

1 Past, present, and future of global health financing: a review of development assistance,
2 government, out-of-pocket, and other private spending on health for 195 countries,
3 1995-2050
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19 Summary

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21 *Background*

22 Comprehensive and comparable estimates of health spending in each country are a key input for health
23 policy and planning, and are necessary to support the achievement of national and international health
24 goals. Previous studies have tracked past and projected future health spending until 2040 and shown that
25 with economic development, countries tend to spend more on health per capita, with a decreasing share
26 of spending from development assistance and out-of-pocket sources. The aim of this study is to
27 characterize the past, present, and predicted future of global health spending, with an emphasis on equity
28 in spending across countries.

29 *Methods*

30 We estimated domestic health spending for 195 countries and territories from 1995 to 2016, split into
31 three categories – government, out-of-pocket, and prepaid private health spending, and estimated
32 development assistance for health (DAH) from 1990 to 2018. We estimated future scenarios of health
33 spending using an ensemble of linear mixed effect models with time series specifications to forecast
34 domestic health spending from 2017 through 2050 and DAH from 2019 through 2050. Data were
35 extracted from a broad set of sources tracking health spending and revenue, and were standardised and
36 converted to inflation-adjusted 2018 US dollars. Incomplete or low quality data were modelled and
37 uncertainty was estimated, leading to a complete data series of total, government, prepaid private, and
38 out-of-pocket health spending, and DAH. Estimates are reported in 2018 US dollars, 2018 purchasing-
39 power parity-adjusted dollars, and as a percent of gross domestic product. We used demographic
40 decomposition methods to assess a set of factors associated with changes in government health spending
41 between 1995 and 2016 and examine evidence to support the theory of the health financing transition.
42 We projected two alternative future scenarios based on higher government health spending to assess the
43 potential ability of governments to generate more resources for health.

44 *Findings*

45 Between 1995 and 2016, health spending grew at a rate of 4.0% (95% uncertainty interval 3.9–4.1)
46 annually, although it grew slower in per capita terms (2.7% [2.6–2.8]) and increased by less than \$1 per
47 capita over this period in 22 out of 195 countries. The highest per capita health spending growth rates
48 were observed in upper-middle-income (5.6% [5.2–6.0]) and lower-middle-income countries (3.7% [3.1–
49 4.3]), mainly due to growth in government health spending and DAH, respectively. Health spending
50 globally reached \$8.0 trillion (7.8–8.1) in 2016 (8.6% [8.4–8.7] of the global economy and \$10.3 trillion
51 [10.1–10.6] purchasing-power parity adjusted dollars) with per capita spending of \$5252 (5184–5319),
52 \$491 (461–524), \$81 (74–89), and \$40 (38–43), in high-, upper-middle, lower-middle, and low-income
53 countries, respectively. In 2018, 0.4% (0.4–0.4) of global health spending was in low-income countries,
54 despite having 10.0% of the global population. In 2018, the largest proportion of DAH remained targeted
55 towards HIV/AIDS (\$9.5 billion, 24.3% of total DAH), although spending on other infectious diseases
56 (excluding tuberculosis and malaria) grew fastest from 2010 to 2018 (6.3% per year). The leading sources
57 of DAH were the United States and private philanthropy (excluding corporate donations and the Bill &
58 Melinda Gates foundation). For the first time, we included estimates of China’s contribution to DAH
59 (\$644.7 million in 2018). Health spending is projected to increase to \$15.0 trillion (14.0–16.0) by 2050

60 (reaching 9.4% [7.6–11.3] of the global economy and \$21.3 trillion [19.8–23.1] purchasing-power parity-
61 adjusted dollars), but at a lower growth rate of 1.8% (1.7–2.0) annually, and with continuing disparities in
62 spending between countries. In 2050, we estimated that only 0.6% (0.6–0.7) of health spending will occur
63 in currently low-income countries, despite having an estimated 15.7% of the global population. The ratio
64 between per capita health spending in high- and low-income countries was 130.2 (122.9–136.9) in 2016,
65 and is projected to remain at similar levels in 2050 (125.9 [113.7–138.1]). The decomposition analysis
66 identified governments’ increased prioritisation of the health sector and economic development as the
67 strongest factors associated with increases in government health spending, globally. Future government
68 health spending scenarios suggest that with greater prioritisation of the health sector and increased
69 government spending, health spending per capita could more than double, with greater impacts in
70 countries currently with the lowest levels of government health spending.

71 *Interpretation*

72 Financing for global health has increased steadily over the past two decades and is projected to continue
73 increasing in the future, although at a slower pace of growth and with persistent disparities in per capita
74 health spending between countries. Out-of-pocket spending is projected to remain substantial outside of
75 high-income countries. Many low-income countries are expected to remain dependent on development
76 assistance, although with greater government spending, substantially larger investments in health are
77 feasible. In the absence of sustained new investments in health, increasing efficiency in health spending
78 is critical to meet global health targets.

79

80 Research in context

81

82 *Evidence before this study*

83 Understanding past and anticipating future trends in health financing are crucial for planning and
84 allocating resources required to achieve universal health coverage (UHC) and other health goals. Previous
85 studies, including work by the Global Burden of Disease Financing Global Health Collaborator Network,
86 have tracked past and projected future health spending and spending disaggregated by funding source
87 (i.e., government, prepaid private, out-of-pocket, and development assistance for health (DAH)) until
88 2040. A 2018 report from the World Health Organization documents the global pattern of declining
89 external financing and increasing domestic public funding, supporting key findings from other existing
90 studies. Research focusing on the global health financing transition by this team and others has shown
91 that with economic development, countries tend to spend more money on health per capita, and that a
92 declining share of that spending tends to come from development assistance and out-of-pocket sources.

93 *Added value of this study*

94 This is the first study of global health financing to generate past trends, characterize present patterns, and
95 predict future scenarios for 195 countries over a period spanning 56 years, with an emphasis on equity
96 across countries over time, providing a holistic assessment of the state of global health financing. This
97 analysis provides new estimates of total, government, prepaid private, and out-of-pocket health spending
98 and DAH for 195 countries spanning from 1995 to 2050. The relationship between economic development
99 and the distribution of these sources of financing provides further support for the theory of the health
100 financing transition. Decomposition analysis shows for the first time key factors that have been associated
101 with increases in government health spending across countries, finding increased prioritisation of the
102 health sector and economic development are the factors associated with the largest increases in
103 government health spending, globally. These long health spending time trends also reveal persistent
104 disparities across income groups, with per capita health spending in high-income countries 130.2 (95%
105 uncertainty interval 122.9–136.9) times that in low-income countries in 2016, and projected to remain
106 stable at 125.9 (113.7–138.1) times greater in 2050. Within low- and middle-income country groups, the
107 gaps between countries with the highest and lowest government health spending per capita are projected
108 to widen between now and the future. Furthermore, consistently high rates of out-of-pocket spending in
109 low- and middle-income countries reflect ongoing within-country inequities. While these trends also
110 provide evidence of the health financing transition, many countries' trends run counter to global norms.

111 *Implications of all available evidence*

112 Development assistance for health has plateaued; moreover, projected future spending suggests that very
113 low levels of domestic health spending and high out-of-pocket spending will persist in many low-income
114 countries. Increasing prioritisation of health and economic development should be supported as key
115 mechanisms to increase government health spending and address persistent global inequities in health
116 spending. Given limited financial resources for health in all countries and persistently low levels of health
117 financing in some, it is critical to identify and implement policies to generate additional resources and
118 improve the efficiency of health spending to maximise health outcomes in the future.

Introduction

Financial resources are an essential input to health systems – at a minimum, these are necessary to purchase medicines and supplies, build health facilities, and pay health workers. However, limited financial resources are a universal constraint faced by all health systems. The World Health Organization (WHO) has identified health financing as one of the six key building blocks of health systems and adequate financing is essential to the other five blocks.¹ Health financing systems are tasked not only with raising sufficient financial resources to fund the health system, but with doing so in a way that promotes equity.² Health systems funded according to one's ability to pay, such as those based on income taxes, promote both financial equity and better health.³ Over-reliance on out-of-pocket spending diminishes access to care for those who are uninsured or underinsured, and risks exacerbating the burden of ill health and increasing poverty due to the high cost of care.⁴ The recognized importance of financial protection has led to its inclusion as one of two pillars of universal health coverage (UHC), alongside coverage of core health services.⁵

Empirical studies have shown that reducing government health spending per capita can lead to increased child, adult, and maternal mortality.⁶⁻⁹ Other research has found that countries with lower levels of health spending coming from pooled financing mechanisms, such as insurance or tax-based financing, have lower performance on UHC.¹⁰ These benefits and the established risks of high out-of-pocket spending have led to a focus on the composition of sources of health financing across countries. The “health financing transition” is a theory developed to characterize the gradual shift in the level and source of health financing observed in countries over time. In general, countries start this transition with a low initial level of health spending per capita that is largely out-of-pocket or from donors, and, progressively, transition to higher per capita spending relying more on government financing.

A prerequisite for assessing the performance of health financing systems and financial protection, characterizing progress along the health financing transition, evaluating health system efficiency and productivity, or advocating for health system policy change is tracking financial resources for health. Moreover, developing future health financing scenarios enables policy makers and donors to predict the amount of services that can be provided and identify gaps where expected funding is insufficient. Established frameworks and examples from a range of countries underscore the critical role of timely and comprehensive health financing estimates in decision-making and analysis.^{11,12} As countries work toward global commitments to UHC and the other health-related targets enshrined in the Sustainable Development Goals (SDGs), the expected resources available for health can be used to assess expected progress.¹³ In the absence of comprehensive and comparable health financing estimates, policy makers and planners cannot clearly measure how much has been spent on health, where that funding has come from, or what are reasonable expectations for future spending.

This study incorporates several important methodological advancements and novel analyses not included in previously published research. The health financing estimation methods are continuously improving and forecasting is particularly enhanced by advances in the underlying approach to project gross domestic product (GDP). The time horizon for spending forecasts is ten years longer than previously available and alternative future scenarios are based for the first time on a new understanding of factors associated with increased government spending, as identified from the decomposition analysis, also new in this study. In addition, these estimates include 7 additional countries or territories not previously included. There are

also several advances specific to the development assistance for health (DAH) estimates, including the addition of China as a donor, the inclusion of the Coalition for Epidemic Preparedness Innovations and the European Economic Area as channels of disbursements, and spending disaggregated by new program areas, such as drug resistance/antimicrobial resistance (AMR).

The objective of this research is to provide comprehensive and comparable national health spending estimates, by four major sources of funding, from the past (1995) to the present (most recent estimates for 2016) and into the future (2050), emphasizing equity in spending across countries over time. This incorporates key trends in domestic spending, from government, out-of-pocket, and other private sources, along with DAH provided by key development agencies to 156 recipient countries. We also characterise health spending patterns associated with economic development to assess support for the theory of the health financing transition; analyse factors associated with increases in government health spending; and report expected future spending under two alternative government spending scenarios. These findings highlight large disparities in health spending across income groups and the problematic persistence of this gap over time.

Methods

Overview

The methods presented here summarize the various components of the estimation process; interested readers are encouraged to consult the appendix for additional details on data sources, methods, and for additional results presented in alternative units. “Health spending” is defined as money spent on services, supplies, and basic infrastructure to deliver health care, using the same definition employed by the System of Health Accounts 2011 and the WHO Global Health Expenditure Database (GHED).^{14,15} Health “financing” and “funding” are used interchangeably to refer to the source, as opposed to the utilization, of financial resources. “Economic development” refers to GDP per capita.

We estimated health spending from four main sources – government, out-of-pocket, prepaid private, and DAH – for 195 countries and territories. For brevity, “countries and territories” are referred to only as “countries”, all of which are categorized into four World Bank income groups (high-, upper-middle-, lower-middle-, and low-income) and seven Global Burden of Disease (GBD) super-regions (Central Europe, Eastern Europe, and Central Asia; GBD high income; Latin America and Caribbean; North Africa and Middle East; South Asia; Southeast Asia, East Asia, and Oceania; and sub-Saharan Africa). Data tracking government, out-of-pocket, and prepaid private health spending, which together comprise total domestic health spending, were available from 1995 through 2016. Government health spending includes social health insurance and mandated private health insurance, as well as government public health programmes. Out-of-pocket health spending includes health care spending paid by the patient or his or her household, excluding insurance premiums paid in advance of care. Prepaid private health spending includes voluntary private insurance and non-governmental agency spending on health.

Estimates of DAH, defined as the financial and in-kind contributions from major development agencies to low- and middle-income countries for the purpose of maintaining or improving population health, were generated from 1990 through 2018, although transfers to recipient countries can only be estimated until 2017. In other words, the total amount of DAH, by source, is estimated through 2018, but is not allocated by recipient country for 2018. The sum of domestic health spending and DAH, net of the administrative

costs needed to run the development agencies, form the envelope of total health spending for each country and year.

Domestic health spending from each of the three sources was projected for each country from 2017 to 2050, and DAH was projected from 2018 to 2050, by modelling rates of change across time. These models incorporate country-specific time trends that attenuate across time and converge to the global average, consider a broad set of covariates and time-series modelling techniques, and propagate four types of uncertainty - model, data, parameter, and fundamental uncertainty.

Estimating domestic health spending: 1995–2016

We extracted data on gross domestic product (GDP) per capita from five leading sources of these estimates (World Bank, International Monetary Fund [IMF], United Nations, Penn World Tables, and Maddison)^{16–20} and built from methods described by James and colleagues to generate a single series of GDP per capita using Gaussian processes. This method incorporated data from all five GDP series and also propagated uncertainty through the estimates.²¹ The resulting series spans 195 countries from 1970 to 2017, and larger uncertainty intervals highlight countries where the input data from the five sources was discordant or estimates were missing.

We extracted data from the WHO's Global Health Expenditure Database (GHED) on government domestic revenue transfers allocated for health, compulsory prepayment, voluntary prepayment, social insurance contributions, and other domestic revenue from households, corporations, and non-profit institutions serving households.²² Data from GHED excludes spending on major investments such as hospital construction, health worker education and training, and research and development. Countries report these data and the data source to WHO; when possible, these are based on National Health Accounts, but alternative sources are used in many cases. Health spending estimates were extracted in current national currency units, deflated 2018 national currency units, and exchanged to 2018 US dollars. Deflator series and exchange rates used were based on those reported in the IMF World Economic Outlook.¹⁸

We estimated domestic government spending on health by aggregating transfers from government domestic revenue for health purposes, compulsory prepayment, and social insurance contributions. Then, to estimate domestic prepaid private health spending, we aggregated voluntary prepayment, other domestic revenues from non-profit institutions serving the household, and other domestic revenues from corporations. All payments by households other than social insurance contributions were designated as out-of-pocket spending. To generate domestic health spending estimates in purchasing-power parity-adjusted (PPP) dollars, we multiplied the health spending fractions by GDP per capita measured in 2018 PPP dollars.

The extracted data were evaluated for quality. Some of the extracted data points were not tied to an underlying data source and were estimated using a diverse set or poorly defined methods. Furthermore, for a given country, some data varied substantially across time. To overcome these concerns, we used a spatiotemporal Gaussian process regression model to estimate health spending across time, country, and spending category.²³ To prevent data with insufficiently described estimation methods or without data source identification from substantially influencing our model estimation, each data point was assessed and assigned a weight between one and five using the point-specific metadata provided in the GHED. We based weights on metadata completeness, documented source information, and documented methods for estimation. The distribution of data points assigned to each of the five data quality scores, by country

income group, is presented in the appendix. Our guidelines for assessing the metadata, a detailed description of how the weights were created, and additional information about the spatiotemporal Gaussian process regression model can also be found in the appendix.

Estimating development assistance for health: 1990–2018

To track DAH, we relied on revenue data in financial statements, annual reports, budget documents, and project disbursement records reported by international development agencies such as the Organisation for Economic Co-operation and Development (OECD) Creditor Reporting System, the World Bank, the Global Fund, and major philanthropic entities like the Bill & Melinda Gates Foundation, Susan Thompson Buffet Foundation, and Rotary International.^{24–33} We used budget and commitment data to generate estimates for recent years for which disbursement data were not yet available; for most channels data extends to 2017 or 2018 so that at most one year of estimation was needed.

Our DAH estimates tracked disbursements from the originating donor (called the source); to the development agency responsible for disbursing the funds to the recipient country (called the channel); to the recipient country. We used revenue and disbursement data to count only once the transfers between development agencies to limit double counting. In addition to reporting the source, channel, and recipient of DAH, spending was disaggregated into nine major health focus areas (as well as more detailed programme areas) by searching project titles and descriptions for keywords, as well as using other indicators in the data. Health focus areas included HIV/AIDS; malaria; tuberculosis; reproductive and maternal health; newborn and child health; non-communicable diseases; other infectious diseases; sector-wide approaches and health system strengthening; and other. The “Other” category captured projects such as general support for a conference on the Millennium Development Goals that were not allocated to any of the eight specific health focus areas; remaining funds for which no project descriptions were available were classified as “unallocable.” The list of keywords used to isolate relevant health projects for each of the health focus areas are included in the supplemental appendix.

While the majority of the methods used for tracking DAH have been described previously, we incorporated several major improvements.^{34–38} These include (i) the addition of China as a source of funding; (ii) the inclusion of the Coalition for Epidemic Preparedness Innovations as a channel; and (iii) the addition of antimicrobial resistance as a programme area.³⁹ The estimate we generated for antimicrobial resistance is restricted to funds that were disbursed through development agencies. These improvements expand the scope of our DAH resource tracking to capture some of the emerging areas of importance in the current global health financing landscape. For all DAH tracking, we include on funds that were transferred through major development agencies included in our research, as well as private foundation and non-governmental agencies for whom we have data. This definition of DAH excludes spending on basic bench science which may have down-stream effects on the development of new drugs. Detailed descriptions of the methodology used for these improvements, including data sources and keywords used to isolate relevant projects, are included in the appendix.

Factors associated with changes in government health spending: 1995–2016

We completed a decomposition analysis to understand the relationship between changes in per capita government health spending between 1995 and 2016 and underlying factors that may have contributed to these changes.

A standard demographic decomposition technique popularised by Das Gupta was applied; this approach yields estimates of how changes in each of a set of pre-specified factors are associated with changes in the outcome (government health spending per capita).⁴⁰ The three factors examined for their role in government health spending were: (i) economic development, (ii) increased total government spending, and (iii) greater government prioritisation of the health sector. More specifically, we measured these three factors as (i) GDP per person ($\frac{GDP}{Total\ pop}$), (ii) the proportion of GDP that is government spending ($\frac{Gov}{GDP}$), and (iii) the proportion of total government spending spent on the health sector ($\frac{Gov\ Health}{Gov}$). The product of these three factors is government health spending per capita ($\frac{Gov\ Health}{Total\ pop}$).

$$\frac{Gov\ Health}{Total\ pop} \equiv \frac{GDP}{Total\ pop} \times \frac{Gov}{GDP} \times \frac{Gov\ Health}{Gov}$$

The three factors form a comprehensive set of factors, such that all other factors that influence government health spending must operate on or through one or more of the factors examined. For example, if the people of a country demand more health services or a population ages and requires more health services from the government, it must lead to an increase in total government spending or a reprioritization of the existing government spending towards health. This decomposition approach measures the relative contribution of each factor to changes in per capita government health spending during the time period examined. A detailed explanation of the decomposition analysis can be found in the supplementary appendix.

Estimating health spending in the future: 2017–2050

Future health spending scenarios were estimated using an ensemble modelling framework and key covariates. A process diagram in the supplementary appendix displays the flow of input data and models for each step of the forecasting process. Rather than using a single model, ensemble modelling estimates a large set of future scenarios using a large number of distinct sub-models, and then takes the average across all sub-models that pass pre-determined inclusion criterion.⁴¹ Each sub-model has a distinct specification or set of covariates. The primary covariates considered were GDP per capita, total government spending, total fertility rate, and fraction of the population older than 65 years, as well as country-specific time trends. Total fertility rates and age-specific population were extracted from the United Nations World Population Prospects, while we generated our own estimates of GDP per capita and fraction of GDP from government spending.⁴² These covariates were considered because estimates of these variables already exist through 2050 or because the covariate is believed to be a fundamental driver of health spending.

In order to project expected GDP per capita for each of the 195 countries from 2018 through 2050, we estimated the GDP per working-aged adult growth rate. Working-aged adult was set to be ages 20 through 64 years. Using out-of-sample validation, we showed that GDP per capita could be more accurately estimated (smaller root-mean-squared error) by estimating GDP per working-aged adult growth rates, rather than GDP per capita growth rates. Sub-models considered in the GDP per working-aged adult growth rate ensemble model included time components such as autoregressive and moving average terms, and a convergence term, which is the one-year lag of the non-differenced dependent variable, and a random country intercept. Inclusion of the convergence term allows for countries with more GDP per working-aged adult to have slower growth rates. We also accounted for the possibility that more recent

time trends are better predictors of the future by including sub-models that placed more weight on more recent data. The country-specific random intercepts estimate the country-specific time trends, conditional on all other factors included in the model. We attenuated country-specific time trends toward zero in order to progressively transition countries toward the global growth rate because the country-specific growth rates observed in the past are generated using a relatively short time span. We excluded sub-models with non-significant independent variables (p-value greater than 0.10), an estimated coefficient on the convergence term greater than zero, and predictions that fell outside the bounds of the historical growth rate of the predicted variable.

For each country, we selected the 10% of sub-models that had the lowest root-mean-squared-error in out-of-sample tests and generated 1,000 draws. The draws were simulated to capture multiple types of uncertainty. First, we propagated parameter uncertainty by randomly sampling from each sub-model's joint precision matrix. Second, we built our estimates from the best fit sub-models rather than relying on a single model. Finally, we propagated the empirical variation around the linear fit of the sub-model using a first-order random walk where the variance of the random walk was determined by the estimated residuals from the retrospective data.

After estimating GDP per capita, we used the same method to estimate future scenarios of (i) total government spending as a fraction of GDP, (ii) government health spending as a fraction of total government spending, (iii) prepaid private health spending as a fraction of GDP, and (iv) out-of-pocket health spending as a fraction of GDP. We called these our reference future scenarios. In addition, we estimated future scenarios of the share of health spending that was provided as DAH from each major donor country, which allowed us to estimate total DAH expected to be disbursed between 2019 and 2050. Next, we estimated the fraction of the total amount of DAH that we expected each low- and middle-income country to receive. Finally, if a country was projected to reach high-income status before 2050, then it was deemed ineligible to receive DAH from that year onward and DAH it was otherwise expected to receive was reallocated to all other countries eligible to receive DAH. The World Bank sets the threshold for high-income countries at GDP per capita of \$12,056, measured using the Atlas method. We used linear regression to convert this estimate to GDP per capita in 2018 US dollars based on market exchange rates, and found the threshold at which a country would be considered high-income to be GDP per capita of \$17,599. To estimate total health spending for each country and year, we added DAH received by countries to estimates of government, prepaid private, and out-of-pocket health spending.

Alternative future government health spending scenarios

To assess the potential for governments to generate more resources for health, we estimated two alternative future scenarios associated with higher government health spending: the first alternative scenario reflects increased prioritisation of the health sector, and the second reflects both increased overall government spending and increased government prioritisation of health. To generate the two scenarios, we assessed the observed 2016 fraction of government spending that was allocated to the health sector ($\frac{Gov\ Health}{Gov}$) and the fraction of GDP that is based on government spending ($\frac{Gov}{GDP}$) across the 195 countries. We then set the target levels of the two fractions as the 90th percentile of the observed fractions' distributions, which we believe is an aspirational yet attainable target for many countries. Building on the existing GDP per capita projections, scenario 1 adjusts all countries so that the fraction of government spending on health is at least the target fraction (ie the 90th percentile), and scenario 2 adjusts all countries so that both the fraction of government spending on health and the fraction of GDP that is

based on government spending is at least the target levels (again, the 90th percentiles). These scenarios measure how much a country's government would spend if it dedicated more resources to health and if it raised and spent more government resources, in addition to dedicating more of those resources to health.

Reporting and uncertainty analysis

All inflation-adjusted health spending estimates are reported using 2018 prices. Future values are not discounted. We report health spending per capita in US dollars and purchasing-power parity adjusted dollars and as a fraction of GDP. When not otherwise indicated, estimates are reported in 2018 US dollars. We report country spending estimates using 2017 Global Burden of Disease super-regions and 2018 World Bank income groups, regardless of whether a country changed, or is projected to change, income groups during the study period.^{43,44} Rates were calculated to reflect each group, rather than the average of countries within the group, such that spending per capita estimates for an income group or region more heavily reflect rates in more populous countries. The uncertainty interval around each estimate was computed using the 2.5th and 97.5th percentiles of the 1,000 draws. All analyses were done using R (version 3.5.2) and Stata (version 13).

Role of the funding source

The funder of this study had no role in study design, data collection, data analysis, data interpretation, or writing of the manuscript. All authors had full access to all the data in the study, and JLD and CJLM had final responsibility for the decision to submit for publication.

Results

This analysis focuses on the past, present, and future of global health financing. First, we present levels and trends in health spending for the historical period, from 1995 to 2016, and the analysis of factors contributing to increases in government health spending. Second, we highlight the role that DAH has played in providing resources for health, especially to low-income countries from 1990 to 2018. Third, we focus on health spending in 2016, and assess variations in the composition of financing sources across countries. Fourth, we present future scenarios of health spending, assessing levels and growth rates of health spending from 2017 to 2050, with an additional emphasis on 2030, given its significance as the target year for achieving the SDGs. Finally, we highlight observed and expected trends during the entire study period, from the past (1995) to the present (2016) and future (2050).

Past and Present

In 1995, health spending globally was \$3.5 trillion (95% uncertainty interval [UI] 3.4–3.5), \$4.3 trillion (4.2–4.4) in purchasing-power parity-adjusted dollars, 6.9% (6.8–7.0) of global GDP. At this time, 87.6% (87.1–88.1) were spent in countries that are currently high-income, 9.8% (9.4–10.3) in upper-middle-income, 2.2% (2.1–2.4) in lower-middle-income, and only 0.3% (0.3–0.4) in low-income countries. Health spending per capita globally was \$612 (603–622), ranging from \$5 (4–7) in Myanmar to \$7318 (5490–10192) in Bermuda (Figure 1a). Countries currently classified as high-, upper-middle, lower-middle, and low-income spent \$2871 (2823–2921), \$158 (150–166), \$38 (35–41), and \$30 (28–31) per capita on health in 1995, respectively. Health spending per capita was the lowest in South Asia and sub-Saharan Africa, with \$26

(21–31) and \$58 (54–62) per capita, respectively, and highest in Global Burden of Disease high income countries, with \$3206 (3151–3264) per capita.

Between 1995 and 2016, there was substantive growth in health spending in many countries, at a global growth rate of 4.0% annually (95% UI 3.9–4.1), although lower for health spending per capita (2.7% [2.6–2.8]) (Figure 1b, Figure 2, Table 1). Countries with the largest absolute increases in annual per capita health spending were the United States (\$4843 increase [4580–5125]), Norway (\$3913 [3501–4327]), and Bermuda (\$3485 [535–5916]), while spending increased less than \$1 per capita in 22 countries. The most of populous of these 22 countries are Venezuela, Yemen, and Angola. Figure 3 shows that the highest annual growth rates in per capita health spending were observed in upper-middle-income (5.6% [5.2–6.0]) and lower-middle-income countries (3.7% [3.1–4.3]); in upper-middle-income countries, the largest source of this increase was increased government health spending (6.9% [6.4–7.3]) and in lower-middle-income countries, the fastest growth was in DAH (4.3%). However, these groups of countries also saw rapid annual growth in out-of-pocket spending: 3.5% [2.6–4.5] in lower-middle-income countries and 4.6% [4.0–5.2] in upper-middle-income countries. Although DAH per capita increased rapidly at 6.7% annually in low-income countries, overall growth in health spending per capita remained low at 1.5% (1.1–1.8) per year in these countries. Across geographic regions, Southeast Asia, East Asia, and Oceania had the highest growth in health spending per capita (8.5% [7.7–9.3]) annually between 1995 and 2016, driven mainly by large growth in government and out-of-pocket spending (10.8% [9.9–11.6] and 7.3% [6.1–8.6]), while sub-Saharan Africa had the lowest growth (1.5% [1.1–2.0]), with only modest increases in government health spending (2.0% [1.4–2.5]) and out-of-pocket spending (0.6% [-0.1–1.4]). The noticeable negative growth (-3.5% [-3.8 to -3.2]) in prepaid private spending per capita in high-income countries is attributable to the enactment in 2014 of the insurance mandate in the United States' Affordable Care Act, which led to reclassifying a large proportion of health spending that was originally prepaid private spending as government health spending because this spending became compulsory.¹⁵

Governments play an important role in the changing landscape of health financing and globally, are the largest source of funds for health. Figure 4 highlights the amount of change in government health spending per capita between 1995 and 2016 that can be associated with each of three key factors. Globally, the primary factor driving increases in government health spending was greater prioritisation of the health sector, which was associated with an increase of \$299 (95% UI 287–311) in annual government spending on health per capita between 1995 and 2016. The other key factor driving growth in government health spending per capita globally was economic development, associated with a \$185 (165–207) increase per capita. Across regions and income groups, government prioritisation was the leading factor of change in high-income countries and North Africa and the Middle East, whereas economic development was the key factor in upper-middle-, lower-middle- and low-income countries; Central Europe, Eastern Europe, and Central Asia; South Asia; Southeast Asia, East Asia, and Oceania; and sub-Saharan Africa. Increases in total government spending also led to substantial increases in government health spending in upper-middle-income countries, and particularly in Southeast Asia, East Asia, and Oceania and Latin America and the Caribbean. The smallest increase in government health spending per capita was in low-income countries and especially in South Asia and sub-Saharan Africa; in both of these regions, economic development was the leading factor contributing to this growth.

Globally, health spending reached \$8.0 trillion (95% UI 7.8–8.1) in 2016, \$10.3 trillion (10.1–10.6) in purchasing-power parity-adjusted dollars, 8.6% (8.4–8.7) of global GDP in 2016. 81.0% (80.0–81.9) was spent in high-income, 15.7% (14.9–16.6) in upper-middle-income, 3.0% (2.7–3.3) in lower-middle-

income, and 0.4% (0.3–0.4) in low-income countries. 41.7% (40.9–42.5) of total health spending worldwide was spent in the U.S. alone. Health spending per capita increased to \$1077 (1058–1096), despite significant variation across regions and income groups (Figure 1b, Table 1). Per capita health spending in high-income countries was \$5252 (5184–5319), ranging from \$261 (208–326) in the Northern Mariana Islands to \$10802 (9469–12352) in Bermuda; and \$40 (38–43) in low-income countries, ranging from \$15 (13–17) in Somalia to \$106 (91–124) in Zimbabwe. Disparities persist across geographic regions, with per capita spending ranging from \$37 (29–48) in Bangladesh to \$84 (69–100) in Bhutan in South Asia, where health spending is the lowest (Table 1).

Figure 2 and Figure 6a collectively highlight the hypotheses made in the health financing transition.⁴⁵ Figure 2 shows the strong exponential relationship between GDP and health spending has persisted from 1995 to 2016. Figure 6a explores how the sources of health spending tend to evolve with economic development (similar figures showing this relationship in past and future years are provided in the supplementary appendix). Countries at a lower income level tend to have a higher proportion of out-of-pocket spending and DAH to finance the health sector, and as countries get wealthier, less of their health spending is financed by DAH. As the proportion of health spending that is DAH subsides, countries tend to fill the gap by further increasing out-of-pocket and government health spending, with an increasing proportion from government health spending as economic development increases. This trend can be seen by comparing the proportion of total spending from out-of-pocket spending in low-income and lower-middle-income countries: in 2016, lower-middle-income countries had the highest share of spending from out-of-pocket spending (56.1%, 47.3–65.4), even higher than that of low-income countries (42.4%, 38.3–47.0), because the latter also has a high share of spending from DAH (25.4%, 23.9–26.8). Despite this global pattern, Figure 6b highlights the wide variation in the proportion of health spending that is from the government: 79.6% (78.2–81.1) of all spending in high-income countries come from government health spending, 53.9% (49.9–58.6) in upper-middle-income, 32.1% (28.4–36.1) in lower-middle-income, and 26.3% (23.3–29.5) in low-income countries. The wide variation exists even for countries at similar levels of GDP per capita. Among low-income countries, the proportion of health spending from government ranges from 5.7% (95% UI 3.9–7.9) in Afghanistan to 61.9% (51.7–72.2) in North Korea; from 14.5% (10.6–19.2) in Nigeria to 84.1% (79.9–87.5) in the Federated States of Micronesia among lower-middle-income countries; 15.8% (12.5–19.7) in Armenia to 90.1% (86.5–93.0) in American Samoa among upper-middle-income countries; and 29.1% (25.1–33.0) in Bermuda to 100.0% (100.0–100.0) in Greenland among high-income countries.

Development assistance for health

While government health spending did not grow substantially in countries that are currently low-income, DAH had the fastest growth in health spending per capita in these countries (Figure 3). Figure 5 (a-c) shows that in 1990, total DAH disbursed to low- and middle-income countries was \$7.7 billion. Between 1990 and 2000, DAH increased at 5.7% annually, while between 2000 and 2010, DAH increased at 10.0% annually. More recently, DAH disbursement has leveled, with annual growth from 2010 through 2018 estimated to be 1.3%.

In 2018, total DAH reached \$38.9 billion, with the United States as the largest source of contributions in terms of volume, providing \$13.2 billion (33.8% of total DAH), the United Kingdom as the second largest contributing source providing \$3.3 billion (8.4%), and the Bill & Melinda Gates Foundation as the third largest contributing source, providing \$3.2 billion (8.3%) (Figure 5a). Despite having a lower income per

capita compared to all other national contributors, China provided \$644.7 million of DAH in 2018. Figure 5b shows the annual total DAH by disbursing agency. The largest multilateral and public-private partnerships that disbursed DAH in 2018 included the Global Fund (\$3.2 billion; 8.2% of the total disbursed), WHO (\$2.6 billion, 6.6%), and United Nations Children’s Fund (UNICEF) (\$1.9 billion, 4.9%). The Coalition for Epidemic Preparedness Innovation disbursed \$71.0 million.

Figure 5c highlights the annual total DAH targeted to different health focus areas over time. While all health focus areas tracked in this study have more DAH targeting them now than in 1990, this growth has been especially acute for funding allocated to HIV/AIDS, malaria, and tuberculosis, all of which grew at more than 20% per year between 2000 and 2010 (Figure 5d). More recently, DAH targeting newborn and child health has grown most quickly – 6.2% annually between 2010 and 2018, during which time, DAH for HIV/AIDS has reduced, with an annualized decline of 2.0% per year between 2010 and 2018, or a reduction of \$1.7 billion since its peak in 2012. Still, in 2018, HIV/AIDS receives more DAH than any other health focus area (24.3% of the total). Newborn and child health, sector-wide approaches/health sector support (SWAps/HSS), and reproductive and maternal health received the second, third, and fourth most DAH in 2018, with \$7.8 billion (20.1%), \$5.6 billion (14.3%), and \$4.7 billion (12.1%), respectively. In 2018, we estimated that \$48.3 million targeted antimicrobial resistance.

Future

Sustained growth in health spending is expected to continue, with global spending projected to reach \$10.6 trillion (95% UI 10.2–10.9) in 2030 and \$15.0 trillion (14.0–16.0) in 2050 (Table 2, Figure 1c, Figure 1d). In purchasing-power parity-adjusted dollars, these values are \$14.3 (13.7–15.0) in 2030 and 21.3 (19.8–23.1) in 2050. In relation to global GDP, these are 8.9% (8.4–9.4) in 2030 and 9.4% (7.6–11.3) in 2050. Despite this growth, health spending is expected to remain skewed, with 69.4% (67.2–71.5) of this spending in countries that are currently considered high-income, 25.1% (23.1–27.1) in upper-middle-income, 4.9% (4.4–5.5) in lower-middle-income, and only 0.6% (0.6–0.7) in low-income countries in 2050. In per capita terms, projected total health spending is \$1264 (1219–1309) per capita in 2030 and \$1667 (1567–1767) per capita in 2050, globally. Per capita spending in 2030 is projected to be \$6313 (6135–6499), \$772 (707–847), \$121 (108–137), and \$48 (44–51) for high-, upper-middle-, lower-middle-, and low-income groups, respectively. In 2050, this is projected to grow to \$8286 (7851–8725), \$1435 (1264–1632), \$200 (176–225), and \$66 (60–73) for these same four groups of countries. The fastest growth in per capita health spending is predicted among lower-middle- and upper-middle-income countries, with 2.6% (2.3–3.0) and 3.2% (2.8–3.6) annual growth projected between 2017 and 2050, respectively. Health spending per capita in 2050 is expected to stay the lowest in sub-Saharan Africa (\$111 [102–121]) and South Asia (\$180 [146–220]).

The two regions with the lowest projected total health spending growth rate between 2017 and 2050 are Global Burden of Disease high income and Central Europe, Eastern Europe, and Central Asia, with 1.4% (1.2–1.5) and 1.4% (1.3–1.6), respectively. Despite this similarity the health spending per capita growth rates are actually quite distinct (1.3% [1.2–1.5] and 1.8% [1.6–2.0]) because of differences in population growth. The impact of population projections has a large impact on health spending per capita growth rates (Table 2), Unlike Central Europe, Eastern Europe, and Central Asia where population growth is less than zero, meaning the population growth is well below replacement, population growth is expected to remain high in North Africa and Middle East, and especially sub-Saharan Africa. In this region, annualized

health spending growth between 2017 and 2050 is expected to be 3.1% (2.8–3.3), although health spending per capita growth is expected to be 1.0% (0.7–1.2).

Our future scenarios of government health spending (Figure 7) estimate the potential additional funding governments might be able to mobilise if the health sector is further prioritised and/or governments increase spending overall. In scenario 1, in 2050, increased prioritisation of health by governments could lead to an additional \$229 (95% UI 212–267) in health spending per capita, compared to the reference scenario. In scenario 2, in 2050, increased prioritisation of health and increased total government spending could lead to an additional \$617 (605–660) per person. In both scenarios, the potential increase in government health spending per capita is more than double what is projected in the reference scenario in some countries. Furthermore, these potential gains are proportionally greater in low- and lower-middle-income countries and south Asia and sub-Saharan Africa, given the low levels of government health spending in the reference scenario (Table 2).

Past to the present to the future

Examining the full set of results spanning 1995 to 2050, we observe three persistent trends. The first trend is an ongoing increase in health spending over time, as shown by the upward push in the curves in Figure 2. Countries at the same level of income that countries were at in the past tend to spend more than those other countries did, especially for higher levels of economic development. The second trend, seen across most regions and income groups is positive, albeit slowing, growth rates in health spending, as well as declining growth rates for population. Because population growth is generally dropping at the same or a faster rate than health spending, health spending per capita growth tends to be flat or increasing. Sub-Saharan Africa stands out in particular, as population growth is noticeably higher than elsewhere in the early 2000s, but is dropping over time, leading to a slowly increasing health spending per capita growth rate. The third trend is increasing disparities in total and government health spending, even among countries in the same income group. As shown in Figure 2, despite the fact that the majority of countries are moving upward over time to higher total health spending per capita, the gap between the smallest and the largest health spenders per capita has grown from \$7313 (6453–10185) in 1995, to \$10787 (9456–12335) in 2016, to a projected value of \$15806 (14654–16913) in 2050. Between income groups, in 1995, per capita health spending in high-income countries was 96.4 (91.3–101.6) times greater than the spending in low-income countries; the ratio increased to 130.2 (122.9–136.9) in 2016 and is projected to stay at similar levels, at 133.0 (123.7–142.4) in 2030 and 125.9 (113.7–138.1) in 2050. Figure 7 shows the changes in the distribution of government health spending per capita by income group over time. While there is clear overall shifting of distributions toward the upper end during the study period, accompanying this trend are the countries that are “left behind” from this positive shift and the large discrepancy in values between high-income and low-income countries, which are shown on different scales. Especially in low- and middle-income groups, the gap between countries with the highest and lowest government health spending per capita are projected to widen between now and the future.

Discussion

Globally, health spending has risen steadily since 1995, reaching \$8.0 (7.8–8.1) trillion in 2016 and projected to further increase to a total of \$15.0 (14.0–16.0) trillion by 2050, but at a slower rate of growth in the majority of countries. Health spending currently constitutes 8.6% (8.4–8.7) of the global economy,

with the largest proportions of this spending financed by governments and spent in high-income countries. The sub-Saharan Africa region and low-income countries currently have the lowest levels of spending, with 1.0% (0.9–1.0) and 0.4% (0.3–0.4) of the global total, respectively. The composition of health spending by financing source has changed and will continue to evolve in the future. In 2016, increased proportions of global health spending came from government (74.0% (72.5–75.5) and DAH (0.2% (0.2–0.2)), and decreased proportions from out-of-pocket (18.6% (18.0–19.4)) and prepaid private spending (7.2% [6.7–7.8]). However, DAH has plateaued since 2010, leading to a renewed emphasis on domestic resource mobilisation in recent years. By 2050, we project a problematic shift in this trend, with government health spending declining to 72.9% (68.4–77.5), and slight increases in out-of-pocket and prepaid private spending.

Sustaining growth in government health spending is important because this spending can provide funding for critical health services.⁴⁶ Furthermore, increased government health spending can also indirectly affect health outcomes by increasing household financial resources for other health determinants, such as food and education, as a result of reduced spending on health care.⁴⁷ Given that government spending is a source of pooled spending, it could also help spread the risk of financial burden due to healthcare across the population. This pooling is particularly important in light of the finding that OOP spending is projected to increase in many low- and middle-income countries. Financial protection is a core tenet of UHC and these projections suggest that many countries are not on track to adequately cover their populations. Achieving UHC, including financial protection, will require identifying additional resources for health or restructuring payment systems to reduce OOP.

Our future government health spending scenarios suggest that, with greater prioritisation of the health sector or increased total government spending, a drastic increase in government health spending per capita could be achieved, especially in countries currently with low levels of government health spending. The two scenarios assessed how much fiscal space there is and how much it could be expanded, though without considering other demands (such as debt) on government spending. This is consistent with findings from recent work by the WHO, which concluded that low-income countries have been lagging in the growth of government health spending in recent years.⁴⁸ The low ratio of tax revenue to GDP in many low-income countries exemplifies this challenge.⁴⁹ Furthermore, work by the OECD points to the difficulty of sustaining current patterns of health financing from public sources in the future. All future health spending projections account for the expected impact of population aging on health spending in two ways: by forecasting economic growth based on the size of the working-age population and by incorporating the proportion of the population over age 65, who have generally higher health costs, as a covariate in all forecasting models.

Patterns of past and projected health spending are useful for characterising countries' progress along the health financing transition.⁴⁵ This can be described as a rise in per capita health spending with a declining proportion from out-of-pocket and donor assistance. This is exemplified by the proportion of health spending that was out-of-pocket in 2016, which peaks among lower-middle-income countries (56.1% [47.3–65.4]). The term “missing middle” has been used to characterise the problematic situation for countries at a middle level of income – as they begin to receive less DAH and do not yet fill the gap in financing with government spending, and instead rely more on additional out-of-pocket spending.⁵⁰ In figure 6a, which shows this relationship cross-sectionally in 2016, the “missing middle” phenomenon appears to peak for countries between \$500 to \$1000 GDP per capita. Key strategies to help prevent countries from falling into this circumstance include expanding DAH as countries reach middle income

status or developing robust domestic health financing systems early in a country's economic development.

These results have important implications for policy, both at national and international levels. For the countries and regions projected to have the slowest increases in government and prepaid private spending, domestic health financing reforms that increase levels of prepaid resources should be a priority as these populations risk falling further behind in the global push toward UHC and in reducing child and adult mortality. Likewise, donors should consider these financing trajectories when making allocation decisions, possibly prioritising countries expected to have the slowest growth in domestic pooled spending. The projected persistence of severe global disparities in health spending requires the global community to consider and develop domestic and international policies that address the causes and effects of these inequities. High-income countries spent 130.2 (95% UI 122.9–136.9) times more on health per capita than low-income countries in 2016 and this trend is expected to continue into the future. The strong relationship between GDP per capita and health spending suggests that supporting economic development in the poorest countries is an important approach for improving equity in health financing across countries. There are many examples of countries that have substantially increased health spending as their economies have grown. Still, there are other important cases where countries that have increased health spending much faster than growth in their economy. These countries, such as China, South Korea, and Cuba, highlight what is possible with political will and investments in health.

While the beginning of the twenty-first century coincided with a period of substantial increase in resources dedicated toward global health goals, growth in overall DAH has plateaued more recently. Some health focus areas, such as HIV/AIDS and health systems strengthening, which has the potential to promote sustainable health systems in recipient countries, have had reductions in funding. Also of note is the relatively small share of DAH currently targeted at non-communicable diseases despite these diseases accounting for the majority of the global disease burden.⁵¹ven so, contributions from emerging donors such as China have the potential to provide new financing streams. Increasingly, China has become an important stakeholder in global health, including contributing substantially to the Ebola containment efforts in 2014 and the establishment of the Africa Center for Diseases and Control thereafter.^{39,52,53} Globally, other innovative financing mechanisms for pooling additional resources to leverage development assistance efforts have been established. For example, the Global Financing Facility was established in 2015 as a catalyst to align financing from international partners, the private sector, and country governments around country-owned investment cases related to reproductive, maternal, and child health.

As health spending growth rates decline or sources of funding plateau, it is especially critical to understand the factors that improve the efficiency of health spending. It is important to note that increases in health spending do not necessarily translate into improvements in access to care, quality of care, or health outcomes. Additional research is needed to identify policies, such as strengthening supply chains, and attributes of health systems and governments, such as reduced corruption, that lead to more efficient spending and improvements in intermediate outputs and outcomes of health systems. Understanding and implementing effective political and policy changes that support more efficient use of financial resources for health will help countries to better utilise limited resources to work toward UHC and improved population health. Furthermore, whether increasing health spending should be viewed positively or negatively (and therefore should be promoted or curbed) should be determined based on the broader context. It is less controversial to call for additional health spending in countries with very low health

spending, but some high-income countries are concerned about the continuous growth in health spending and are implementing policies to curb these trends.

Limitations

This study has some limitations. First, although we utilised estimation methods that account for challenges related to the reliability and completeness of publicly available historical global health spending data, we acknowledge that the input data had some weaknesses. For example, for certain countries the extracted data were not tied to an underlying data source or did not seem to have credible year-over-year trends. In these cases, we modelled domestic spending ourselves rather than relying on observed data. In addition, we used the definition of spending employed by the System of Health Accounts and the WHO GHED, which excludes investment spending, informal payments, and all spending that falls outside of the health system including cross-sectoral investments. Population estimates used to compute per capita values are subject to similar data limitations, and this is especially true for countries with civil unrest and large migration patterns. Second, uncertainty intervals provided throughout this paper reflect uncertainty in both the retrospective and prospective data. For the latter, the widening of uncertainty intervals as we push further into the future reflects the challenges in using data points from a short time span in the past to forecast into the future as well as incorporating unexpected future events and changes. Third, the out-of-sample predictive validity of our models was tested on the last ten years of observed data. This process determined the models picked for projecting growth rates. Therefore, our future scenarios are dependent on any observed shocks in the recent past, which would be difficult to predict out-of-sample. Similarly, forecasts are based on past trends and relationships, and our models cannot forecast events, such as natural disasters or unexpected events, that have never occurred. Fourth, our forecasts of available DAH rely primarily on growth in GDP, however we acknowledge that other political and commercial factors also drive the allocation of DAH from donors to recipient countries. Fifth, we were not able to measure health spending inequities within countries (such as those across subnational regions, income levels, ethnic groups, etc.). While some countries are projected to have large gains in health spending during the study period, the benefits are not likely to be distributed equally across subgroups. Country-specific context and determinants of health spending, such as domestic policies and political movements, are not discussed here but are critical when designing country-specific policies. Finally, our prediction models do not capture the dynamic nature of health spending, in that health spending leads to better health, which can also lead to economic growth.

The data going into our modelling were all prepared in US dollars. US dollars were seen to be more stable across countries and observed years than purchasing-power parity-adjusted dollars, and more comparable to existing studies. Each currency has strengths, but neither US dollars nor purchasing-power parity-adjusted dollars are a perfect measure. US dollars value spending most accurately for tradable goods, but purchasing-power parity-adjusted estimates provide a better reflection of domestic spending on non-tradeable goods and are better for cross-country comparisons. While neither of the currencies is measured perfectly in the data, having a more stable input to our models allowed us to produce more reliable estimates. Furthermore, there is no perfect method for currency conversion as the inputs (the deflator and exchange rates) as well as the methods (the order of operations) substantially influence the estimates.

Conclusions

Health spending per capita, which has increased steadily since 1995, is projected to continue increasing well into the future, but at a slower rate of growth, and large existing disparities in per capita spending by country are projected to persist in coming decades. Increasing prioritisation of health and total government spending are key factors to facilitate the health financing transition in all countries, whereby additional domestic resources are mobilised for health to gradually replace high out-of-pocket payments. Sustained increases in the quantity, equity, and efficiency of health financing are critical to achieving UHC and improving health outcomes globally.

Declaration of Interests

The declaration of interests section will be updated once all signed author forms and COIs have been collected.

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Citations

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Table and figure titles and notes

Table 1. Health spending by source, 2016

Estimates in parentheses are 95% uncertainty intervals. GBD=Global Burden of Disease. GDP=Gross domestic product.

Table 2. Health spending by source and alternative future scenarios of government health spending, 2050

Estimates in parentheses are 95% uncertainty intervals. GBD=Global Burden of Disease. GDP=Gross domestic product.

Figure 1. Health spending per capita in 1995, 2016, 2030, and 2050

Reported in inflation-adjusted 2018 US dollars. Grey signifies countries without estimates. 2030 and 2050 values are reference scenario. ATG=Antigua and Barbuda. VCT=Saint Vincent and the Grenadines. BRB=Barbados. COM=Comoros. DMA=Dominica. GRD=Grenada. MDV=Maldives. MUS=Mauritius. LCA=Saint Lucia. TTO=Trinidad and Tobago. TLS=Timor-Leste. SYC=Seychelles. W Africa=West Africa. E Med= East Mediterranean. MLT=Malta. SGP=Singapore. MHL=Marshall Islands. KIR=Kiribati. SLB=Solomon Islands. FSM=Federated States of Micronesia. VUT=Vanuatu. WSM=Samoa. FJI=Fiji. TON=Tonga. This figure was remade but with health spending measured as a percent of gross domestic product, and is included in the appendix.

Figure 2. Health spending per capita by gross domestic product per capita, 1995, 2016, 2030, and 2050

Health spending and gross domestic product per capita are reported in inflation-adjusted 2018 US dollars. The lines are the trend lines reflecting model fit for each year. 2030 and 2050 values are reference scenario. Each dot represents a country-year estimate, with the colours representing different years (1995, 2016, 2030, and 2050). The x-axis is presented in natural logarithmic scale. This figure was remade but with health spending measured as a percent of gross domestic product, and is included in the appendix.

Figure 3. Annualised rate of change in health spending per capita by source, by income group [A] and Global Burden of Disease super-region [B], 1995–2016

Black lines represent 95% uncertainty intervals. This figure was remade but with health spending measured as a percent of gross domestic product, and is included in the appendix.

Figure 4. Factors of change in government health spending per capita, 1995–2016

Change in government health spending per capita by global [A], high-income [B], and low- and middle-income countries [C], reported in inflation-adjusted 2018 US dollars. Black lines represent uncertainty intervals. Black dots represent the estimated change in government spending per capita. GBD=Global Burden of Disease.

Figure 5. Changes in development assistance for health disbursements, 1990–2018

Development assistance for health by source of funding [A], channel of assistance [B], health focus area [C], and annualised rate of change by health focus area [D].

Reported in billions of inflation-adjusted 2018 US dollars. World Bank includes the International Development Association and the International Bank for Reconstruction and Development (IBRD); and regional development banks include the Inter-American Development Bank, the African Development Bank, and the Asian Development Bank. NGOs=non-governmental organisations. CEPI=Coalition for Epidemic Preparedness Innovations. Gavi=Gavi, the Vaccine Alliance. WHO=World Health Organization. UNICEF=United Nations Children’s Fund. UNFPA=United Nations Population Fund. UNAIDS=Joint United Nations Programme on HIV/AIDS. PAHO=Pan American Health Organization. HSS=health sector support. SWAps=Sector-wide approaches. *Data for 2018 are preliminary estimates based on budget data and estimation.

Figure 6. Economic development and the composition of health spending by source and proportion of health spending from the government, 2016

Composition by source [A] and proportion of health spending from government [B]. Each dot represents a country colour-coded by World Bank income group. Gross domestic product per capita reported in inflation-adjusted 2018 US dollars. The x-axes are presented in natural logarithmic scale.

Figure 7. Distribution of government health spending per capita, global and by income group, 1995, 2016, 2030, 2050, and two future scenarios

Reported in inflation-adjusted 2018 US dollars. 2050 scenario 1 reflects the increase in government health spending if all countries met the target proportion of government spending on health. 2050 scenario 2 reflects the increase in government health spending if all countries met the target proportion of government spending on health and target proportion of gross domestic product that is based on government spending. The x-axes are presented in natural logarithmic scale. This figure was remade but with health spending measured as a percent of gross domestic product, and is included in the appendix.

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