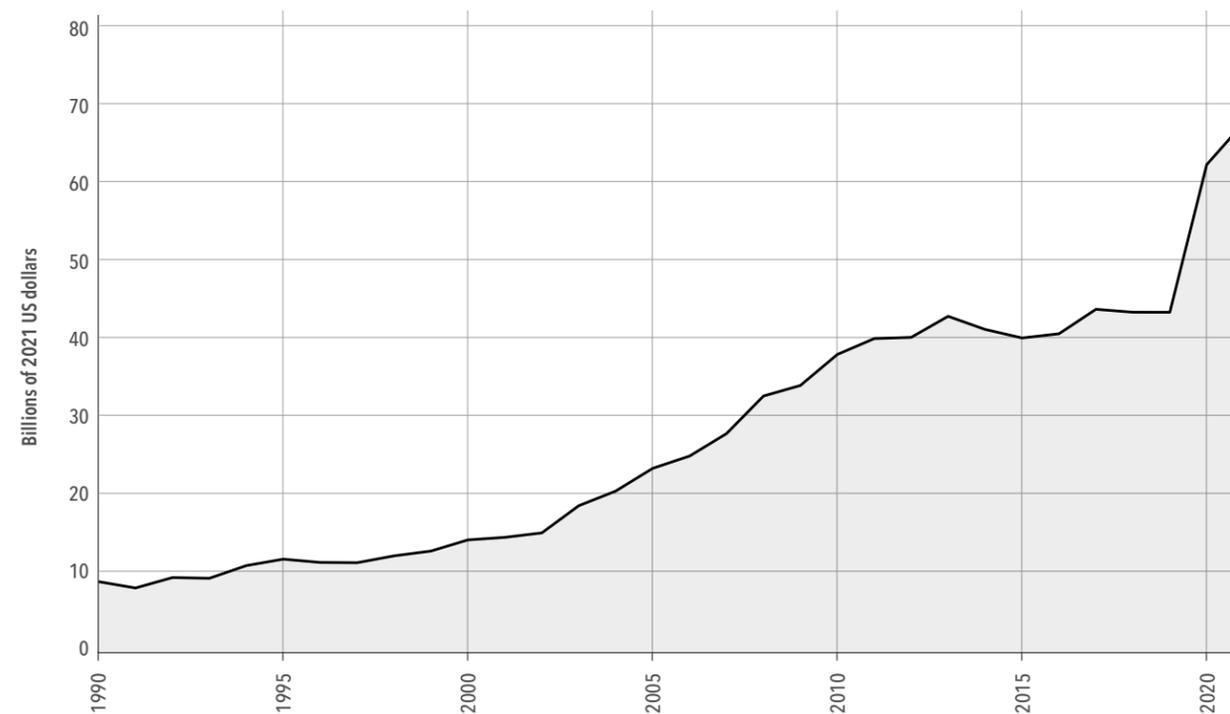
Likewise, overall spending on health also increased, going from \$9.2 trillion (9.1–9.3) in 2019 to a forecast of \$9.9 trillion (9.8–10.0) in 2020 (see Part Two of *Financing Global Health 2021* for more details on our prospective estimates).

Substantial as the increases in health spending have been, they are far smaller than the economic costs of the pandemic, which are estimated to be in the tens of trillions. One study estimated that COVID-19 has cost the US alone \$16 trillion.<sup>5</sup> Funding to prevent future pandemics should be set aside; the cost of inaction now, both economically and in terms of human lives derailed or lost, could be enormous.

To avoid future pandemics, the HLIP recommends a number of steps, including “greater domestic investments by national authorities” and spending an additional \$15 billion per year (comprising resources for global responses, as well as support for low-income and lower-middle-income countries) on PPR over the next five years. While the latter may be attainable – in 2021, estimated DAH for pandemic preparedness plus COVID-19 was 150.5% higher than the HLIP’s target – increasing government spending on health, particularly by the 1% of GDP recommended by the HLIP, might prove impossible for some low-income and lower-middle-income countries; at the moment, an estimated 13 countries currently devote less than 1% of GDP to health.

Nonetheless, COVID-19 has presented the world with a reminder of the importance of investing in health care, in PPR, and in tracking health spending to better understand the levels and distribution of health spending. Understanding how the world’s financial resources are being used to reduce health loss is valuable for adjusting spending and evaluating how we can better direct those resources. We should make the best use of the opportunity to avoid future pandemics that the huge increase in health spending driven by COVID-19 has given us. “Together with climate change, countering the existential threat of deadly and costly pandemics must be the human security issue of our times,” the HLIP notes.

**FIGURE 2** Overall development assistance for health, 1990–2021\*



\*2021 estimates are preliminary.

# Funding today's priorities

## Total health spending through 2019

In 2019, total health spending reached \$9.2 trillion (9.1–9.3),<sup>\*\*\*</sup> a 3.1% (2.9–3.4) increase over the 2018 estimate. Health spending now constitutes 9.7% (9.6–9.8) of the global economy, due to steady growth over the past two decades; health spending's current share of the global economy reflects an increase since 1995, when health spending was an estimated 8.3% (8.1–8.4) of the global economy.

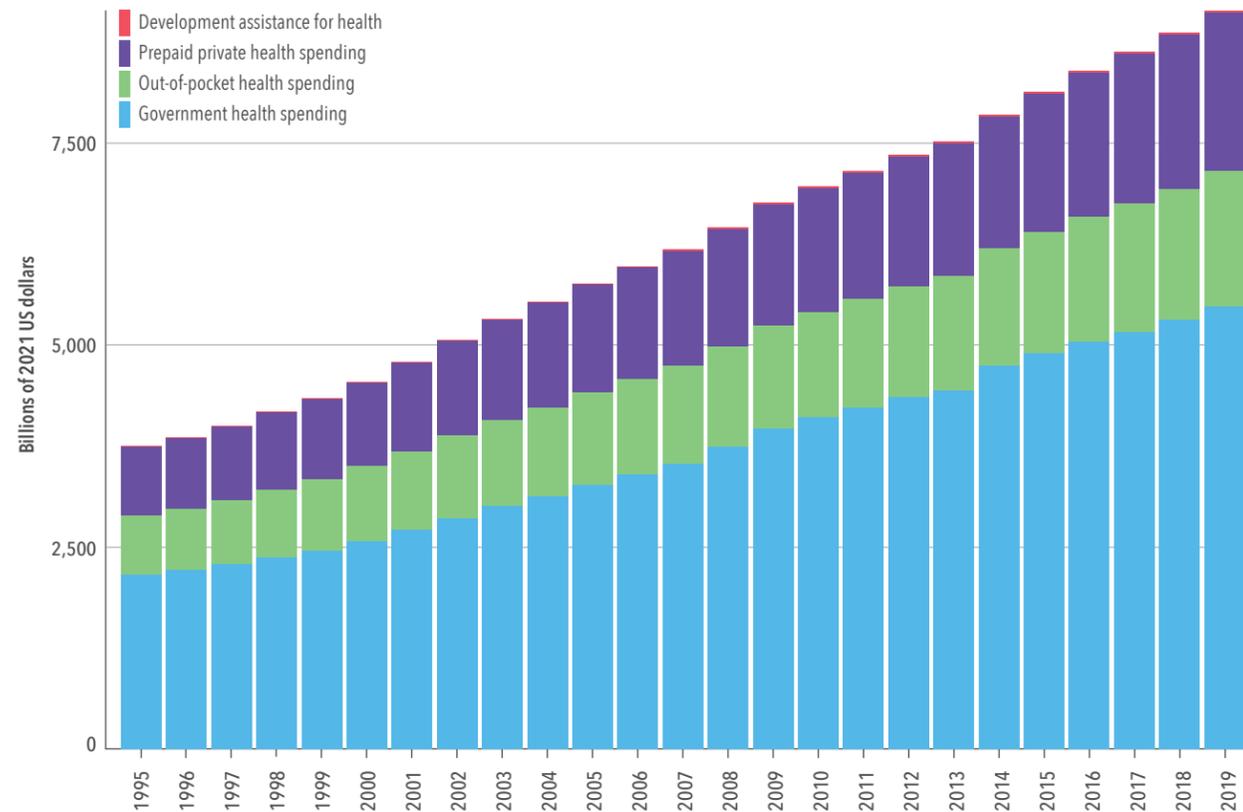
Figure 3 shows the growth of total global health spending between 1995 and 2019, with spending split into four sources: development assistance for health (DAH), prepaid private health spending, out-of-pocket spending, and government health spending. DAH is support provided through major development agencies to improve and maintain health in low- and middle-income countries. Prepaid private spending covers health spending on private insurance premiums and through domestic non-governmental organizations. Out-of-pocket spending includes all health spending not paid in advance. Finally, government health spending is defined as spending on health from all levels of government, in public and private facilities.

Tracking each source of spending is important for several reasons. Understanding how government spending is allocated helps better understand funding needed to build robust public health systems, while prepaid spending (government or private) is essential for reducing the possibility of catastrophic health spending for individuals. Robust prepaid spending is also essential for attaining universal health coverage. Meanwhile, out-of-pocket spending shows how much health spending falls on individuals (that is not prepaid premiums for insurance). And tracking DAH shows which external sources of funding are supporting which health focus areas, and how that money is disbursed. Tracking DAH can also show the degree to which lower-income countries rely on external funding, something integral to planning for future development and sustainability.

Since 1995, the relative fraction of each financing source has remained relatively constant: prepaid private health spending went from 22.7% (22.0–23.4) of total spending in 1995 to 21.6% (21.2–22.0) in 2019; out-of-pocket spending went from 19.4% (18.9–19.9) in 1995 to 18.2% (18.0–18.5) in 2019; and DAH saw growth from 0.3% (0.3–0.3) of total spending on health in 1995 to 0.5% (0.5–0.5) in 2019. Government health spending remains the leading source of spending in high-income and middle-income countries, and the degree to which it dominates overall health spending in wealthier nations has in fact increased. For example, in 1995, government health spending made up 57.8% (57.8–57.9) of total spending, whereas in 2019 it made up 60.0% (60.0–60.0).

<sup>\*\*\*</sup>The modeled estimates for total health spending are presented with uncertainty intervals. Our estimates of DAH are generally not modeled and do not include uncertainty intervals. Unless otherwise indicated, all estimates are reported in 2021 inflation-adjusted US dollars. Estimates in 2021 purchasing-power parity-adjusted dollars are available at <http://ghdx.healthdata.org/>.

**FIGURE 3** Total health spending by source of financing, 1995–2019



**BOX 3** Development assistance for health terms defined

**Sources:** The origins of funding, such as government treasuries, private philanthropic foundations, or any private-party contributions.

**Channels:** The intermediaries in the flow of funds, channels include bilateral aid agencies, multilateral organizations, non-governmental organizations (NGOs), UN agencies, public-private partnerships, and private foundations.

**Implementing institutions:** DAH is ultimately directed to implementing institutions to provide health services and prevent and treat diseases in low- and middle-income countries. These institutions include governmental bodies, NGOs, and international organizations.

**Health focus areas:** The health focus areas assessed in this report are malaria; HIV/AIDS; tuberculosis; reproductive, maternal, newborn, and child health; non-communicable diseases; other infectious diseases; and health systems strengthening (HSS) and sector-wide approaches (SWAPs). “Other DAH” refers to resources that target issues outside these focus areas, and “unallocable” captures the resources that we do not have information to assign.

**Program areas:** Within health focus areas, program areas describe the nature of the activity for which funds are being used. For example, program areas related to tuberculosis include diagnosis, drug resistance, human resources, and treatment.

**Development assistance for health for COVID-19:** Resources intended to improve COVID-19 health outcomes in low- and middle-income countries by development organizations through health interventions focused on country-level coordination, supply chain and logistics support, and treatment; COVID-19 DAH also covers spending for infection prevention and personal protective equipment, as well as vaccine research and development. Note that our estimates of DAH for COVID-19 exclude investments in humanitarian responses and economic stabilization programs.

Figure 4, which compares spending, population, and disability-adjusted life years across World Bank income groups in 2019, illustrates the degree to which inequality shapes health spending globally. Even though high-income countries make up the smallest percentage of the global population (15.8%), they are nonetheless responsible for 79.4% (79.3–79.5) of the world’s health spending.

In addition, Figure 4 shows how the proportion of disability-adjusted life years, or years of healthy life lost, due to more than 350 diseases and injuries according to the Global Burden of Disease 2019 study,<sup>4</sup> corresponds with population. In 2019, DALYs were highest in lower-middle-income countries (43.5%), while upper-middle-income countries made up 29.6% of DALYs, high-income countries 14.1%, and low-income countries 12.7% of total DALYs.

**FIGURE 4** Health spending, population, and disability-adjusted life years by World Bank income group, 2019

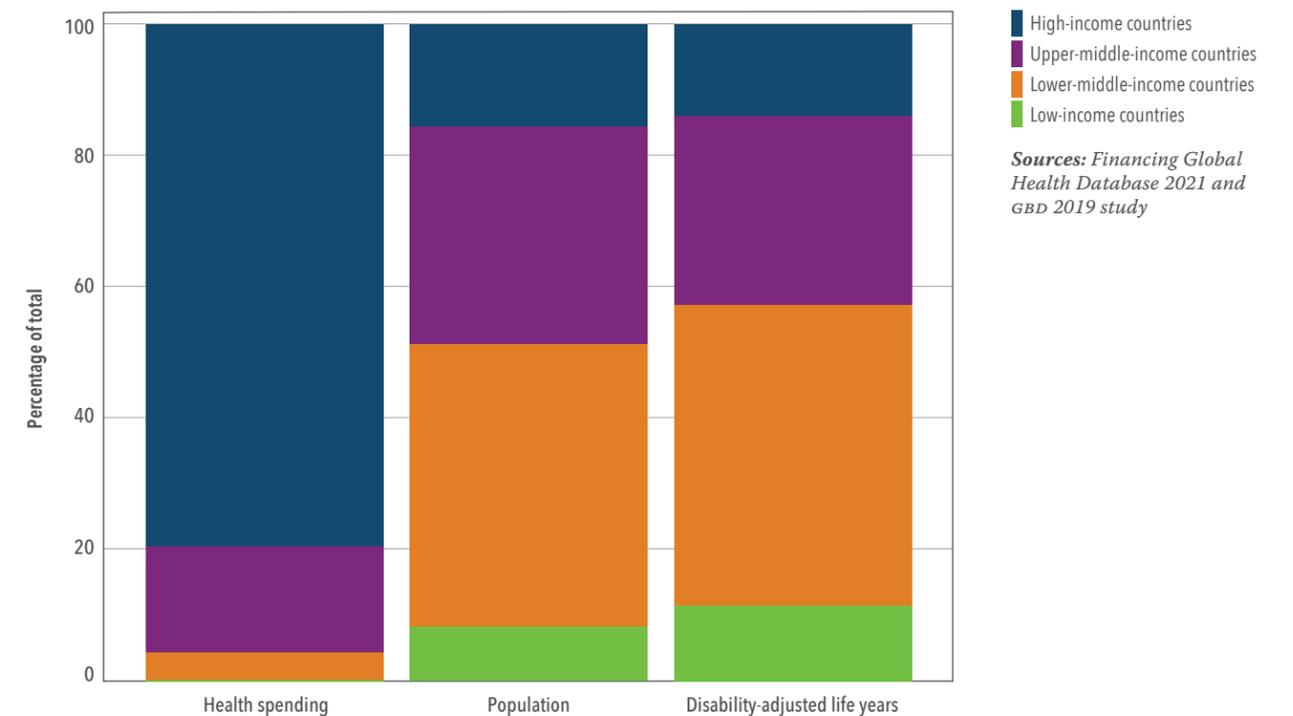
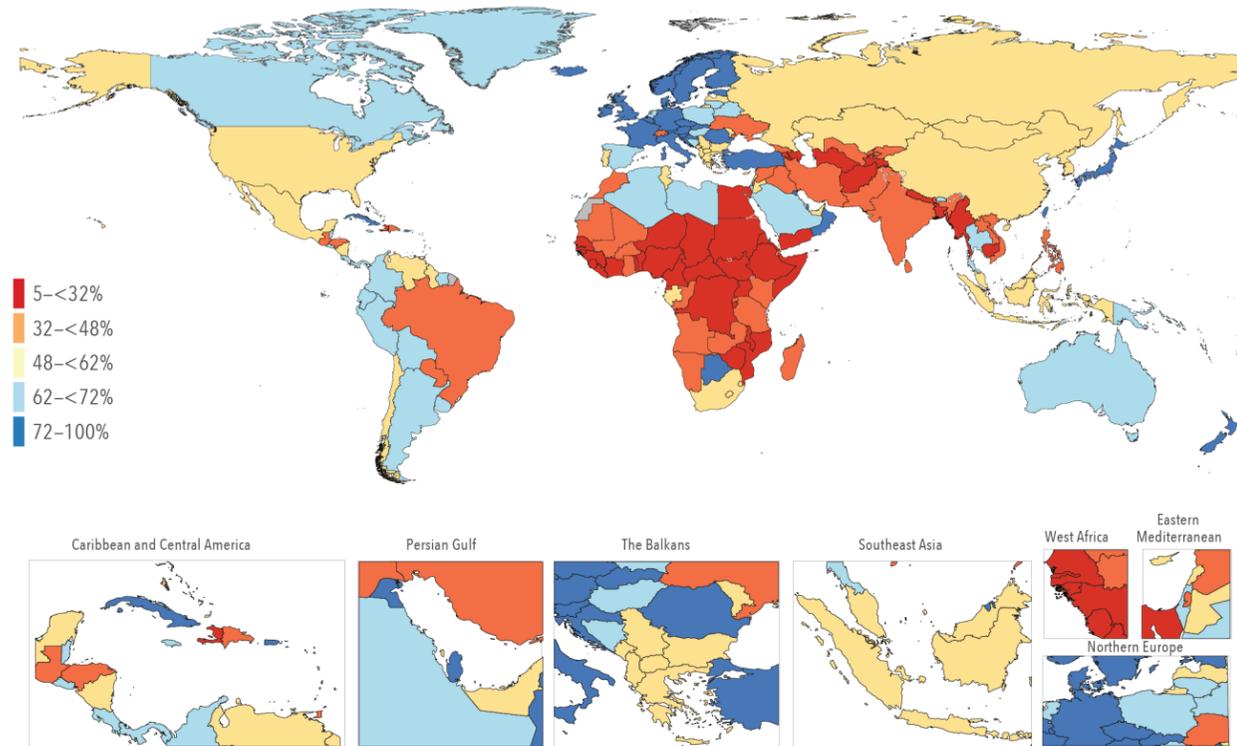


Figure 5 shows 2019 government health spending as a percentage of overall health spending; looking at government health spending in this way can provide insights as to which countries are on the path to financial risk protection.

Generally, the higher the percentage of government spending on health is (especially versus out-of-pocket spending), the more a health system can be said to protect against financial risk. And as countries become less dependent on donor funding and out-of-pocket spending – which can be catastrophic for individuals – the closer they move to universal health coverage (UHC).

While ensuring broad access to health services is a key aspect of achieving UHC, it is not the only factor to consider. Patient access to care at the expense of household welfare, or at the risk of being pushed into poverty, is at odds with the very idea of UHC. Financial risk protection, through government health and private health financing, can increase UHC and reduce the chances of medical impoverishment.<sup>6-8</sup>

**FIGURE 5** Government health spending as a fraction of total health spending, 2019



### Development assistance for health through 2021

In 2021, DAH was an estimated \$67.4 billion, an increase of 8.6% over the 2020 total of \$62.1 billion.<sup>\*\*\*\*</sup> Though the increase in overall DAH between 2020 and 2021 was relatively large compared to historical trends, it is much smaller than the unprecedented 2019–2020 increase of 43.9%. Excluding DAH for COVID-19, 2021 DAH was \$45.6 billion, a 0.9% decrease from the 2020 non-COVID-19 total.

Though DAH only made up approximately 0.5% of total spending on health in 2019, it is important for a number of reasons. Notably, many low-income and lower-middle-income countries rely on DAH to support their health systems and to relieve the burden of specific health conditions. For example, according to the Global Burden of Disease 2019 study,<sup>4</sup> malaria was the fifth-highest cause of disease burden in low-income

<sup>\*\*\*\*</sup>2021 estimates presented are forecasts, while the 2020 numbers are observed.

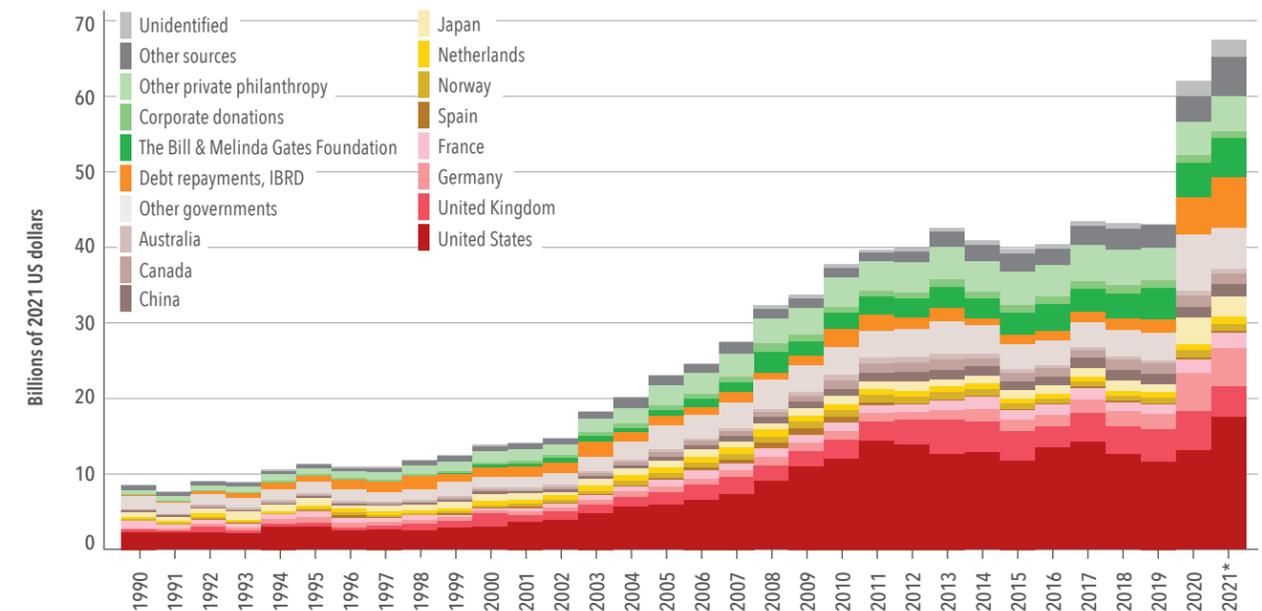
countries,<sup>†</sup> which received \$0.9 billion in DAH for malaria.

Overall, in low-income countries, DAH accounted for 27.7% of spending in 2019, versus 2.4% in lower-middle-income countries.

Figure 6 illustrates the dramatic jump in DAH driven by COVID-19. Between 2019 and 2020, DAH grew 43.9%, and between 2020 and 2021, it grew 8.6%. DAH has never increased the way it did over the past two years. If the increase between 2019 and 2020 had not occurred, the 2020–2021 increase in DAH would still have been remarkable.

<sup>†</sup> Cause Level 3, age-standardized rate. For information about GBD cause levels, please visit <https://www.healthdata.org/node/7849>.

**FIGURE 6** Development assistance for health and COVID-19 by source of funding, 1990–2021



<sup>\*</sup>2021 estimates are preliminary.

IBRD = International Bank for Reconstruction and Development.

“Other sources” captures development assistance for health for which we have source information but which is not identified as originating within any of the sources listed.

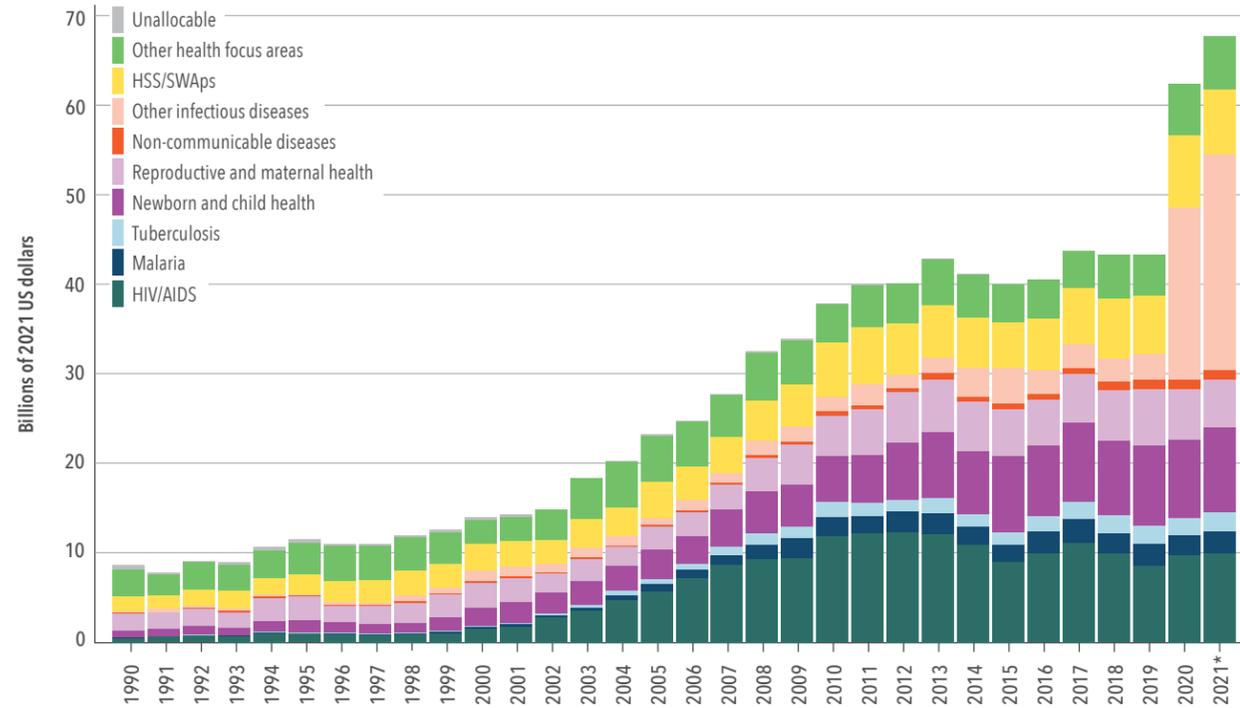
Funding for which we have no source information is designated as “Unidentified.”

Examining the sources of DAH reveals which are most responsible for the COVID-19-driven increase; for example, DAH for COVID from Japan went up more than 200% between 2019 and 2020. By dollars, DAH from the US for COVID-19 increased \$4.5 billion between 2020 and 2021.

Figures 8 and 9 offer two additional views of DAH between 1990 and 2021, by health focus area and disbursing entity; as in Figure 7, both figures show the rise in DAH between 2019 and 2020 due to COVID-19, and then the relatively large increase in DAH between 2020 and 2021.

By health focus area, the other infectious diseases category (under which COVID-19 is grouped) saw the biggest increase, growing 26.1% between 2020 and 2021. DAH for malaria saw the second-highest growth between 2020 and 2021, going up 13.6%.

**FIGURE 7** Development assistance for health by health focus area, 1990–2021



\*2021 estimates are preliminary.

“Other health focus areas” captures development assistance for health for which we have health focus area information but which is not identified as being allocated to any of the health focus areas listed. Health assistance for which we have no health focus area information is designated as “Unallocable.”

HSS/swaps = Health systems strengthening and sector-wide approaches

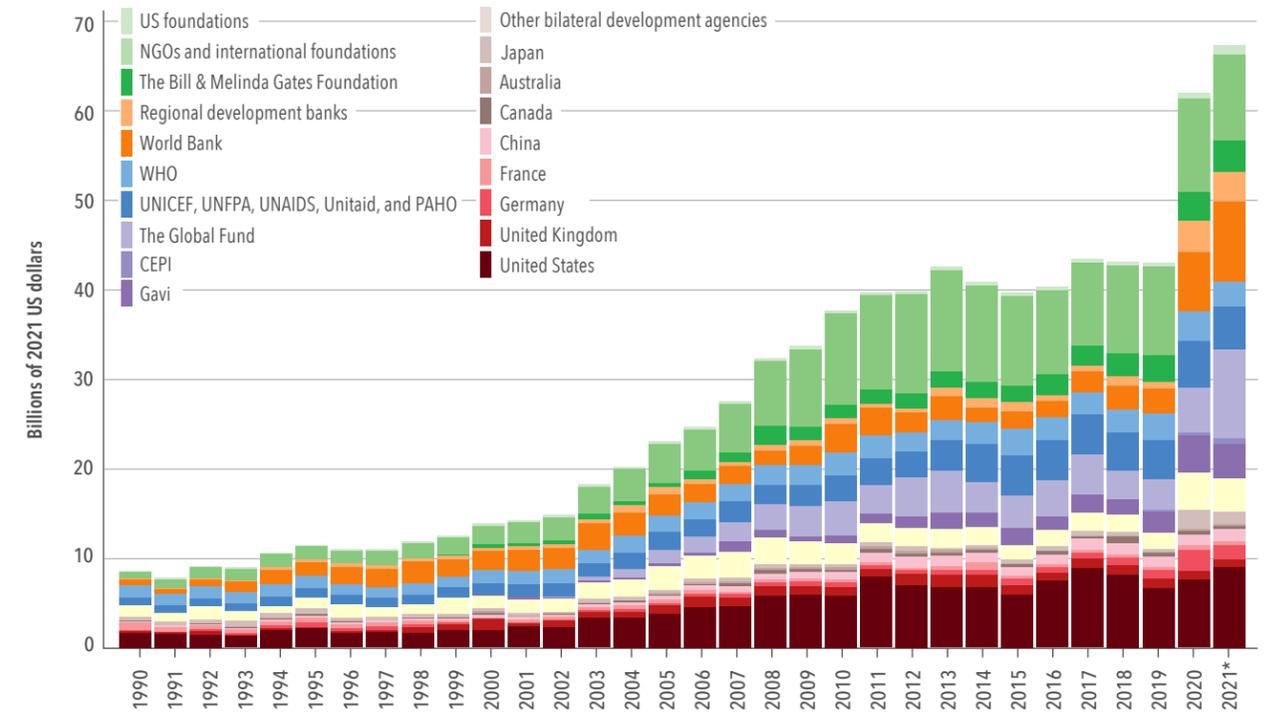
By disbursing entity, DAH disbursed through the World Bank grew 36.3% between 2020 and 2021, and DAH flowing through non-governmental organizations went up 14.1%. Gavi, the Vaccine Alliance, which co-leads COVAX, the international partnership that has worked to speed vaccine development and distribution, disbursed \$3.9 billion in DAH in 2021, a decrease of 7.5% since 2020.

The diagram in Figure 9 maps the flow of our 2021 development assistance for health for COVID-19 estimates: it shows how DAH for COVID-19 flowed from source to channel to program area. This high-level view of where spending originated, how it was disbursed, and the program areas targeted illustrates the ways sources and channels have approached combating the pandemic.

Leading sources of DAH for COVID-19 include the US at \$5.2 billion, as well as Germany and Japan, which contributed nearly equal amounts of DAH for COVID-19, at \$1.8 and \$1.5 billion, respectively

In terms of channels, the World Bank disbursed the most DAH for COVID-19 (an estimated \$5.6 billion), followed by the Global Fund (\$5.1 billion) and regional development banks as a group (\$2.4 billion). By program area, the most DAH for COVID-19 was directed at vaccine procurement and distribution (\$9.9 billion), followed by country-level coordination

**FIGURE 8** Development assistance for health by channel of assistance, 1990–2021



\*2021 estimates are preliminary.

CEPI = Coalition for Epidemic Preparedness Innovations  
Gavi = Gavi, the Vaccine Alliance  
NGOs = Non-governmental organizations  
PAHO = Pan American Health Organization  
UNAIDS = Joint United Nations Programme on HIV/AIDS  
UNFPA = United Nations Population Fund  
UNICEF = United Nations Children’s Fund  
WHO = World Health Organization

“Other bilateral development agencies” include Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, South Korea, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Arab Emirates, the European Commission, and EEA. “Regional development banks” include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

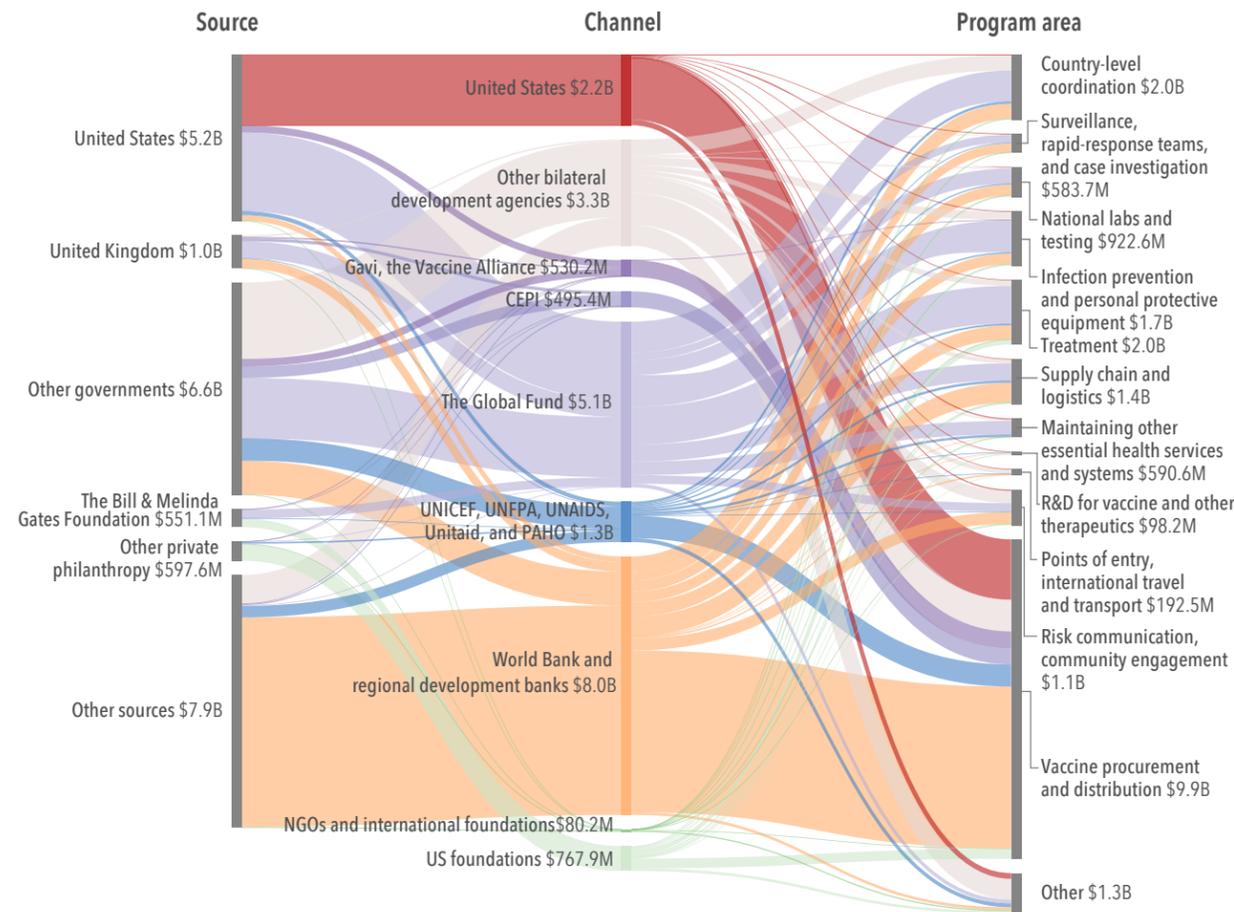
programs (\$2.0 billion) and spending on treatment (\$2.0 billion).

A close look at Figure 9 shows how some types of DAH for COVID-19 have been directed through specific channels. For example, 27.0% of spending that flowed through Japan’s bilateral agencies went toward country-level coordination. Notably, a substantial percentage of COVID-19 resources across a wide variety of program areas flowed through the Global Fund, showing how quickly the organization was able to adapt to a changing DAH landscape.

Figures 11 and 12 show the annual rate of change in DAH by source and channel, respectively, for the periods 2000–2015 (the Millennium Development Goals [MDG] era), 2015–2019 (the Sustainable Development Goals [SDG] era), and 2019–2021 (which may come to be known as the COVID era).

As shown in Figure 10, between 2000 and 2015, most sources of DAH increased, except for DAH from Spain, which decreased 3.6% annually. Total DAH increased at an annualized rate of 7.3% between 2000 and 2015. The period from 2015 to 2019 tells a similar story, though for different sources.

**FIGURE 9** Flows of development assistance for health for COVID-19 from source to channel to program area, 2021



“Other sources” captures development assistance for health for which we have source information but which is not identified as originating within any of the sources listed.

Health assistance for which we have no source information is designated as “Unidentified.”

“Other governments” include Afghanistan, Angola, Argentina, Australia, Austria, Azerbaijan, Bangladesh, Belgium, Bhutan, Brazil, Brunei, Bulgaria, Cameroon, Canada, Central African Republic, Chad, China, Colombia, Côte d’Ivoire, Croatia, Czechia, Democratic Republic of the Congo, Denmark, Egypt, Estonia, Ethiopia, Finland, France, Gabon, Germany, Greece, Guinea, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Italy, Jamaica, Japan, Jordan, Kenya, Kuwait, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Monaco, Myanmar, New Zealand, Nigeria, Norway, Oman, Pakistan, Palestine, Peru, Poland, Portugal, Qatar, Romania, Russia, São Tomé and Príncipe, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, South Sudan, Spain, Sweden, Switzerland, Syria, Taiwan (province of China), Thailand, the Netherlands, Togo, Turkey, Uganda, Ukraine, United Arab Emirates, Yemen, and Zimbabwe.

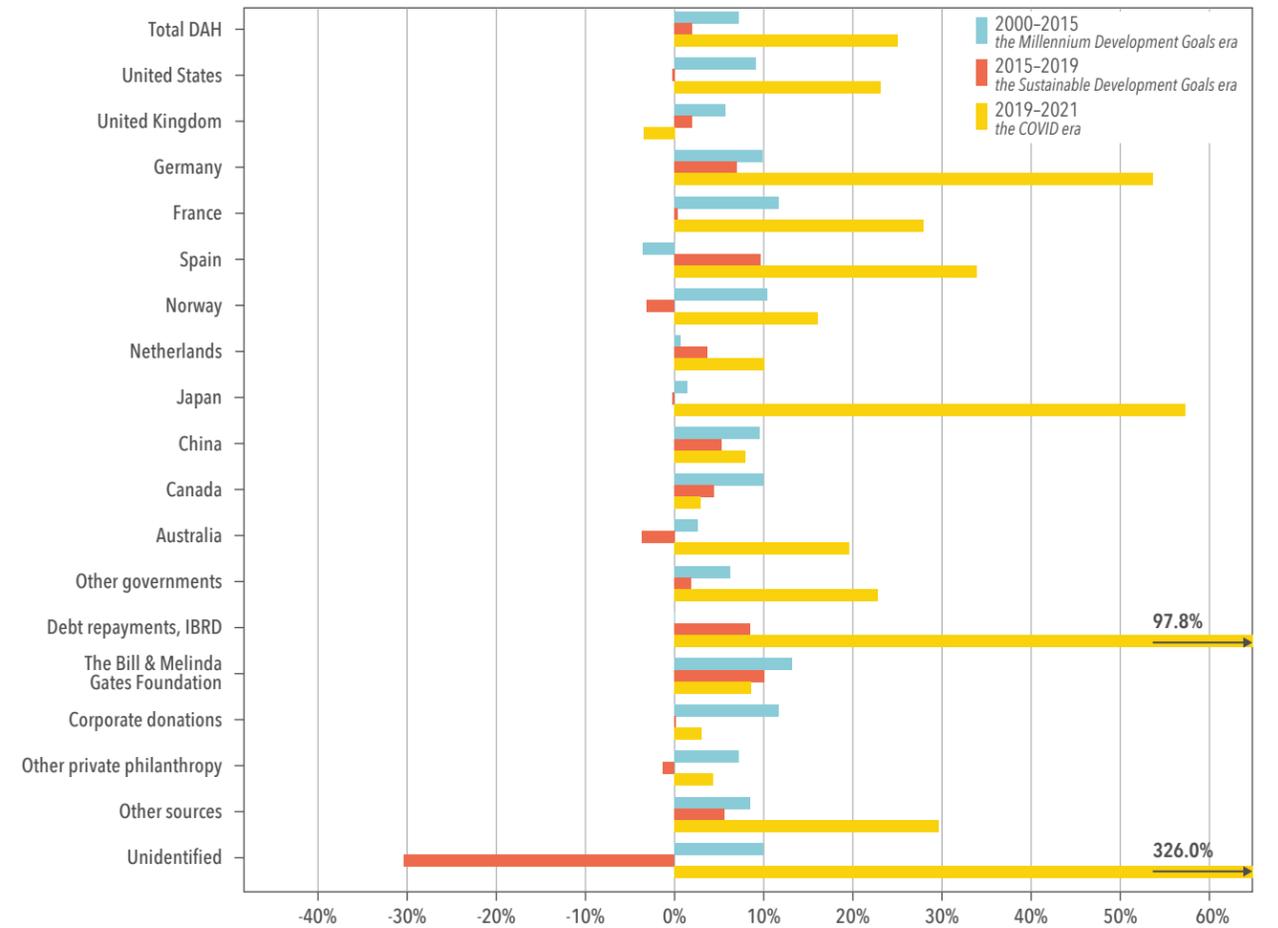
“Other bilateral development agencies” include Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, South Korea, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Arab Emirates, the United Kingdom, the European Commission, and EEA.

“Regional development banks” include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

“Other” captures development assistance for health for which we have program area information but which is not identified as being allocated to any of the program areas listed.

CEPI = Coalition for Epidemic Preparedness Innovations  
 NGOs = Non-governmental organizations  
 PAHO = Pan American Health Organization  
 UNAIDS = Joint United Nations Programme on HIV/AIDS  
 UNFPA = United Nations Population Fund  
 UNICEF = United Nations Children’s Fund  
 WHO = World Health Organization

**FIGURE 10** Annualized rate of change in development assistance for health disbursed by source, 2000–2015, 2015–2019, and 2019–2021\*



\*2021 estimates are preliminary.

“Other sources” captures development assistance for health from sources such as net investment income, revenue adjustments, and unallocable, which do not fall into one of the listed source categories.

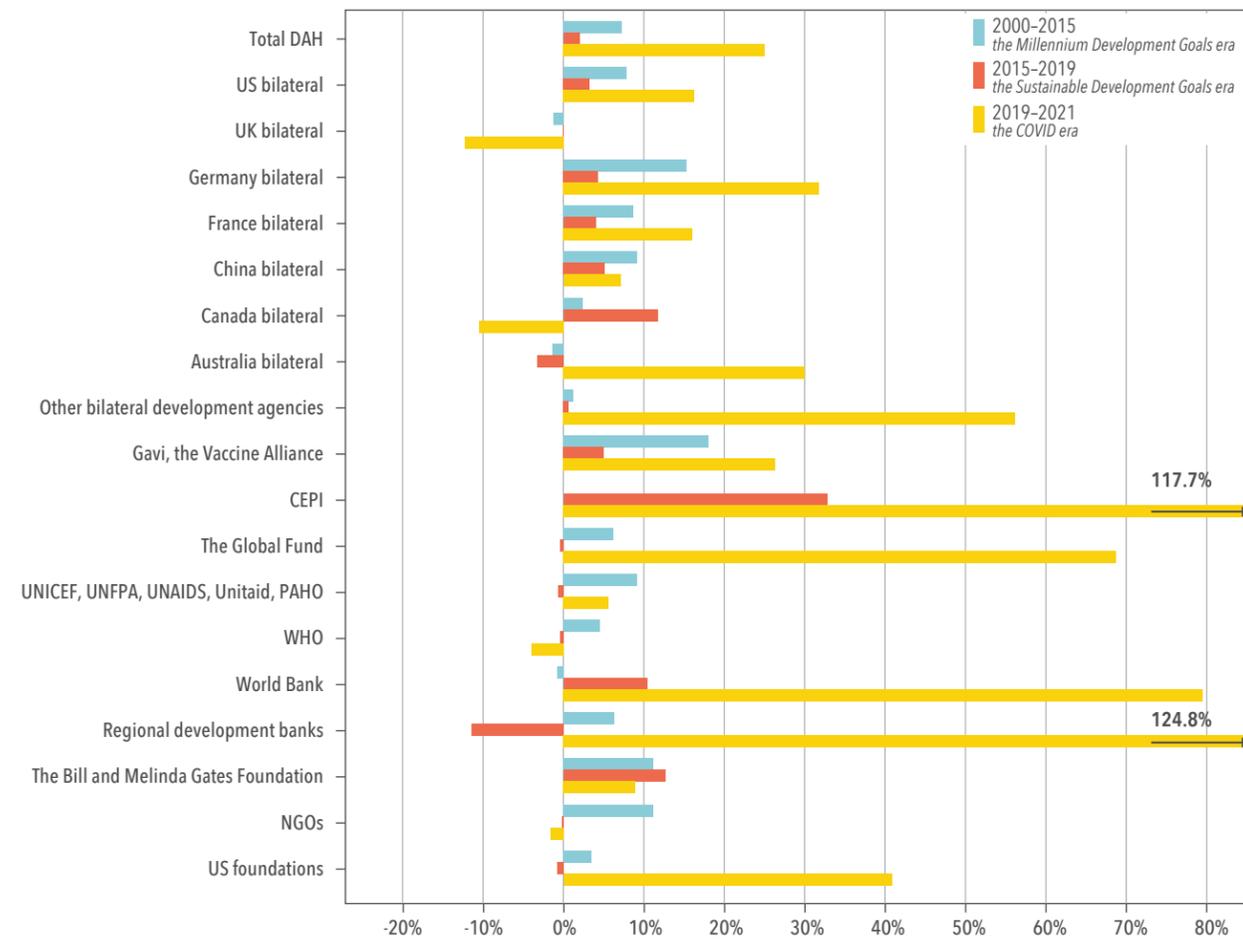
IBRD = International Bank for Reconstruction and Development

During this period, DAH from the US (-0.2%), Norway (-3.1%), and private philanthropy (excluding the Bill & Melinda Gates Foundation) (-1.2%) decreased, while all other sources increased. Indeed, a number of sources of DAH saw large increases between 2015 and 2019, such as DAH funded by the Bill & Melinda Gates Foundation (10.1%) and Spain (9.6%).

Between 2019 and 2021, of the groupings shown in Figure 10, the only source of DAH that declined was the United Kingdom (-3.5%). Indeed, during the COVID-19 era of development spending, a number of sources of DAH grew immensely. For example, DAH from Japan and Germany increased 57.4% and 53.8%, respectively.

Figure 11 shows that between 2000 and 2015, channels of DAH increased across nearly all channels tracked, save for UK bilateral DAH (-1.3%), bilateral DAH from Australia (-1.4%), and World Bank DAH (-0.7%). And for the

**FIGURE 11** Annualized rate of change in development assistance for health disbursed by channel, 2000–2015, 2015–2019, and 2019–2021\*



\*2021 estimates are preliminary.

CEPI = Coalition for Epidemic Preparedness Innovations  
 NGOs = Non-governmental organizations  
 UNFPA = United Nations Population Fund  
 PAHO = Pan American Health Organization  
 UNAIDS = Joint United Nations Programme on HIV/AIDS  
 UNICEF = United Nations Children's Fund  
 WHO = World Health Organization

CEPI data start from 2018 onward; 2018–2019 (SDG era). The Global Fund data start from 2002–2015 (MDG era).

"Regional development banks" include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

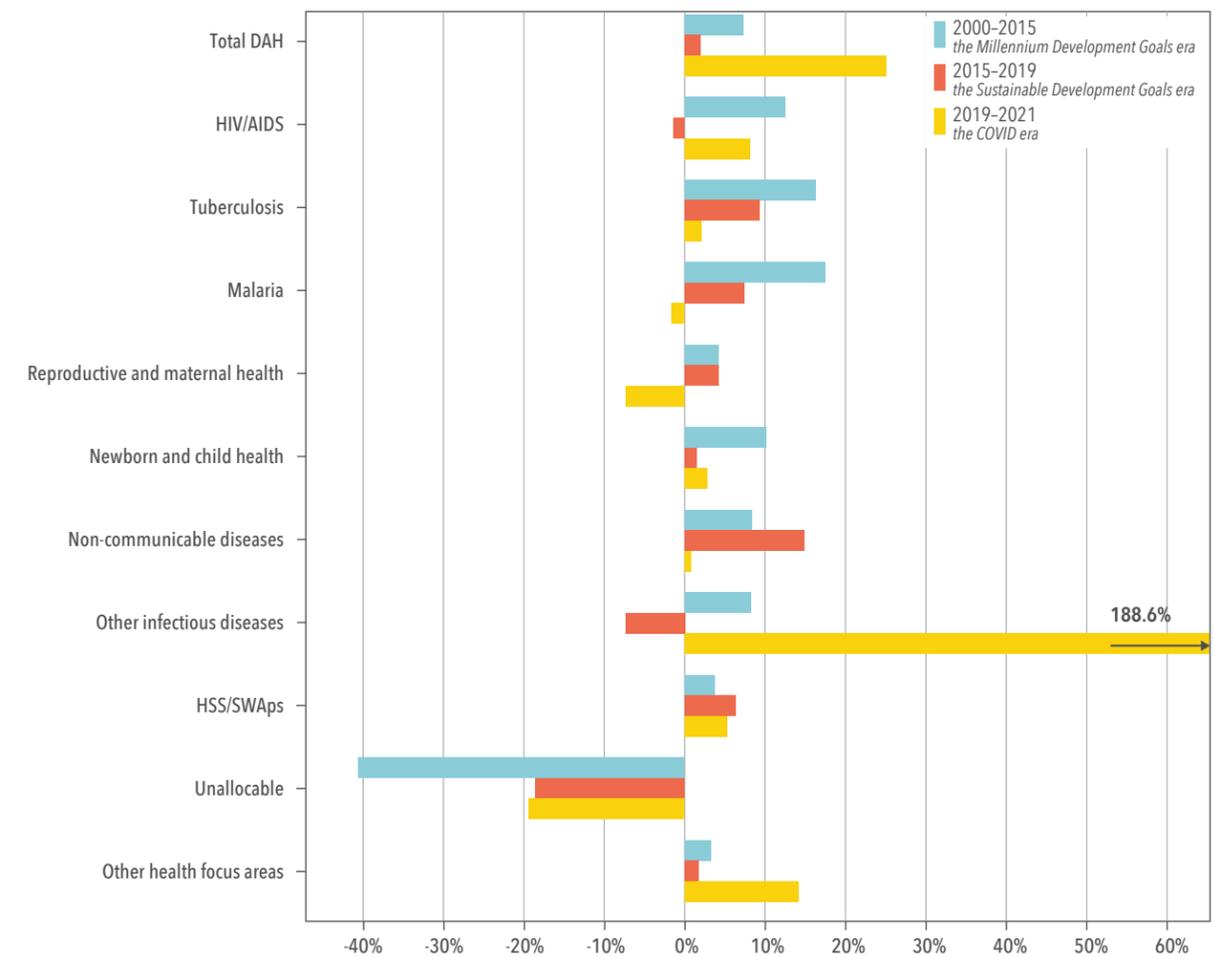
period between 2015 and 2019, bilateral DAH from Australia declined 3.3%, while DAH flowing through regional development banks decreased 11.4%. The period 2019–2021 tells a different story: of all channels tracked, the vast majority saw increases.

In both Figures 11 and 12, the impact of the pandemic is clear; in fact, spending on COVID-19 skews several annualized rates for the period between 2015 and 2020. Without the COVID-driven increase in DAH, for example, DAH from sources like corporate donations might have declined

during this period.

Figure 12 presents another view of the annualized rate of change in DAH: by health focus areas. Again, the periods 2000–2015, 2015–2019, and 2019–2021 are shown. During both the MDG and SDG eras, DAH increased across most health focus areas tracked; exceptions include spending on HIV/AIDS and other infectious diseases, which declined 1.4% and 7.4%, respectively, during the SDG era. The latter is particularly interesting given that COVID-19 falls under the other infectious diseases grouping of health

**FIGURE 12** Annualized rate of change in development assistance for health disbursed, by health focus area, 2000–2015, 2015–2019, and 2019–2021\*



\*2021 estimates are preliminary.

HSS/swaps = Health systems strengthening and sector-wide approaches

CEPI data start from 2018 onward; 2018–2019 (SDG era). The Global Fund data start from 2002–2015 (MDG era).

"Other health focus areas" captures development assistance for health for which we have health focus area information but which is not identified as being allocated to any of the health focus areas listed. Health assistance for which we have no health focus area information is designated as "Unallocable."

"Regional development banks" include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

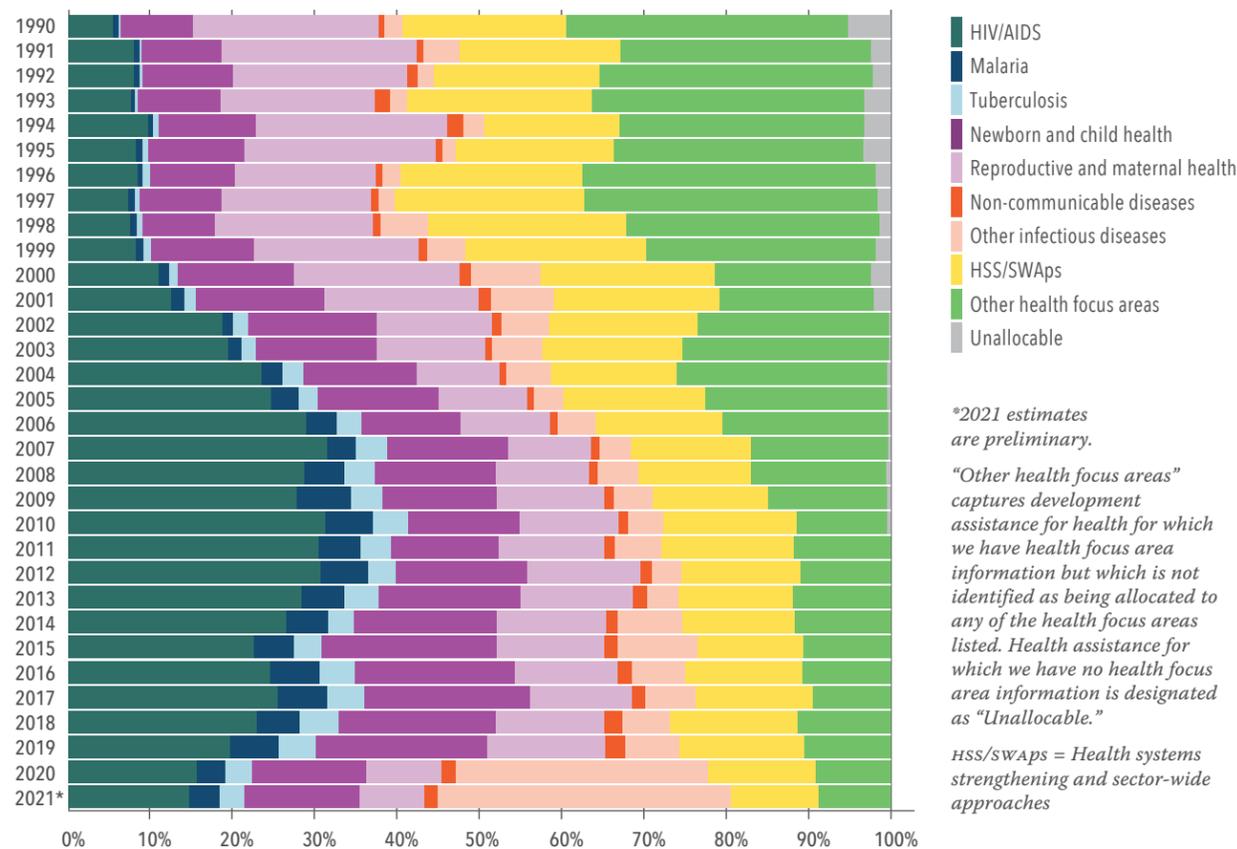
focus areas.

Particularly notable, then, is the change in other infectious diseases DAH between 2019 and 2021, when it grew 188.6%. Also regrettably notable are the health focus areas that saw projected declines in DAH between 2019 and 2021, or during the period when the world was focused on COVID-19. It can be argued that spending on malaria, as well as reproductive and maternal health, could be more robust given the widespread disease burden caused by both health focus areas.

A question going forward is whether the overall rise in DAH driven by COVID-19 will be sustained, or whether development assistance for health will continue to plateau or even decline.

The degree to which COVID-19 drove the growth in other infectious diseases DAH is underscored by Figure 13, which shows the share of DAH by health focus area between 1990 and 2021. For example, in 1990, other infectious diseases DAH constituted 2.2% of DAH; in 2021, it was 35.6%. What's more, other infectious diseases DAH has grown since the start of the pandemic: in 2020 it was \$19.0 billion, and we project it was an estimated \$24.0 billion in 2021, an increase of 26.1%. Meanwhile, as noted above, preliminary estimates suggest that several health focus areas have seen declines, but it is too early to tell whether those declines are the result of COVID-19 – either funds reallocated to fight the pandemic, or other eco-

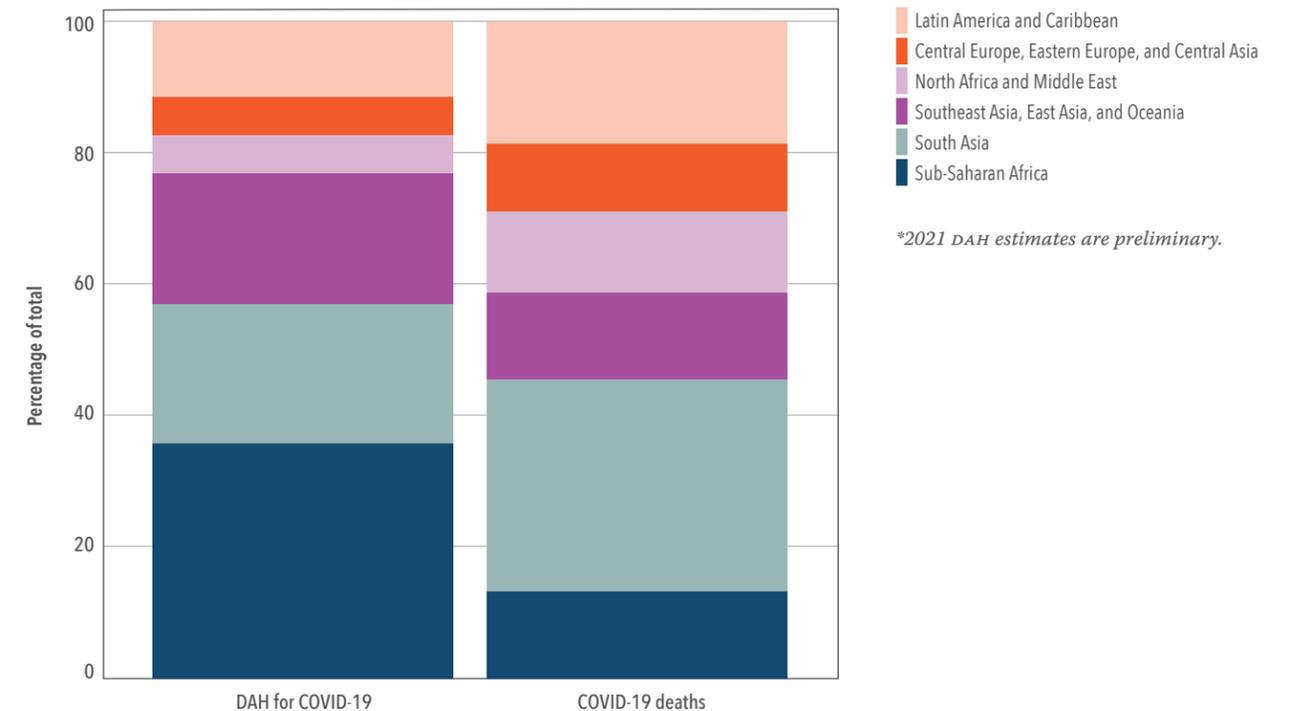
**FIGURE 13** The share of development assistance for health allocated by health focus area, 1990–2021



nomie effects of COVID-19.

Figure 14 offers a view of how COVID-19 spending compares to deaths from COVID-19 between 2020 and 2021, by Global Burden of Disease super-region. For example, sub-Saharan Africa has received 33.6% of DAH for COVID-19, but only 13.5% of COVID-19 deaths have occurred in the region. Meanwhile, the South Asia super-region – which comprises five middle-income countries – has seen 36.3% of the world's COVID-19 deaths but received only 21.8% of DAH for COVID-19.

**FIGURE 14** Development assistance for health targeting COVID-19 and deaths from COVID-19, 2020–2021\*

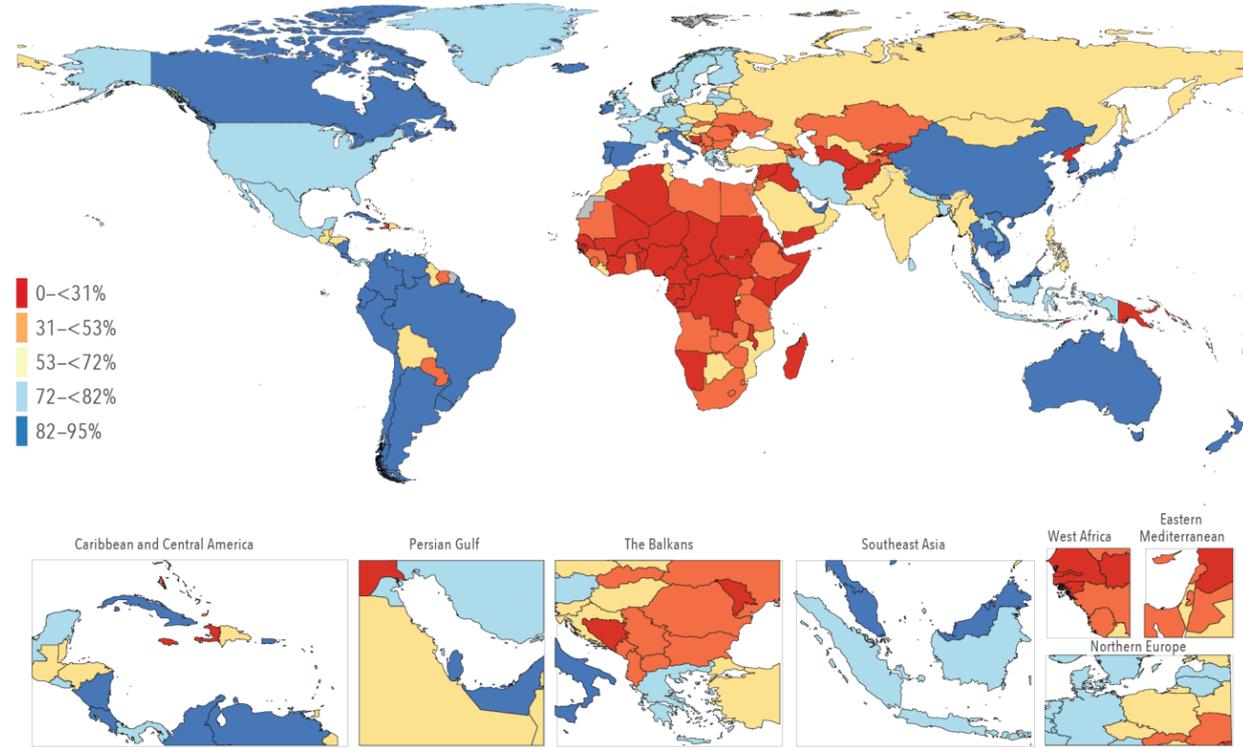


While it's certainly welcome news that sub-Saharan Africa has so far seen relatively few COVID-19 deaths, the region's fight against COVID-19 is likely far from over, if only because vaccination coverage in the region is low compared to much of the world. As Figure 15 illustrates, global COVID-19 vaccine coverage is far from being equal.

In fact, this view of vaccine coverage roughly corresponds to a map of the parts of the world that receive the most DAH: where vaccine coverage is lowest, DAH is often highest. For example, as of August 2022, vaccine coverage in Western Europe as a region was 80.8%, but it was 25.3% in sub-Saharan Africa.

Figure 16 disaggregates 2020–2021 development assistance for COVID-19 into four categories: program area, source of funding, channel, and Global Burden of Disease super-region; this figure shows at a high level which program areas and regions received the most DAH for COVID-19, and then the sources and channels that funding flowed from and through,

FIGURE 15 Global COVID-19 vaccine coverage, August 2022

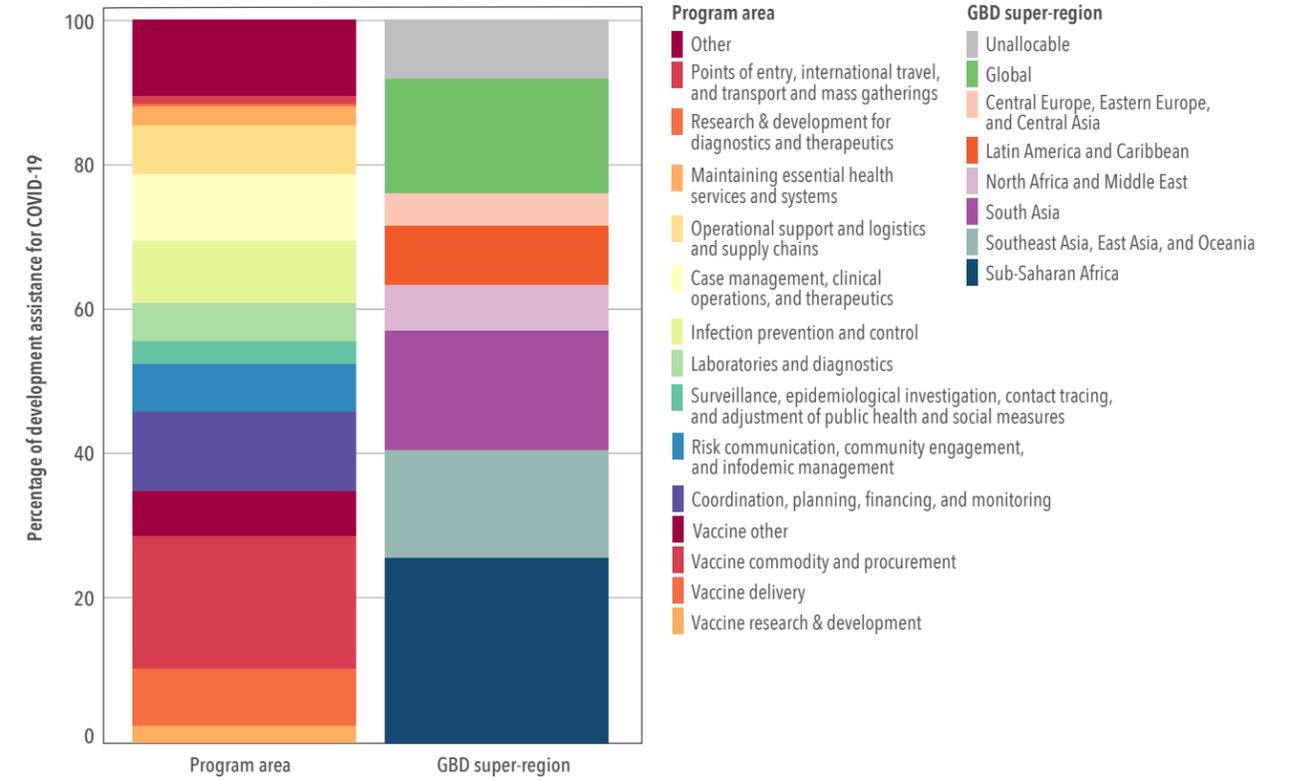
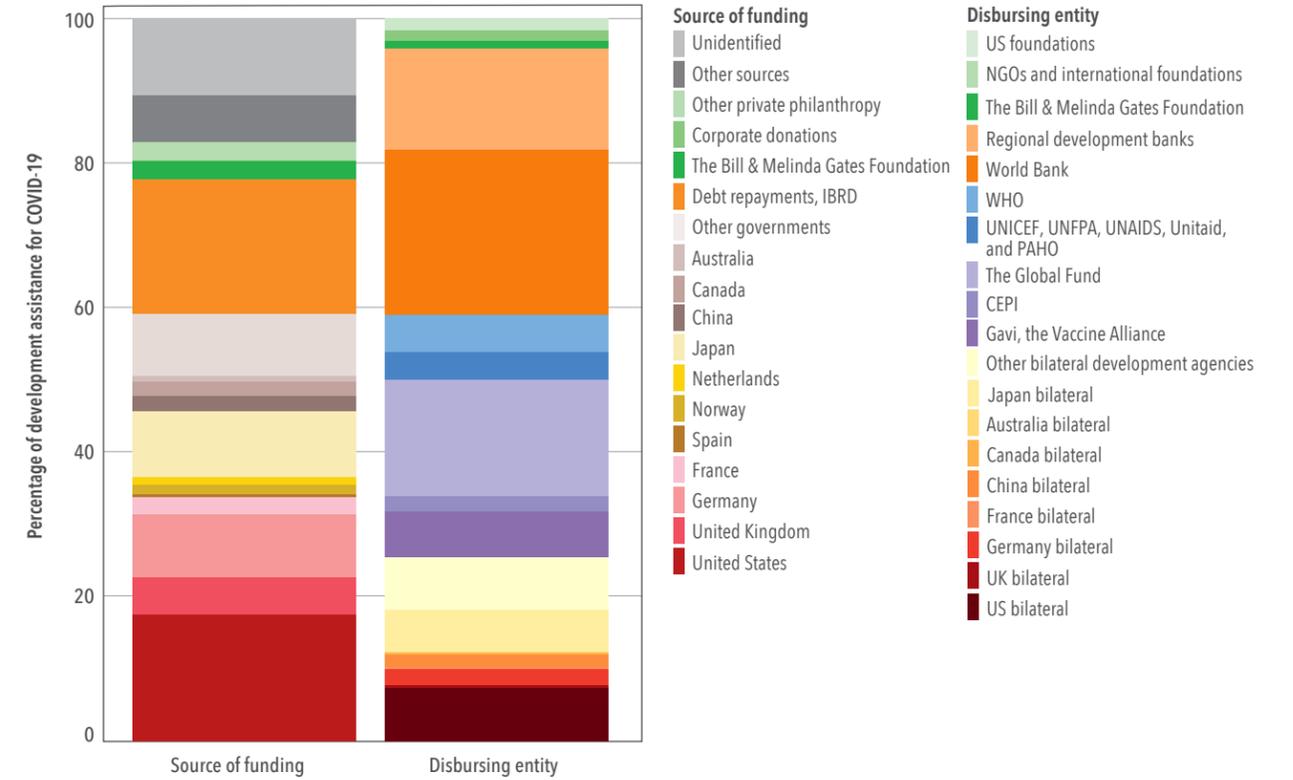


Source: IHME COVID team

respectively.

The largest two program areas of DAH for COVID-19 in 2020–2021 were “vaccine commodity and procurement” and “coordination, planning, financing, and monitoring,” while the largest source of DAH for COVID-19 was the us. The two largest disbursing entities were the World Bank and the Global Fund, and the regions that received the most DAH for COVID-19 were sub-Saharan Africa (notably, also the largest region for DAH overall) and South Asia.

FIGURE 16 Percentage of development assistance for health for COVID-19, 2020–2021



PART TWO:

# Meeting tomorrow's challenges

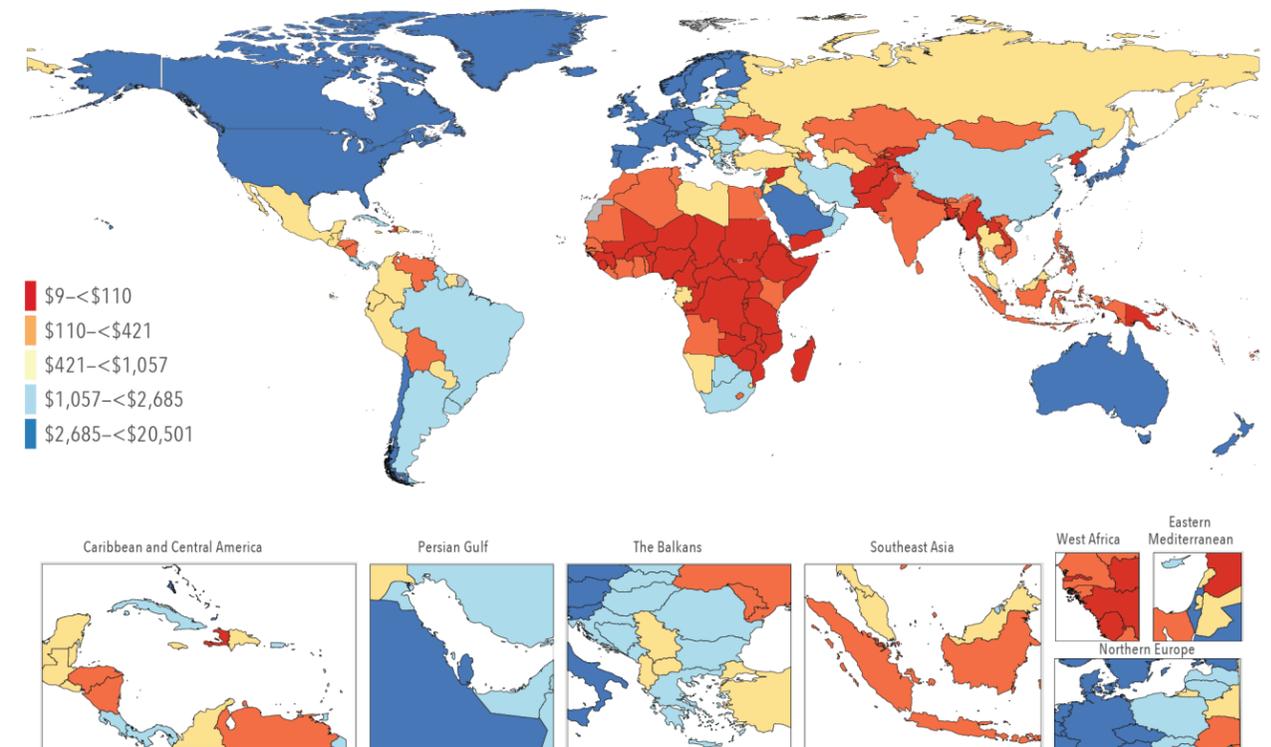
## Future spending on health

By 2050, global spending on health is projected to grow 84.8% (76.9–93.0), from an estimated \$9.2 trillion (9.1–9.3) in 2019 to \$16.9 trillion (16.1–17.8).

By type of health spending, global government spending is projected to grow 72.0% (63.9–80.2) between 2019 and 2050, out-of-pocket spending 28.7% (28.0–29.4), prepaid private spending 168.4% (140.7–196.9), and DAH 61.6% (47.5–87.5).

Many of those increases, however, will be driven by spending in high-income countries. By World Bank income group, spending on health in high-income countries makes up 69.2% (65.2–72.6) of the total health spending increase from 2019 to 2050, while upper-middle-income spending is projected to contribute to 23.6% (20.4–27.2) of the increase, lower-middle-income 6.7% (6.0–7.5), and low-income only 0.6% (0.5–0.7).

FIGURE 17 Forecasted total health spending per person, 2050



*Bins were determined by assigning all countries to evenly distributed quintiles.*

In 2050, we project that the top three countries by per person spending will be the US (\$20,501 [18,479–22,512]), Switzerland (\$16,580 [14,718–18,497]), and Bermuda (\$14,546 [11,310–18,552]).

The lowest three countries by per person spending in 2050 are projected to be Somalia (\$9 [5–16]), Eritrea (\$27 [22–34]), and South Sudan (\$29 [25–36]), all of which face a number of challenges – including poverty, political turmoil, and either active conflicts or a long history of conflict. All three countries are also in sub-Saharan Africa; indeed, many of the countries with the lowest projected per person spending across the globe can be found in sub-Saharan Africa.

Several countries with high projections of 2050 spending will likely see their populations begin to plateau and/or decline around the same time.<sup>9</sup> Many of the poorest countries in the world will be growing, while the richest countries – where much of the world’s spending on health will remain concentrated – will be shrinking. For example, according to the Global Burden of Disease forecasts,<sup>9</sup> Switzerland’s population is projected to peak in 2049 and then decline by 2100 to its mid-2010s level. Eritrea, in comparison, will see its population peak around 2060 and then end the century with a population of roughly 7 million – over 500,000 people more than the country’s current population.

However, spending on health is not projected to adjust accordingly to the expected increase in low-income and lower-middle-income country

populations: we estimate that after the sharp increase in DAH due to COVID-19, development assistance for health will increase 12.3% between 2020 and 2050. Indeed, there are already signs that some donors may be responding to the ongoing economic crisis caused by COVID-19 (and exacerbated by the war in Ukraine) by cutting aid and support for DAH. For example, there are reports that the UK government has begun freezing some forms of foreign aid.<sup>10</sup>

Meanwhile, the population of sub-Saharan Africa is expected to grow from roughly 1.2 billion in 2022 to 2.1 billion in 2050,<sup>9</sup> which could put additional pressure on the region’s already taxed health systems. The health focus areas that DAH has in the past been effective at reducing the burden of – such as malaria and tuberculosis – continue to cause needless suffering and death in the area, so a decline in DAH could be catastrophic to the well-being of the region.

## Funding for pandemic preparedness and response

Just over two years before COVID-19 began, the World Bank released a report<sup>11</sup> on pandemic preparedness that would prove to be prophetic. The conclusion of the May 2017 report, *From Panic and Neglect to Investing in Health Security: Financing Pandemic Preparedness at a National Level*, begins with this paragraph:

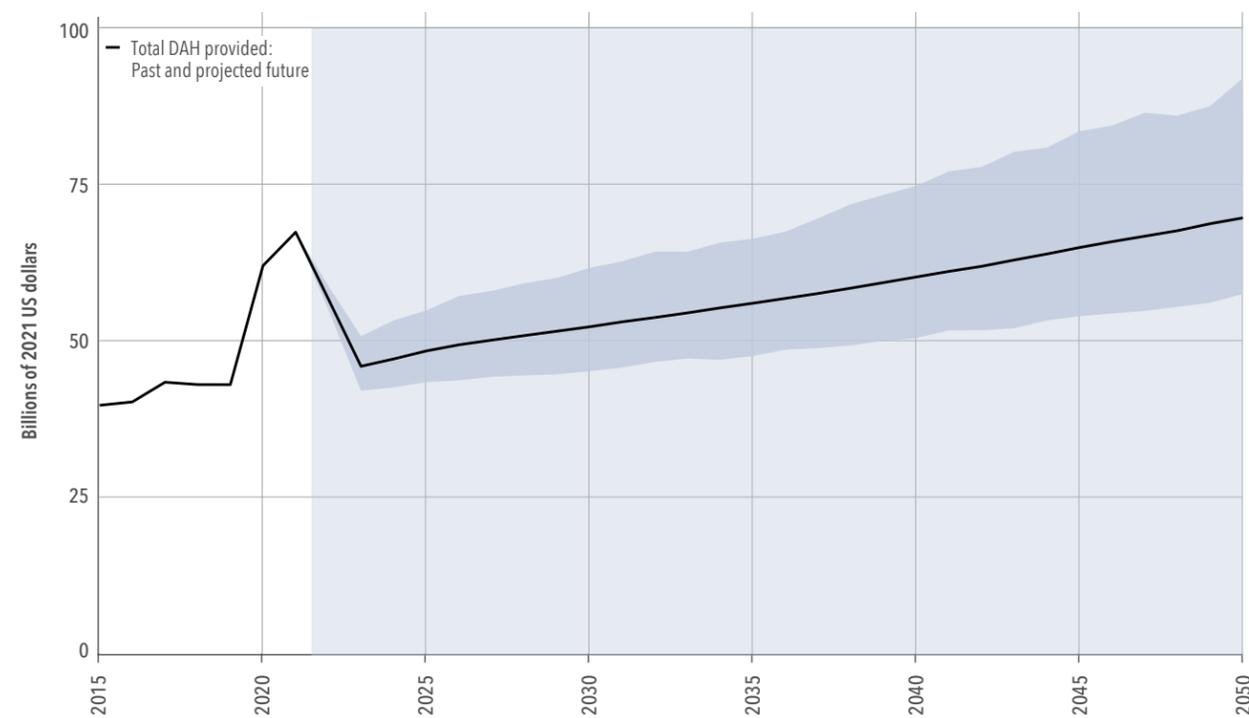
“We know that it is only a matter of time before the next pandemic hits us. We also know that there is a good chance that it will be severe. It may mean death on a slow fuse, spreading insidiously through populations, unrecognized for years, like HIV in the 1980s. Or it may strike people down with stark violence and lightning speed, plunging national economies abruptly into chaos, like Ebola in West Africa in 2014-15. Whatever its mode of attack, the next large-scale, lethal pandemic is at most only decades away.”

As it turned out, the COVID-19 pandemic was only two years away. The cost of pandemic inaction has been enormous: COVID-19’s estimated reported death toll as of mid-December 2022 was 7.2 million people, while its estimated total death toll is 17.8 million.<sup>1</sup> The pandemic has also cost the world economy tens of trillions of dollars and pushed almost 100 million people into poverty,<sup>12</sup> and its long-term effects – health-related and otherwise – will likely be felt for decades.

A positive story of COVID-19 has been the huge increase in development assistance for health for PPR: between 2019 and 2020, DAH for pandemic preparedness and response grew an unforeseen 119.8%. Prior to the onset of the pandemic, the largest annualized rate of change observed in pandemic preparedness between 1990 and 2019 was 7.9%.

Breakdowns of DAH for PPR between 1990 and 2021, by source of funding and channel, respectively, are shown in Figures 19 and 20. Both figures illustrate the many years of slow growth in pandemic preparedness funding from 1990 to 2019, followed by the sudden, dramatic rise in spending (following the trend of spending increasing after a major outbreak or epidemic) driven by DAH for COVID-19 in 2020 and 2021. Though DAH for pandemic preparedness was \$786.6 million in 2021 – 25.1% less than the 2020 total of \$1.0 billion – that still constitutes an increase of 64.8% over

**FIGURE 18** Forecasted development assistance for health, 2015–2050



\*2021 estimates are preliminary.

Shaded area represents forecasted values. Shaded region around black line represents 95% uncertainty intervals.

the 2019 total.

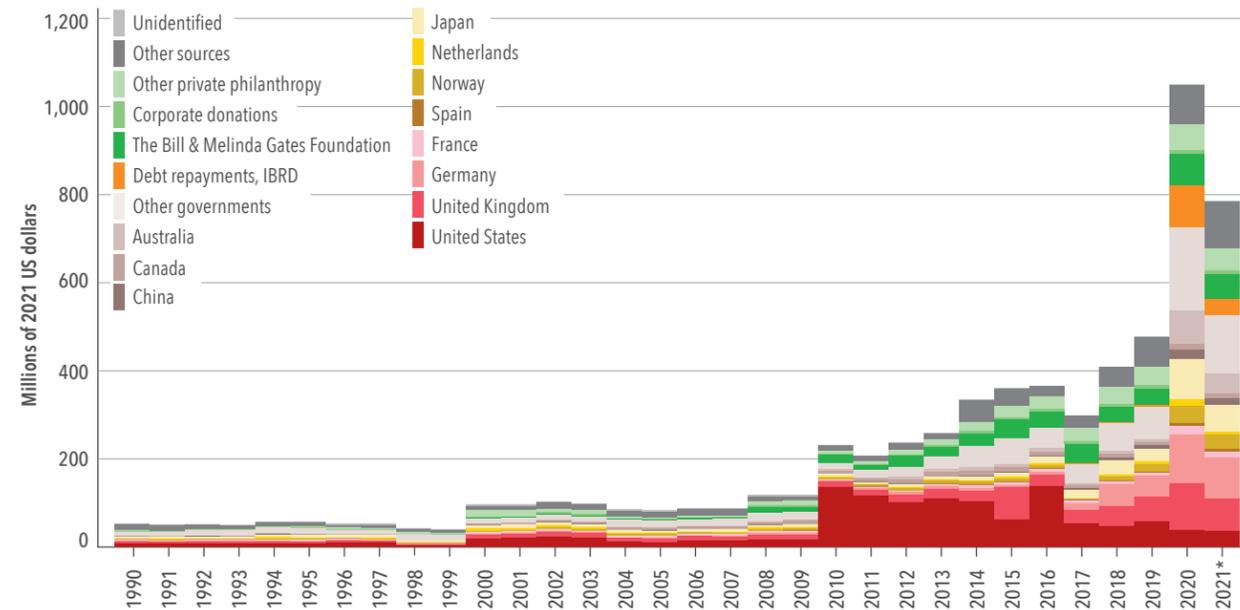
Of note as well are the increase in US support for DAH for PPR in 2010, a following spike in 2016, and then a drop from the high in 2016 that has persisted; while the US strongly supported the response to COVID-19, the country's support for pandemic preparedness has been more limited.

The Bill & Melinda Gates Foundation's increased role in DAH for PPR (as both a source of funding and as a channel), is also shown. Overall, in 2021, the individual largest sources of DAH for pandemic response were Germany, the United Kingdom, and Japan, while WHO was by far the largest channel in this sphere, disbursing 62.2% of 2021 DAH for pandemic response.

Whether overall pandemic preparedness support remains at or near its current levels after COVID-19's acute phase has passed remains an open question and will likely continue to be a topic of much discussion.

But support for PPR DAH will likely go down if the pandemic's burden continues to decline. Of course, some will argue that funding now devoted

**FIGURE 19** Development assistance for pandemic preparedness and response by source of funding, 1990-2021



\*2021 estimates are preliminary.

IBRD = International Bank for Reconstruction and Development.

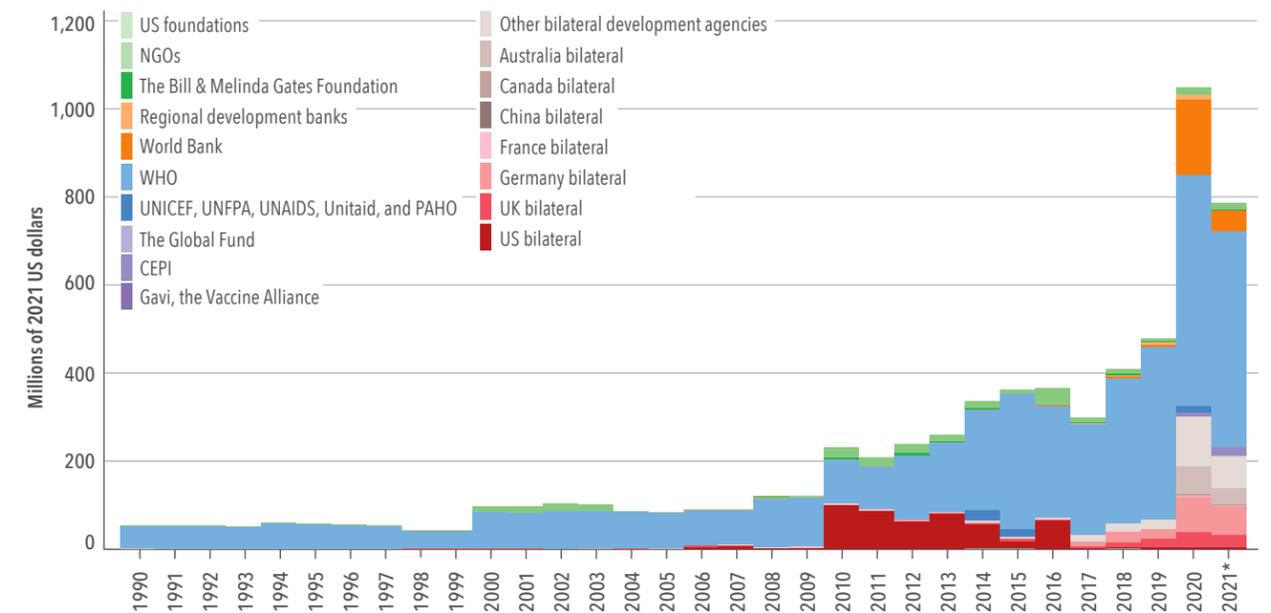
"Other sources" captures development assistance for health for which we have source information but which is not identified as originating within any of the sources listed.

Funding for which we have no source information is designated as "Unidentified."

to fighting COVID-19 should be reallocated to other health focus areas once the acute period of the pandemic has fully passed, but that does not necessarily mean pandemic preparedness should cease to be a priority.

Should DAH for pandemic preparedness decline too much – for example,

**FIGURE 20** Development assistance for pandemic preparedness and response by disbursing entity, 1990-2021



\*2021 estimates are preliminary.

CEPI = Coalition for Epidemic Preparedness Innovations  
 Global Fund = The Global Fund to Fight AIDS, Tuberculosis and Malaria  
 NGOs = Non-governmental organizations  
 PAHO = Pan American Health Organization  
 UNAIDS = Joint United Nations Programme on HIV/AIDS  
 UNFPA = United Nations Population Fund  
 UNICEF = United Nations Children's Fund  
 WHO = World Health Organization

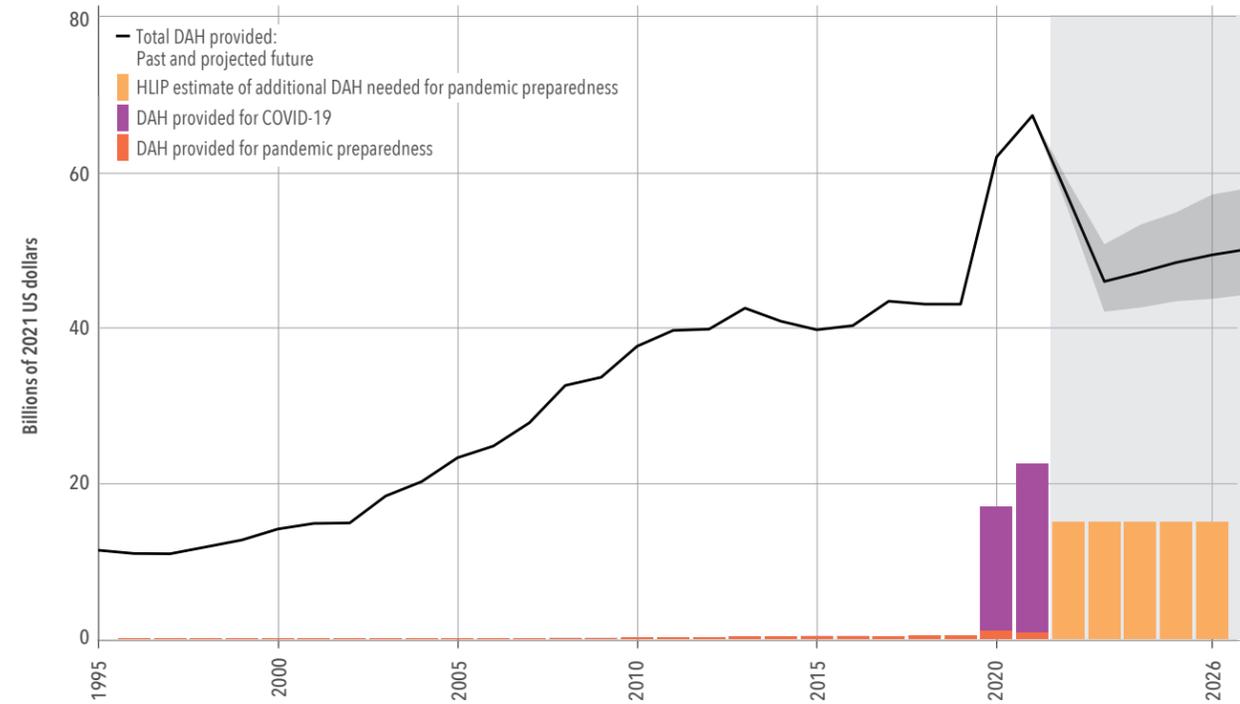
"Other bilateral development agencies" include Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, South Korea, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Arab Emirates, the European Commission, and EEA. "Regional development banks" include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

to its 2000s-era average of \$97.8 million – then the world runs the risk of experiencing another pandemic. To quote the 2017 World Bank report again, "we know by now that the world will see another pandemic in the not-too-distant future; that random mutations occur often enough in microbes that help them survive and adapt; that new pathogens will inevitably find a way to break through our defenses; and that there is the increased potential for intentional or accidental release of a synthesized agent." Every expert commentary and every analysis in recent years tells us that the costs of inaction are immense.

How much support for pandemic preparedness is needed? Figure 21 attempts to answer this question. According to the G20 HLIP on pandemic preparedness,<sup>13</sup> between 2022 and 2026, a total of \$75 billion (\$15 billion per year) in additional funding for pandemic preparedness is needed to prevent the next pandemic. This would represent an annual increase of 1,807% over total pandemic preparedness spending in 2021, but 6.5% less than development assistance for health for COVID-19 in 2020, and 31.2% less than DAH for COVID-19 in 2021.

The world should be spending more to prevent future pandemics. By devoting additional resources to pandemic preparedness, the global

FIGURE 21 Development assistance for pandemic preparedness and COVID-19, 1995–2026



\*2021 estimates are preliminary.

HLIP = High Level Independent Panel on Financing the Global Commons for Pandemic Preparedness and Response

Shaded area represents forecasted values. Shaded region around black line represents 95% uncertainty intervals.

community could be more adequately prepared for the next pandemic – which could help avoid the steep economic costs associated with fighting a pandemic, while potentially saving millions of lives. As the HLIP report notes, “scaling up pandemic preparedness cannot wait until COVID-19 is over. The threat of future pandemics is already with us.”

Perhaps just as importantly, the more health systems are prepared for the shock of a pandemic, the more they can address other health issues and events. For example, at the beginning of COVID-19, shortages of personal protective equipment and intensive care unit (ICU) beds (and the equipment found in ICUs) led to more deaths than would have occurred had local systems been adequately prepared for the onset of COVID-19. Moreover, experience with other outbreaks – such as Ebola in West African countries – helped those countries manage COVID-19.<sup>14</sup> Finally, by helping ensure that hospitals and health systems can deal with the surge of patients associated with a pandemic, DAH for pandemic preparedness can strengthen them and improve health outcomes overall.

# Conclusion

## Many challenges

The last few years have certainly been challenging. The turbulence brought on by the pandemic – both due to its impacts on health, and because of the crises caused directly and indirectly by the disruption of COVID-19 – cannot be stressed often or strongly enough. COVID-19 is the first major pandemic since the 1918 influenza pandemic, and it has arguably been more of a jolt to the global order, advances in medical treatment and vaccines notwithstanding, because the world is now much more connected than it was in 1918.

Now, with COVID-19 transforming from a pandemic to an endemic illness, along with many other worries on the horizon (including the war in Ukraine, challenging economic conditions and the specter of a global recession, and climate change), financing global health is as challenging and as critical as ever. Though the most immediate, COVID-19 is hardly the only disease that needs fighting, and that development assistance for health for some health focus areas – like DAH for reproductive and maternal health – seems to have declined during the COVID-19 period (2019–2021) is cause for concern.

Still, the past few years have not been without their positive stories. The jump in DAH driven by COVID-19, the global distribution (however unequal) of safe and effective COVID-19 vaccines in record time, the continued development of drugs to prevent HIV infection,<sup>15</sup> and the development of the first malaria vaccine – all of these things occurred *during* the pandemic. The world has much to be proud of and perhaps to feel optimistic about the future of global health.

Nonetheless, there remains the danger that once the pandemic's worst is truly past, the world will turn its attention away from global health, specifically away from DAH. The pandemic underscored the importance of development assistance for health to countries that rely on DAH. For example, countries in sub-Saharan Africa have long depended on DAH; between 2000 and 2021, 19.9% of global DAH per capita went to countries in the region.

So as the COVID-19 crisis becomes less acute, instead of refocusing their attention and resources on areas outside of health, donors should instead look to COVID-19 as a direct example of the importance of global health in a highly connected world. The improvement of COVID-19 outcomes should be seen as a chance to focus spending toward areas that continue to cause burden (NCDs, malaria, child and newborn health), as well as toward preventing the next pandemic.

## But also, many opportunities

In September 2022, at the Global Fund’s Seventh Replenishment conference, President Biden gave a short summary of the impact spending on health can have:<sup>16</sup> “for every dollar to fight these diseases [HIV, TB, and malaria], we expect \$31 in health gains and economic returns, which also advances our progress toward meeting the goal of the Sustainable Development Agenda.” Though estimates of the return on investment associated with global health spending differ,<sup>17</sup> President Biden’s point stands: it is more prudent to prevent a crisis than wait until a crisis occurs to address it. And spending on health (ahead of crises) begets improvements in health, which can help reduce spending on health overall.

COVID-19 has taught the world a number of hard lessons, one of the most important being the wide impact collective action and timely, targeted spending on health can have. The death toll from COVID-19 will forever be far too high, but without the huge, global increase in spending on health, as well as the many stories of coordination that arose during the pandemic, COVID-19’s toll would surely have been higher.

This is hardly the pandemic’s only positive story. In 2020, when much of the world was in lockdown, significant reductions in air pollution were noted, as well as decreases in motor vehicle accidents.<sup>18</sup> And there are the positive health outcomes that came out of the pandemic: the aforementioned rapid development and deployment of millions of vaccine doses; the marked improvement in daily deaths and infections from COVID-19, particularly since the spring of 2021; and the outcomes that *did not* occur as a result of COVID-19.

Specifically, at the beginning of the pandemic there were fears that when COVID-19 made its way to low-income countries with fewer hospital resources, there would be widespread suffering and death. Instead, as far we can tell, that has not happened. While total deaths from COVID-19 in regions like sub-Saharan Africa are certainly far higher than reported deaths from COVID-19,<sup>19</sup> the fact remains that the region has likely suffered less from the pandemic than many other parts of the world. Exactly why remains something of a mystery.

The rapid growth of DAH during COVID-19 is a positive sign, and one on which it makes sense to end *Financing Global Health 2021*. While much of the increase in DAH between 2019 and 2021 can be attributed to the release of emergency funds that the donor community was able to vastly (and speedily) ramp up, spending on health during the pandemic suggests that where there is a will to increase spending, there is a way. This could prove to be key in the debate over pandemic preparedness and how much donors should contribute to health in the future.

Therefore, a key challenge facing the global health community going forward is maintaining the same sense of urgency after COVID-19 passes. The pandemic has shown us what we can achieve by working together. Let’s continue to do so.

# Global health financing focus area profiles

*Financing Global Health 2021's* global health financing focus area profiles expand upon the main report by offering detailed DAH data and information on seven health focus areas:

- COVID-19
- HIV/AIDS
- Tuberculosis
- Malaria
- Other infectious diseases
- Reproductive, maternal, newborn, and child health
- NCDs

# COVID-19

A respiratory disease caused by the SARS-COV-2 virus, COVID-19 was first detected in late 2019. Since its origin, COVID-19 has spread across the globe, causing more than 15.0 billion infections worldwide and an estimated 17.8 million deaths through mid-December 2022.<sup>1</sup>

Generally spread by close contact between individuals, COVID-19 can also be spread via airborne transmission and, less frequently, through contact with contaminated surfaces. While most people who get COVID-19 recover (some never exhibiting symptoms), roughly 12.3% of those who do get COVID-19 can become seriously ill, requiring hospitalization and/or intensive care. Older individuals with comorbidities like cardiac issues, diabetes, and cancer are at the most risk for severe COVID-19.

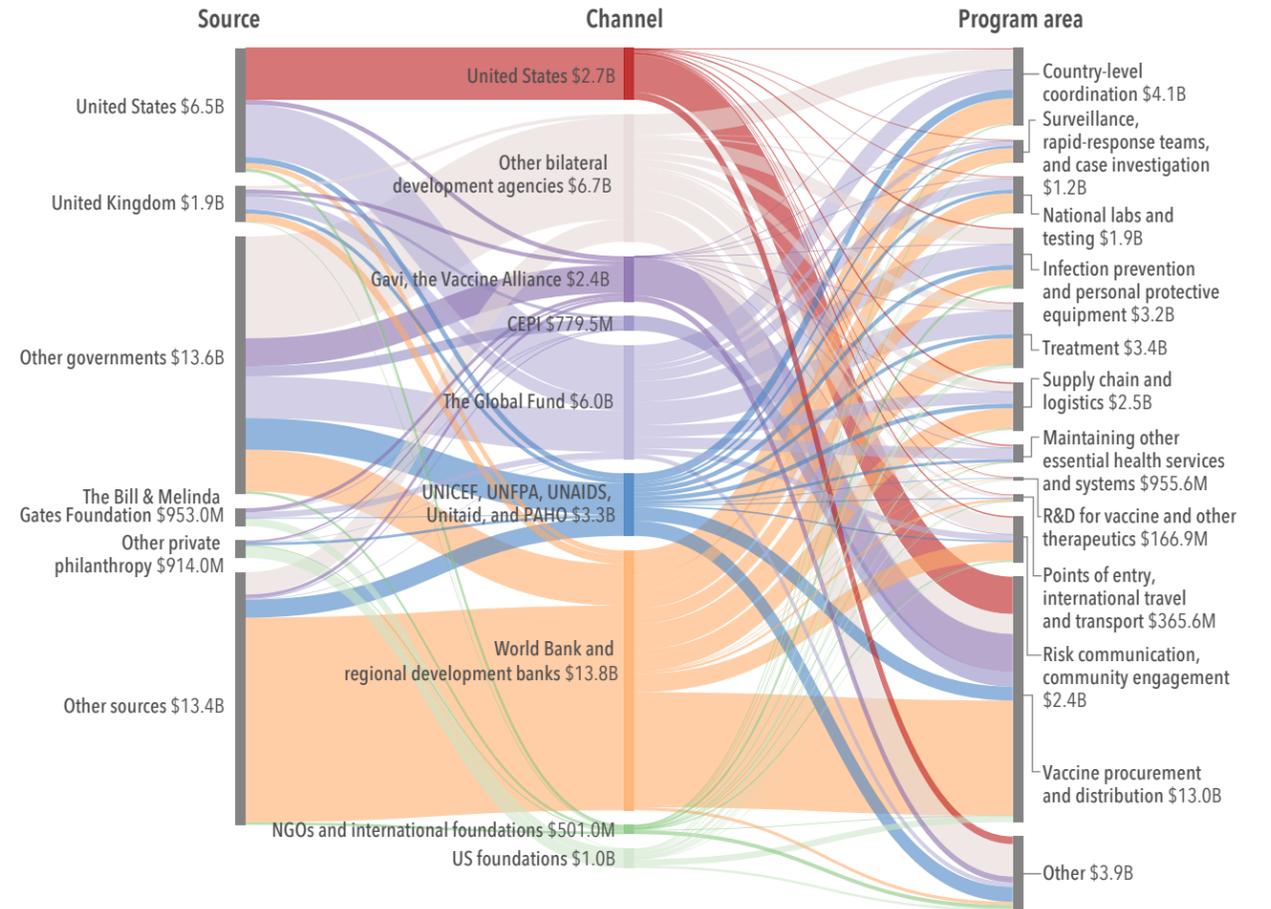
In addition to the toll it has taken on global health, the lockdowns and other restrictions imposed to slow the spread of COVID-19 have had a severe economic

impact. Between 2019 and 2020, the world economy shrank an estimated 4.3%, while the surge of infections and deaths caused by the Omicron variant in late 2021 and early 2022 slowed the global economic recovery.<sup>20</sup>

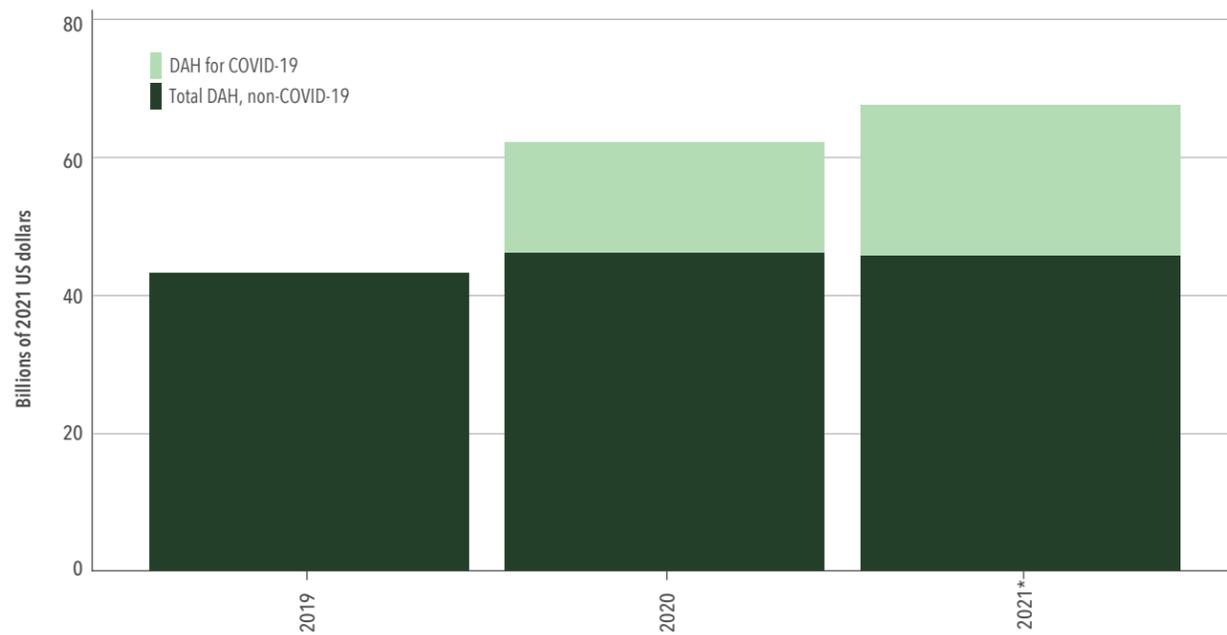
However, COVID-19 has also led to a surge in government spending, including a huge increase in development assistance for health; an estimated \$16.0 billion was directed toward COVID-19 in 2020, and in 2021, DAH for COVID-19 was an estimated \$21.8 billion. Overall, DAH for COVID-19 led to a 56.3% increase in total DAH between 2019 and 2021: in 2019, total DAH was \$43.1 billion, while in 2021, it was \$67.4 billion.

The COVID-19 profile illustrates the sources, disbursement channels, and program areas to which COVID-19 DAH was allocated. Figure A shows how DAH for COVID-19 drove the overall growth of DAH between 2019 and 2021, while Figure B illustrates how DAH for COVID-19 flowed from source to channel to program area in 2020–2021.

**FIGURE B** Flows of development assistance for health for COVID-19 from source to channel to program area, 2020–2021



**FIGURE A** Development assistance for health for COVID-19, 2020–2021\*



\*2021 estimates are preliminary.

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CEPI = Coalition for Epidemic Preparedness Innovations  
 NGOs = Non-governmental organizations  
 PAHO = Pan American Health Organization  
 UNAIDS = Joint United Nations Programme on HIV/AIDS  
 UNFPA = United Nations Population Fund  
 UNICEF = United Nations Children’s Fund  
 WHO = World Health Organization

# HIV/AIDS

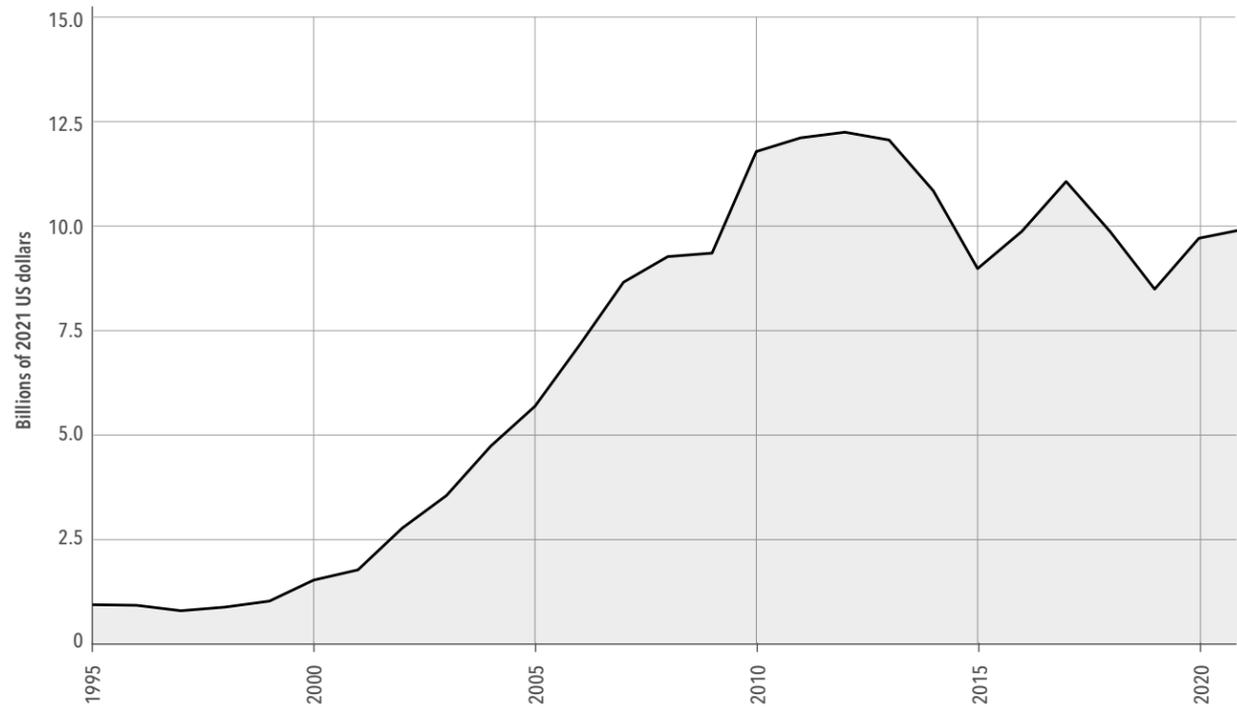
The human immunodeficiency virus, or HIV, is the virus that can cause AIDS, or acquired immunodeficiency syndrome; if left untreated, HIV/AIDS can lead to life-threatening infections and health conditions. Though there are now effective anti-retroviral treatments for HIV/AIDS, when the disease first appeared in the 1980s it led to a widespread public health crisis. Since the start of the HIV/AIDS epidemic, more than 30 million people have died from AIDS-related illnesses.<sup>21</sup>

In 2021, DAH for HIV/AIDS was \$9.9 billion, a 2.2% increase from the 2020 DAH total. Though DAH for HIV/AIDS has increased since 2019, it remains lower than

the 2017–2018 average of \$10.5 billion. In 2019, in low-income and lower-middle-income countries, a total of \$3.8 billion was spent on HIV/AIDS, which was 45.4% of total DAH for HIV/AIDS. For context, DAH for HIV/AIDS was \$8.5 billion, 19.7% of the 2019 DAH total.

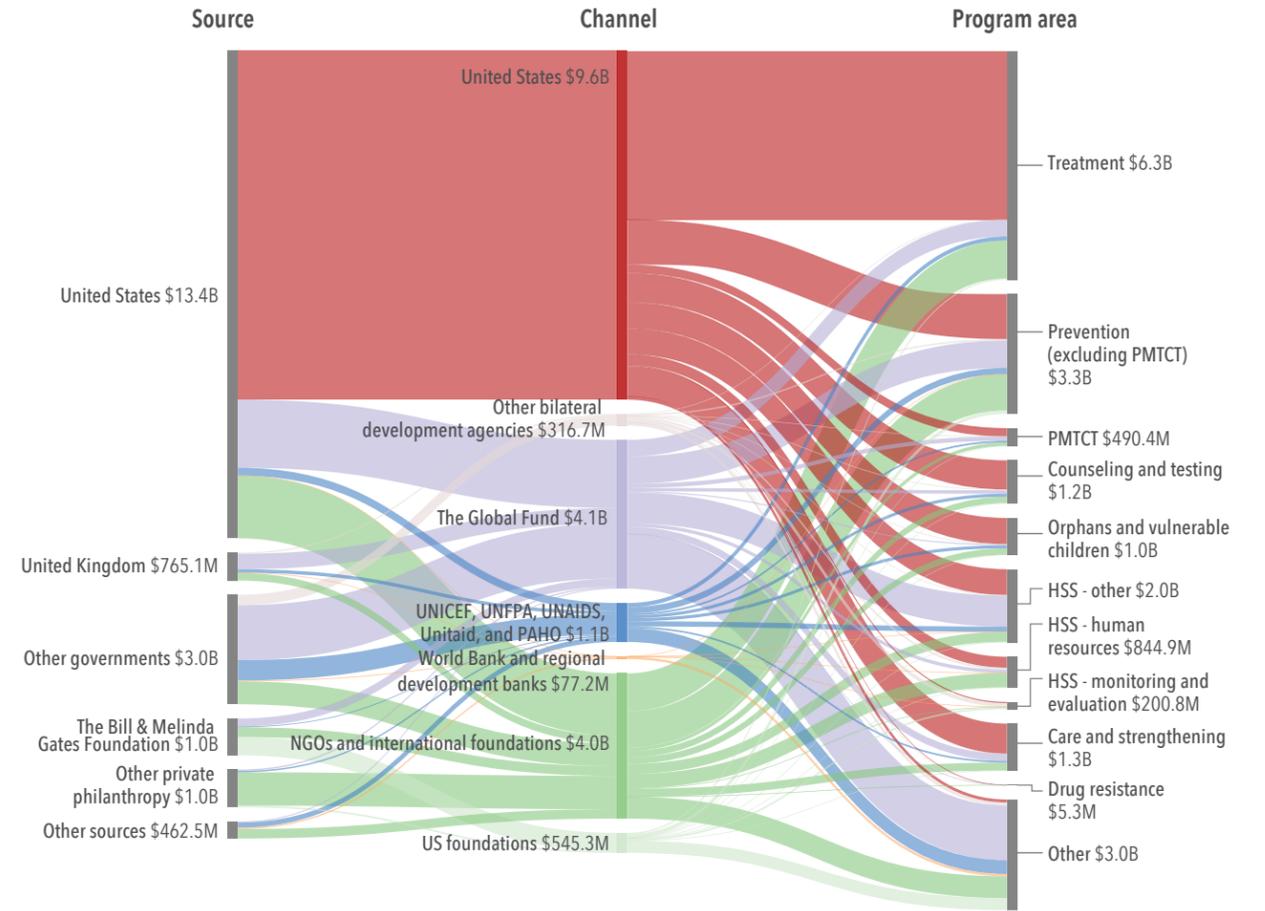
The HIV/AIDS profile illustrates the sources, disbursement channels, and program areas to which HIV/AIDS DAH was allocated. Figure A gives a high-level view of DAH for HIV/AIDS between 1995 and 2021, while Figure B illustrates how DAH for HIV/AIDS flowed from source to channel to program area in 2020–2021.

**FIGURE A** Development assistance for health for HIV/AIDS, 1995–2021\*



\*2021 estimates are preliminary.

**FIGURE B** Flows of development assistance for health for HIV/AIDS from source to channel to program area, 2020–2021



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 NGOs = Non-governmental organizations  
 PAHO = Pan American Health Organization  
 PMTCT = Prevention of mother-to-child transmission  
 UNAIDS = Joint United Nations Programme on HIV/AIDS  
 UNFPA = United Nations Population Fund  
 UNICEF = United Nations Children’s Fund  
 WHO = World Health Organization

# Tuberculosis

Caused by the bacterium *Mycobacterium tuberculosis*, tuberculosis is a highly contagious infectious disease that generally affects the lungs. While many cases of tuberculosis do not progress to active disease, those that do can be fatal. Tuberculosis is a leading killer of people with HIV, and “a major cause of deaths related to antimicrobial resistance,” according to the World Health Organization.<sup>22</sup> By number of deaths, much of the world’s tuberculosis burden is in countries like India, Indonesia, Pakistan, and the Democratic Republic of the Congo.<sup>4</sup>

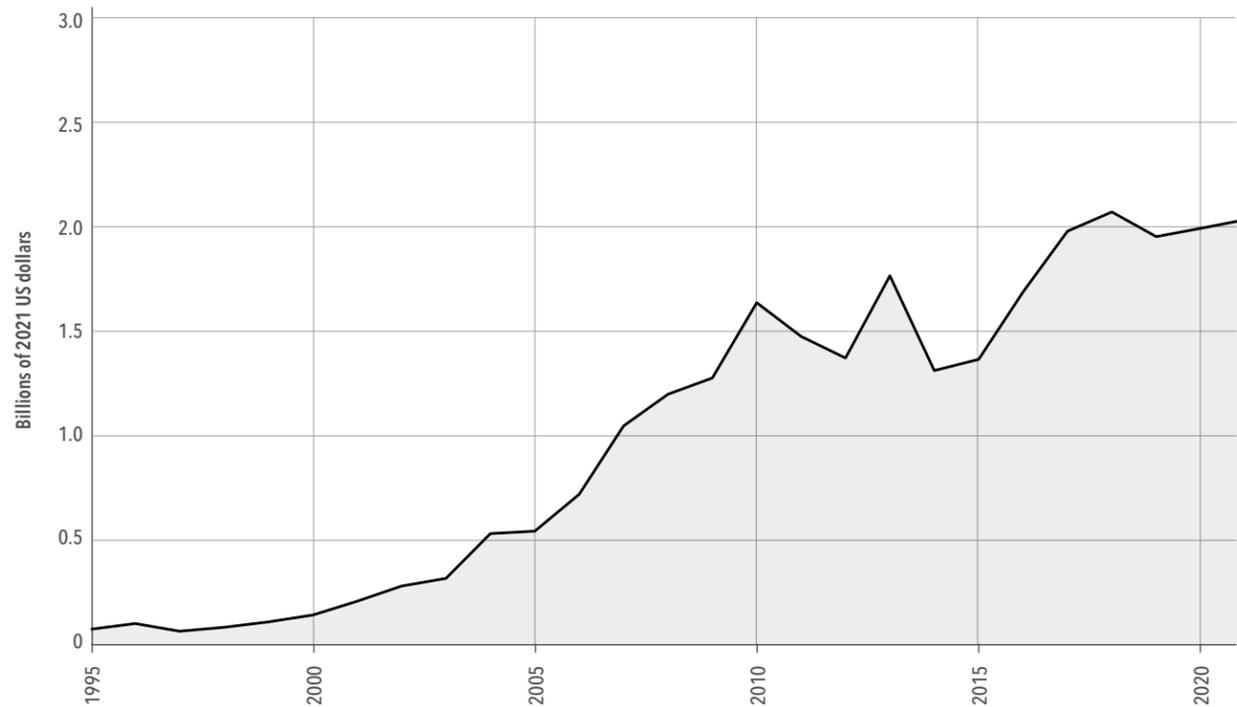
Tuberculosis outcomes have improved since 1990. For example, the age-standardized rate of tuberculosis deaths in China in 1990 was 20.2 per 100,000, and in 2019 it was 2.0. Ethiopia’s age-standardized rate of deaths due to tuberculosis was 317.3 in 1990 (then the

leading cause of death in Ethiopia), and by 2019 it had gone down to 60.9 per 100,000.<sup>4</sup>

In 2021 – the most recent year for which we estimate development assistance for health by health focus area – a total of \$1.3 billion was spent on tuberculosis in low-income and lower-middle-income countries, which was 65.0% of total 2020 DAH for tuberculosis. In 2021, a total of \$2.0 billion was allocated for DAH for tuberculosis, an increase of 2.1% from 2020.

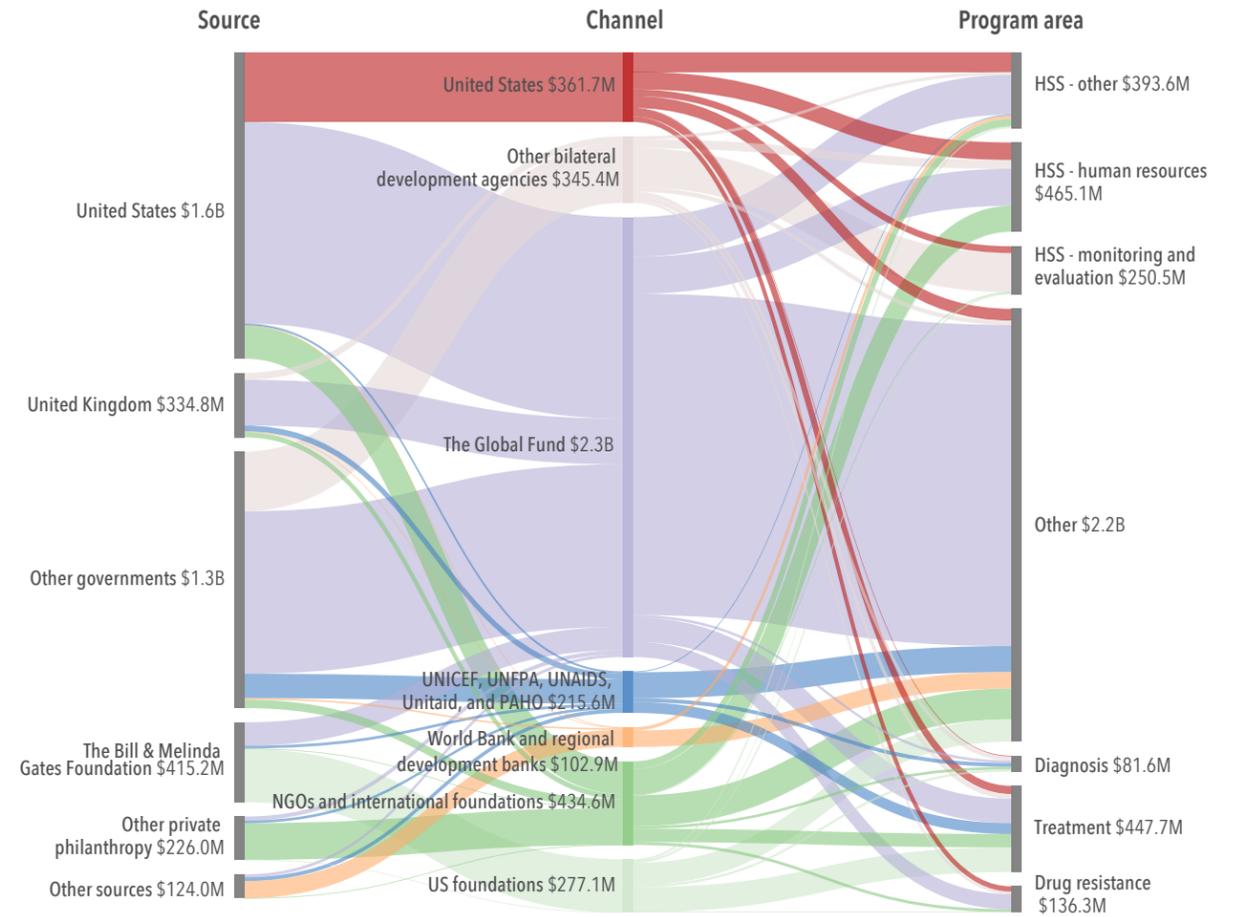
The tuberculosis profile illustrates the sources, disbursement channels, and program areas to which tuberculosis DAH was allocated. Figure A gives a high-level view of DAH for tuberculosis between 1995 and 2021, while Figure B illustrates how DAH for tuberculosis flowed from source to channel to program area in 2020–2021.

**FIGURE A** Development assistance for health for tuberculosis, 1995–2021\*



\*2021 estimates are preliminary.

**FIGURE B** Flows of development assistance for health for tuberculosis from source to channel to program area, 2020–2021



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# Malaria

Transmitted by mosquitoes, malaria is a disease caused by parasites of the *Plasmodium* group, two of which – *P. falciparum* and *P. vivax* – pose the greatest threat to humans. Malaria’s symptoms include flu-like symptoms (chills, fever), vomiting, diarrhea, and jaundice,<sup>23</sup> and if left untreated, malaria can lead to acute illness and death.

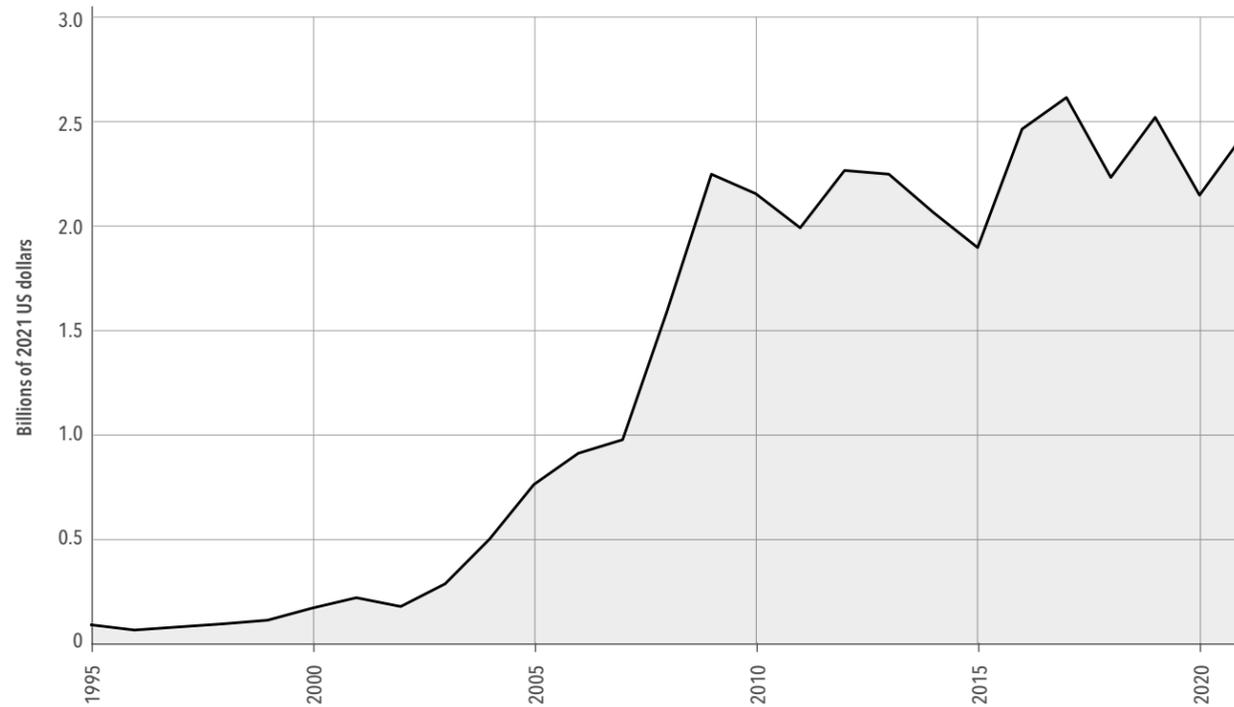
According to the Global Burden of Disease 2019 study,<sup>4</sup> in 2019 most global malaria burden remained in sub-Saharan Africa, with the highest age-standardized rates of disability-adjusted life years (DALYs) in Sierra Leone, Côte d’Ivoire, and Burkina Faso. The most malaria deaths were in Nigeria (nearly 200,000) and the Democratic Republic of the Congo (over 55,000). However, these numbers obscure the tremendous progress in the fight against malaria: in 1990, there were almost 850,000 deaths from malaria globally, but by

2019, that number had dropped to roughly 650,000. And a malaria vaccine is expected to be distributed widely in 2023.<sup>24</sup>

There was a total of \$2.4 billion in DAH for malaria in 2021. In comparison, a total of \$4.3 billion (comprising government spending, prepaid private spending, out-of-pocket spending, and DAH) was spent on malaria across malaria-endemic countries in 2017, the latest year for which we estimate total spending by health focus area; 38.8% of total spending on malaria was DAH.

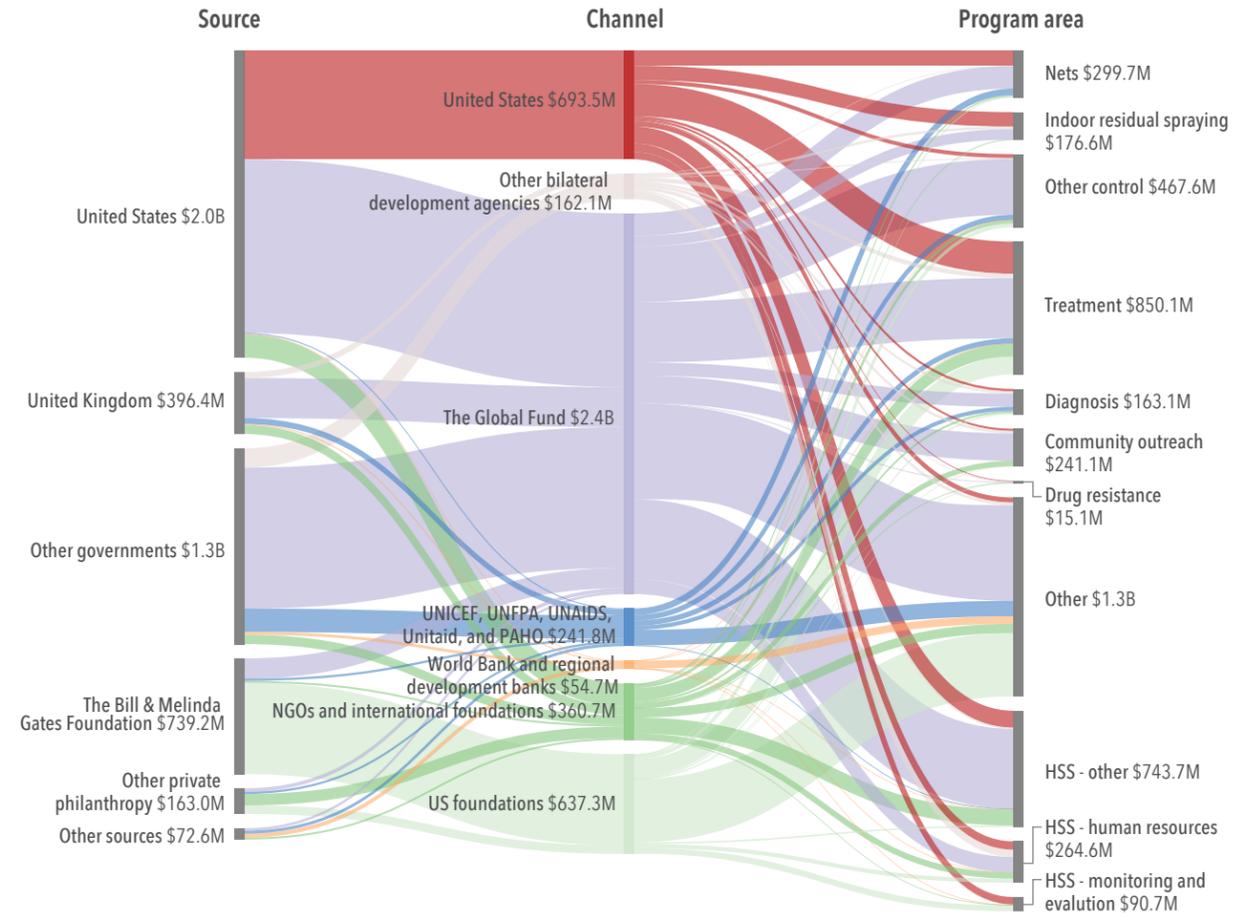
The malaria profile illustrates the sources, disbursement channels, and program areas to which malaria DAH was allocated. Figure A gives a high-level view of DAH for malaria between 1995 and 2021, while Figure B illustrates how DAH for malaria flowed from source to channel to program area in 2020–2021.

**FIGURE A** Development assistance for health for malaria, 1995–2021\*



\*2021 estimates are preliminary.

**FIGURE B** Flows of development assistance for health for malaria from source to channel to program area, 2020–2021



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 WHO = World Health Organization

# Other infectious diseases

*Financing Global Health's* other infectious diseases group refers to all infectious diseases other than HIV/AIDS, tuberculosis, malaria, and childhood diseases covered under our reproductive, maternal, neonatal, and child health spending category. Note that the other infectious diseases group includes COVID-19, hence the 733.1% rise in other infectious disease DAH between 2019 and 2021.

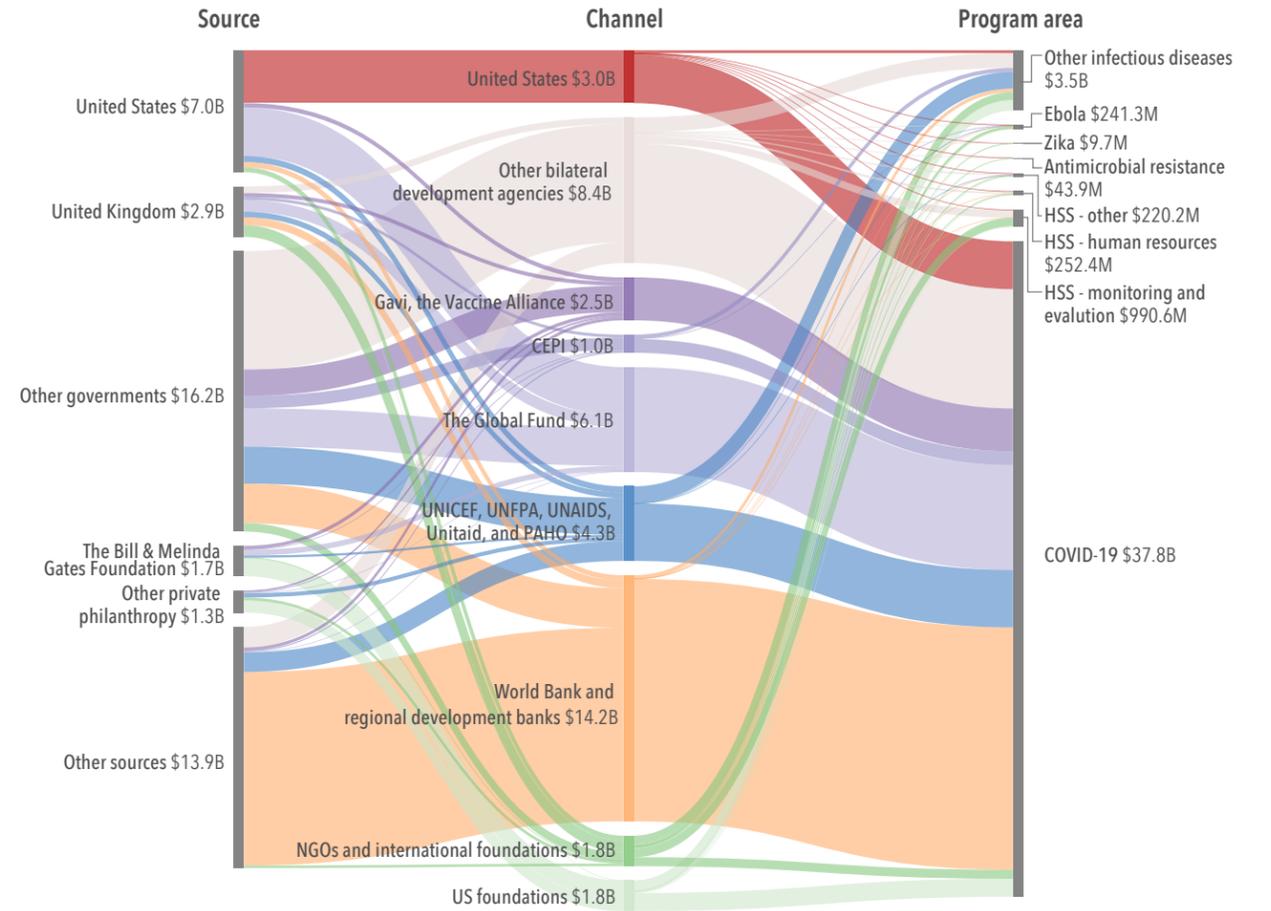
COVID-19 notwithstanding, the burden of this group of diseases has gone down over the past two decades – according to the Global Burden of Disease 2019 study,<sup>4</sup> as a category, other infectious diseases caused roughly 0.7 million deaths in 2019, down from 2.2 million in 1990. But where the burden of infectious diseases is felt has not changed. In 1990, sub-Saharan Africa had the most other infectious disease burden, and South Asia the second-most; in the 2019, the regions' order was unchanged, despite the dramatic

decrease in other infectious disease burden in both regions.

The other infectious diseases profile illustrates the sources, disbursement channels, and program areas to which other infectious diseases DAH was allocated. Figure A gives a high-level view of DAH for other infectious diseases between 1995 and 2021, while Figure B illustrates how DAH for other infectious diseases flowed from source to channel to program area in 2020–2021.

The increase in spending between 2019 and 2021 includes rises in the percentage of other infectious diseases DAH by some sources. For example, in 2019, Japan was responsible for 3.2% of other infectious diseases DAH, while in 2021, Japan accounted for 6.5%. For additional context, 9.2% (\$2.2 billion) of 2021 other infectious diseases spending was unrelated to COVID-19, a decrease of 26.3% under the 2020 total.

**FIGURE B** Flows of development assistance for health for other infectious diseases from source to channel to program area, 2020–2021



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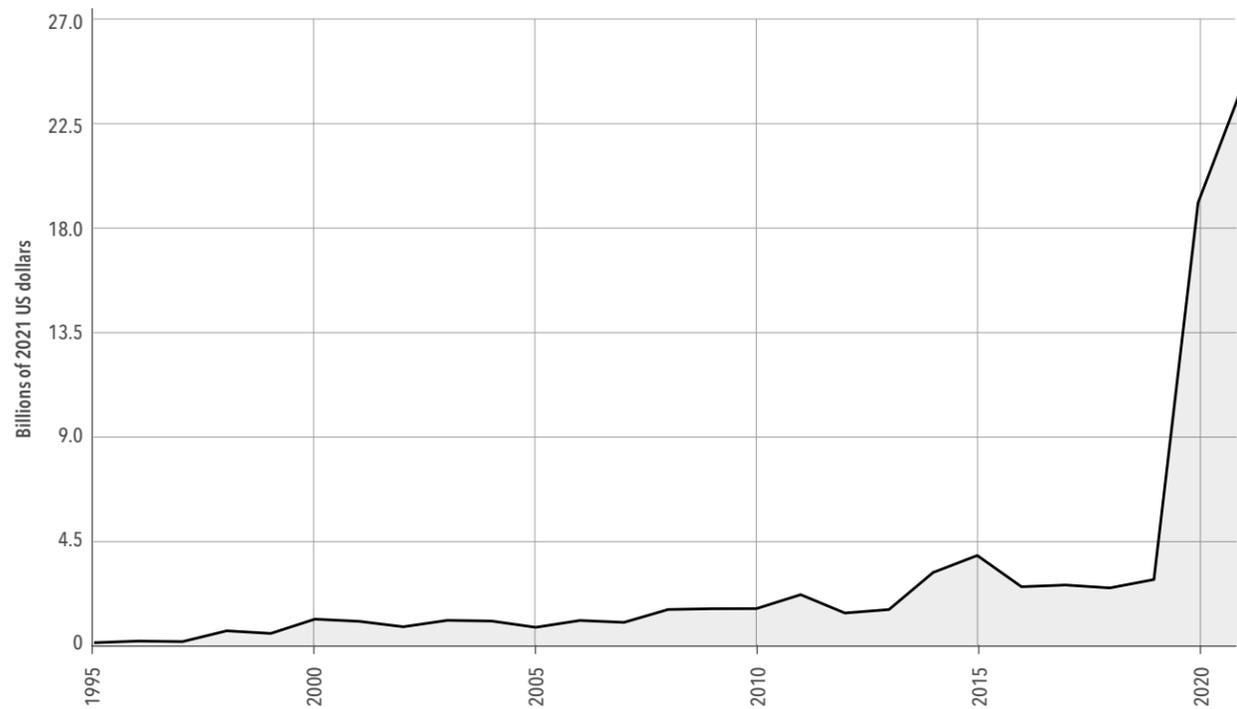
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**FIGURE A** Development assistance for health for other infectious diseases, 1995–2021\*



\*2021 estimates are preliminary.

# Reproductive, maternal, newborn, and child health

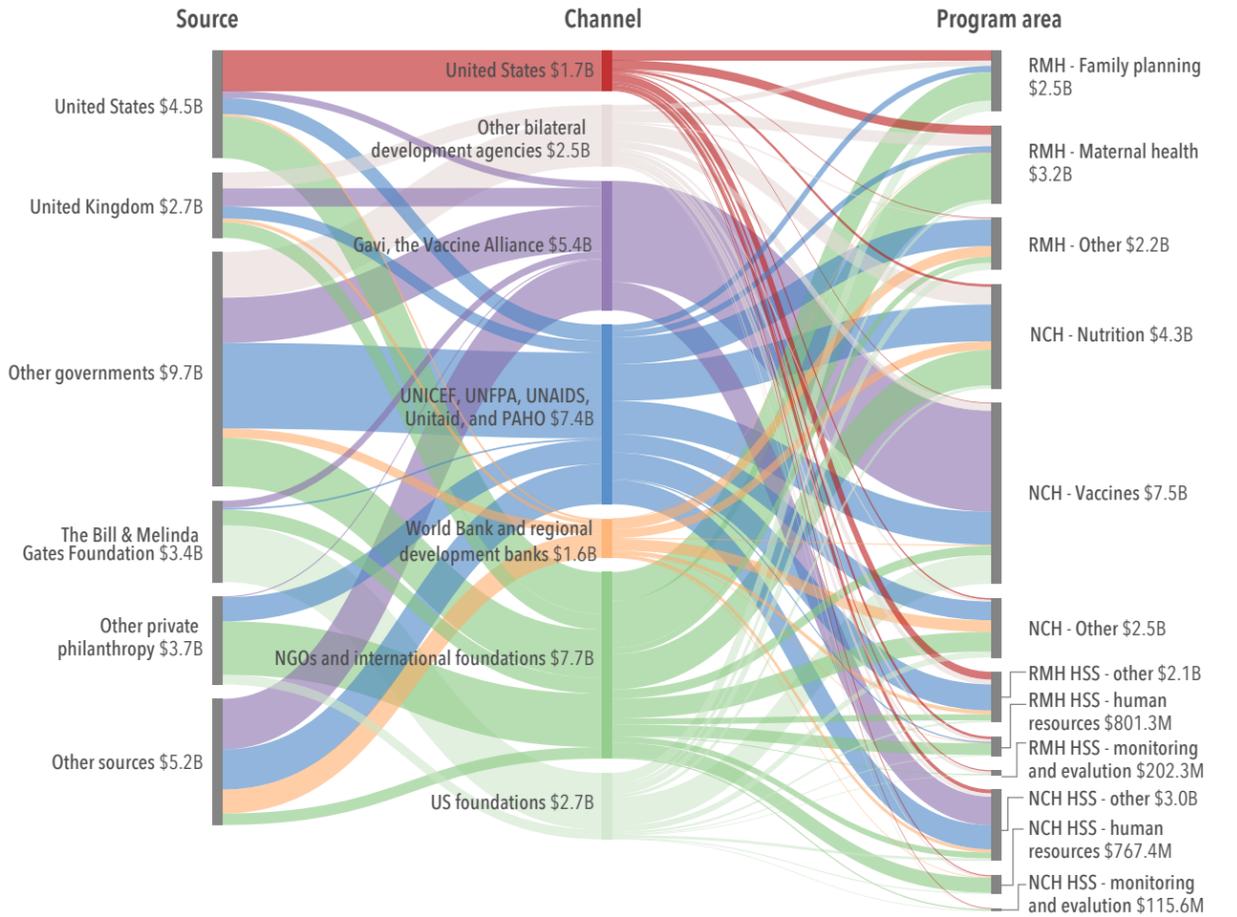
The reproductive, maternal, newborn, and child health category encompasses maternal disorders like maternal hemorrhage and ectopic pregnancy, neonatal sepsis and jaundice, and vaccine-related funding. Taken together, the burden of maternal and neonatal disorders is most felt in sub-Saharan Africa (with Pakistan also experiencing a high rate of DALYS due to maternal and neonatal disorders), according to the Global Burden of Disease 2019 study.<sup>4</sup> As a group, maternal and neonatal disorders caused over 2 million deaths in 2019.

By cause, neonatal preterm birth and neonatal encephalopathy caused the most burden in 2019, leading to over 660,000 and 560,000 global deaths, respectively. But strides have been made over the past few decades: since 1990, the global, all-ages rate of deaths due to neonatal preterm birth has gone down 63.9%, and deaths caused by maternal hemorrhage have gone down 51.1%, from 95,100 in 1990 to 46,500 in 2019.<sup>4</sup>

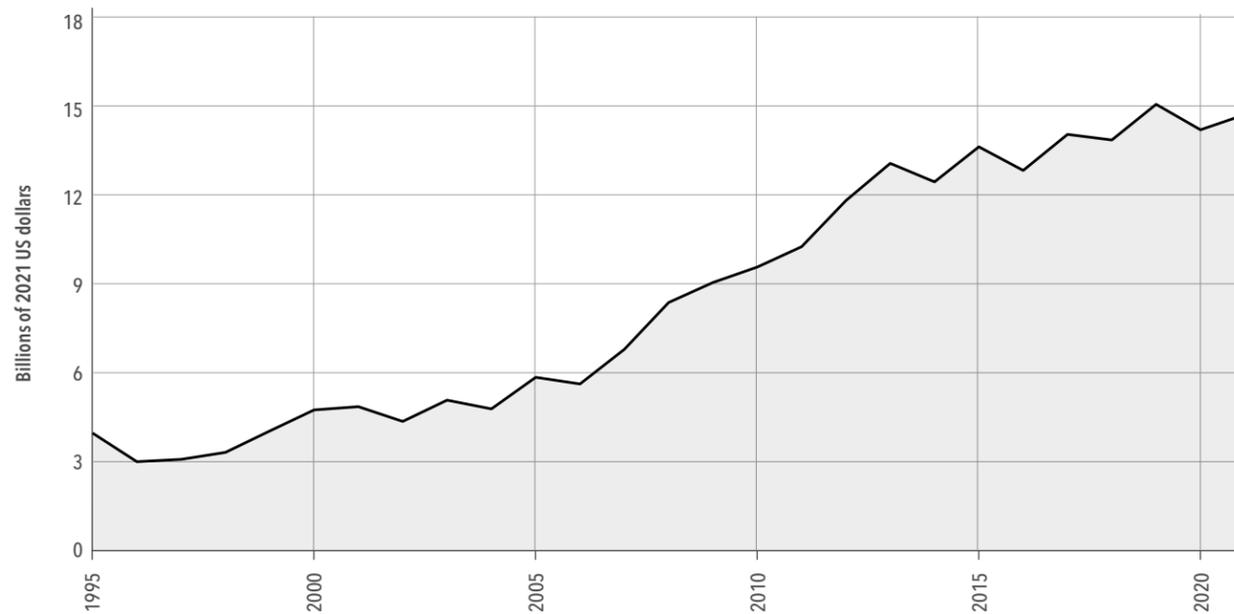
An estimated \$14.8 billion in DAH went to reproductive, maternal, newborn, and child health in 2021, a decrease of 2.3% since 2019. By region, sub-Saharan Africa was the largest recipient of development assistance for reproductive, maternal, newborn, and child health in 2019, receiving \$4.4 billion, or 28.8% of 2019 DAH.

The reproductive, maternal, newborn, and child health profile illustrates the sources, disbursement channels, and program areas reproductive, maternal, newborn, and child health DAH was allocated to. Figure A gives a high-level view of DAH for reproductive, maternal, newborn, and child health between 1995 and 2021, while Figure B illustrates how DAH for reproductive, maternal, newborn, and child health flowed from source to channel to program area in 2020–2021.

**FIGURE B** Flows of development assistance for health for reproductive, maternal, newborn, and child health from source to channel to program area, 2020–2021



**FIGURE A** Development assistance for health for reproductive, maternal, newborn, and child health, 1995–2021\*



\*2021 estimates are preliminary.

“Other sources” captures development assistance for health for which we have source information but which is not identified as originating within any of the sources listed.

Health assistance for which we have no source information is designated as “Unidentified.”

“Other governments” include Afghanistan, Angola, Argentina, Australia, Austria, Azerbaijan, Bangladesh, Belgium, Bhutan, Brazil, Brunei, Bulgaria, Cameroon, Canada, Central African Republic, Chad, China, Colombia, Côte d’Ivoire, Croatia, Czechia, Democratic Republic of the Congo, Denmark, Egypt, Estonia, Ethiopia, Finland, France, Gabon, Germany, Greece, Guinea, Hungary, Iceland, India, Indonesia, Iran, Iraq, Ireland, Italy, Jamaica, Japan, Jordan, Kenya, Kuwait, Latvia, Lebanon, Libya, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Monaco, Myanmar, New Zealand, Nigeria, Norway, Oman, Pakistan, Palestine, Peru, Poland, Portugal, Qatar, Romania, Russia, São Tomé and Príncipe, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, South Sudan, Spain, Sudan, Sweden, Switzerland, Syria, Taiwan (province of China), Thailand, the Netherlands, Togo, Turkey, Uganda, Ukraine, United Arab Emirates, Yemen, and Zimbabwe.

“Other bilateral development agencies” include Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, South Korea, Luxembourg, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Arab Emirates, the United Kingdom, the European Commission, and EEA.

“Regional development banks” include the African Development Bank, the Asian Development Bank, and the Inter-American Development Bank.

“Other” captures development assistance for health for which we have program area information but which is not identified as being allocated to any of the program areas listed.

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# Non-communicable diseases

Non-communicable diseases (NCDs) are defined as conditions that are not transmissible from person to person; NCDs are chronic diseases, and behaviors like smoking and overuse of alcohol can increase the chance of developing one. NCDs include cardiovascular diseases, chronic respiratory diseases, and cancers.

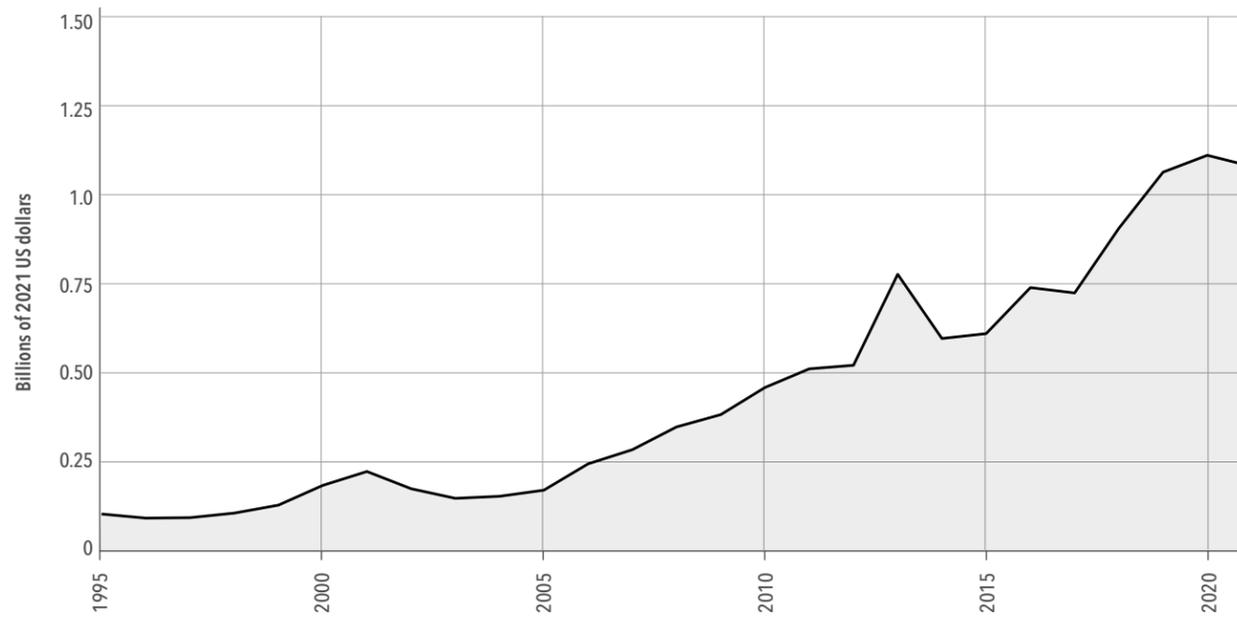
As a group, NCDs were the leading cause of disease burden globally in 2019, causing nearly three times as many deaths (more than 42 million) as communicable, maternal, neonatal, and nutritional diseases – plus injuries – combined. The leading types of NCDs include ischemic heart disease, stroke, and chronic obstructive pulmonary disease; NCD risk can be mitigated by modifying certain risk factors, like smoking.<sup>25</sup> Globally, NCD burden is highest in many middle-income countries. For example, 31.5% of 2019 deaths in Russia were attributable to ischemic heart disease, and 18.3% to stroke. Moreover, the past 30 years have been marked by a shift away from communicable diseases (COVID-19 notwithstanding) and toward non-communicable

disease burden.<sup>4</sup>

Though NCD-related DAH has grown over the past 30 years, spending on NCDs has not necessarily kept pace with the burden the group of conditions causes. A total of about \$1.1 billion was directed toward NCD DAH in 2021, reflecting little change over the 2020 total. Between 1990 and 2021, total NCD DAH grew 1,889.2%, while overall DAH grew 688.4%. Meanwhile, between 1990 and 2019, as a portion of total DALYS, NCDs grew 47.9%. For reference, between 1990 and 2019, the percentage of deaths attributable to NCDs grew almost 31%. In 1990, NCDs caused 56.8% of global deaths, while in 2019 NCDs caused 74.4% of global deaths.

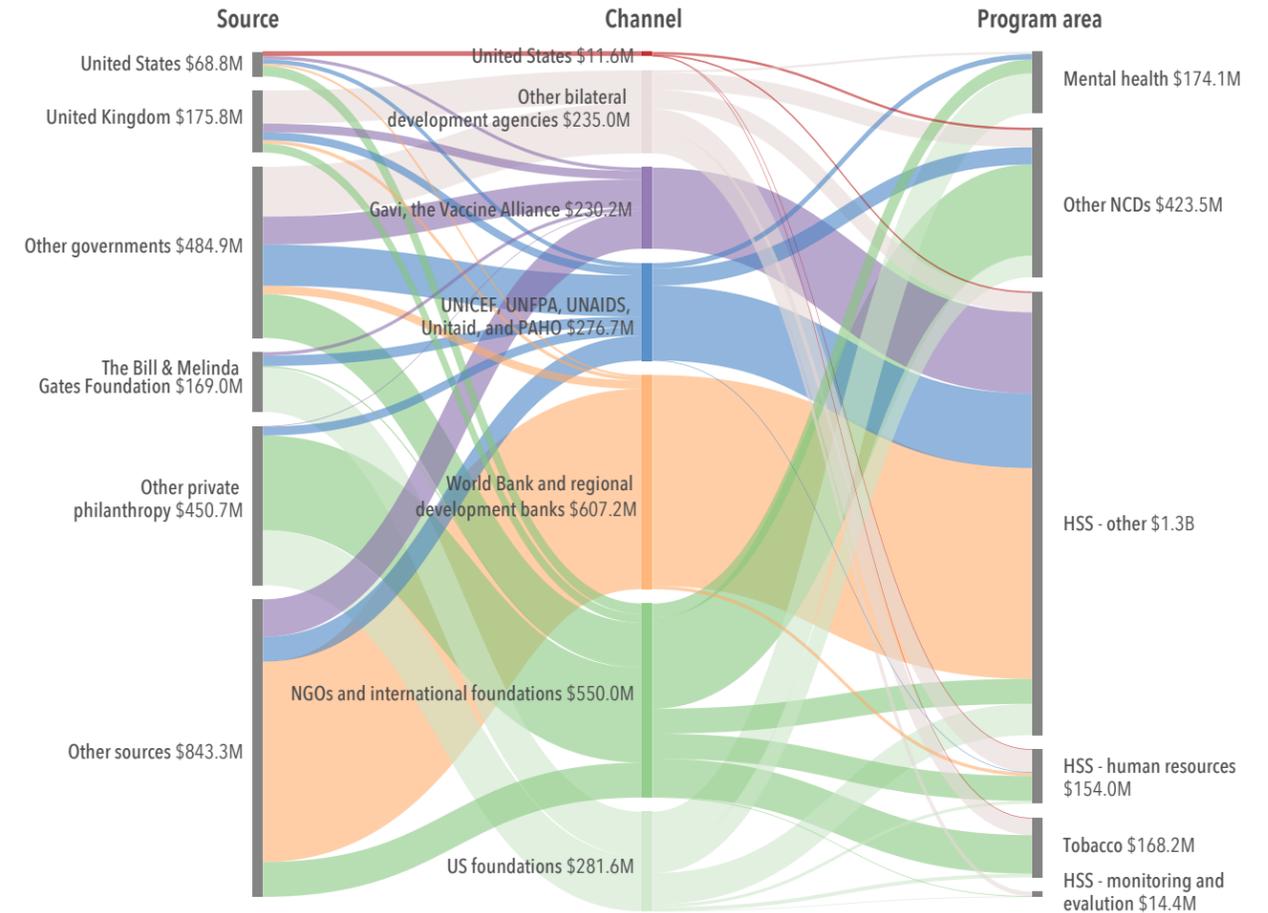
The NCDs profile illustrates the sources, disbursement channels, and program areas to which NCDs DAH was allocated. Figure A gives a high-level view of DAH for NCDs between 1995 and 2021, while Figure B illustrates how DAH for NCDs flowed from source to channel to program area in 2020–2021.

**FIGURE A** Development assistance for health for non-communicable diseases, 1995–2021\*



\*2021 estimates are preliminary.

**FIGURE B** Flows of development assistance for health for non-communicable diseases from source to channel to program area, 2020–2021



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## ANNEX:

# Methods

## Overview

*Financing Global Health 2021* reports estimates based on the most reliable and up-to-date data available as of June 2022. Drawing upon data from spending accounts, budgets, and other estimates from a broad set of sources, we employed statistical models and accounting methods to produce our estimates. This section briefly outlines our processes. For detailed information on the input data and methodology, please refer to our online Methods Annex, available at <https://bit.ly/fgh2021methods>.

Additional information on methods can also be found in a paper published in 2023 by the Global Burden of Disease Health Financing Collaborator Network in *The Lancet Global Health*, “Global investments in pandemic preparedness and COVID-19: tracking development assistance and domestic spending on health, 1990–2026.” [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(23\)00007-4/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(23)00007-4/fulltext)

## Development assistance for health

IHME compiled financing data from the sources and disbursing entities discussed in this report. The goal was to track disbursements through international development agencies that aimed to maintain or improve health in low- and middle-income countries from 1990 through 2021. In addition to data from international databases such as the Organisation for Economic Co-operation and Development’s Creditor Reporting System, we extracted and harmonized commitment and disbursement data from development project records, annual budgets, annual financial statements, and revenue statements from a broad set of development agencies, including multilateral and bilateral aid agencies, public-private partnerships, NGOs, and private foundations.

Furthermore, for several disbursing agencies, direct correspondence with agencies led to better understanding of the data or to the acquisition of more granular, more reliable, or more timely data. Some organizations were not able to report on disbursements for the previous year because agencies’ accounting processes can be lengthy. We therefore relied on budgets, revenues, commitments, and appropriations, as well as macroeconomic data to estimate disbursements for organizations without up-to-date spending information, and these were used to model the most recent year’s disbursements. This method led to the development of “preliminary estimates” of DAH by source, channel, and health focus area for 2021. We do not report DAH estimates by recipient for 2021 because preliminary estimates were not made by recipient.

Global health agencies frequently transfer funds among themselves. Since these funding flows are often reported by both the entity from which funds

originate and the recipient agency, double-counting occurs in the data. Including disbursements from both agencies would lead to an overestimation of disbursements. In order to avoid double-counting, we used revenue data to assess the source of all funds and remove resources that were passed between development agencies before being disbursed. For our accounting purposes, the source of the funds is where the funds originated, while the channel is the last disbursing agency that we track to disburse the resources. Because each data source provides different categories and different information about what focus areas were targeted by their disbursements, project-specific sector and theme codes and keyword searches of project titles and descriptions were used to classify funding. All DAH from the Joint United Nations Programme on HIV/AIDS (UNAIDS) was considered funding for HIV/AIDS and tuberculosis. Funding from UNICEF was classified as DAH for reproductive, maternal, newborn, and child health, HIV/AIDS, and Ebola. For projects that span two or more health focus areas, funding was divided according to weights based on the number of keywords associated with each health focus area. DAH estimates were reported in 2021 US dollars.

We developed a separate methodology for estimating DAH for COVID-19 because much of the project-level data used as input for the historical DAH estimates (described above) do not extend through 2021 and therefore do not include resources disbursed in response to COVID-19 in 2021. We extracted project data on commitments and disbursements from a diverse set of databases, including the UNOCHA Financial Tracking Service and the International Aid Transparency Initiative. For other development channels, we obtained information about COVID-19 commitments and disbursements through correspondence or from their respective online databases.

## Domestic health spending and total health spending

We extracted and adjusted health spending data from the World Health Organization Global Health Expenditure Database to estimate total health spending and health spending by source. Extracted data included transfers from government domestic revenue (allocated to health purposes), social insurance contributions, compulsory prepayment, voluntary prepayment, other domestic revenue from households, corporations, and nonprofit institutions serving the household, and GDP. We extracted spending estimates in current local currency and converted them into 2021 US dollars. We used a spatiotemporal Gaussian process regression model (ST-GPR) to estimate health spending across time, country, and spending category.

Additionally, we developed a method to prioritize data from the Global Health Expenditure Database that had the most credible sources and with the best documentation for our ST-GPR modeling to prevent data with unclear sources or imputation methods from influencing our ST-GPR estimation. Our method used a natural language processing model to evaluate and assign a weight based on the information describing the source and methods used to estimate data points in the Global Health Expenditure Database. Weights were based upon metadata completeness, documented source information, and documented methods for estimation. While we

included all available data in the ST-GPR model, data with the most reputable sources and most complete documentation influenced the model the most. We aggregated DAH measured in 2021 US dollars, government health spending, prepaid private health spending, and out-of-pocket health spending to estimate total health spending.

## Future health spending

Our forecasted estimates include GDP, general government spending (across all sectors); government, out-of-pocket, and prepaid private health spending; and total DAH provided and received from 2020 to 2030 and 2050. We used ensemble models to estimate per person GDP, government spending, DAH, and government, out-of-pocket, and prepaid private health spending through 2050, our reference scenario.

Supplementary data are available via the Global Health Data Exchange (GHDx):

- Development Assistance for Health Database 1990-2021 (<https://ghdx.healthdata.org/record/ihme-data/development-assistance-health-database-1990-2021>)
- Development Assistance for Health on COVID Database 2000-2021 (<https://ghdx.healthdata.org/record/ihme-data/development-assistance-health-covid-2020-2021>)
- Global Expected Health Spending Database 2020-2050 (<https://ghdx.healthdata.org/record/ihme-data/global-expected-health-spending-2020-2050>)
- Global Health Spending Database 1995-2019 (<https://ghdx.healthdata.org/record/ihme-data/global-health-spending-1995-2019>)
- Gross Domestic Product Per Capita 1960-2050 (<https://ghdx.healthdata.org/record/ihme-data/global-gdp-per-capita-1960-2050-fgh-2021>)





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