Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017

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Summary

Background Efforts to establish the 2015 baseline and monitor early implementation of the UN Sustainable Development Goals (SDGs) highlight both great potential for and threats to improving health by 2030. To fully deliver on the SDG aim of "leaving no one behind", it is increasingly important to examine the health-related SDGs beyond national-level estimates. As part of the Global Burden of Diseases, Injuries, and Risk Factors Study 2017 (GBD 2017), we measured progress on 41 of 52 health-related SDG indicators and estimated the health-related SDG index for 195 countries and territories for the period 1990–2017, projected indicators to 2030, and analysed global attainment.

Methods We measured progress on 41 health-related SDG indicators from 1990 to 2017, an increase of four indicators since GBD 2016 (new indicators were health worker density, sexual violence by non-intimate partners, population census status, and prevalence of physical and sexual violence [reported separately]). We also improved the measurement of several previously reported indicators. We constructed national-level estimates and, for a subset of health-related SDGs, examined indicator-level differences by sex and Socio-demographic Index (SDI) quintile. We also did subnational assessments of performance for selected countries. To construct the health-related SDG index, we transformed the value for each indicator on a scale of 0–100, with 0 as the 2·5th percentile and 100 as the 97·5th percentile of 1000 draws calculated from 1990 to 2030, and took the geometric mean of the scaled indicators by target. To generate projections through 2030, we used a forecasting framework that drew estimates from the broader GBD study and used weighted averages of indicator-specific and country-specific annualised rates of change from 1990 to 2017 to inform future estimates. We assessed attainment of indicators with defined targets in two ways: first, using mean values projected for 2030, and then using the probability of attainment in 2030 calculated from 1000 draws. We also did a global attainment analysis of the feasibility of attaining SDG targets on the basis of past trends. Using 2015 global averages of indicators with defined SDG targets, we calculated the global annualised rates of change required from 2015 to 2030 to meet these targets, and then identified in what percentiles the required global annualised rates of change fell in the distribution of country-level rates of change from 1990 to 2015. We took the mean of these global percentile values across indicators and applied the past rate of change at this mean global percentile to all health-related SDG indicators, irrespective of target definition, to estimate the equivalent 2030 global average value and percentage change from 2015 to 2030 for each indicator.

Findings The global median health-related SDG index in 2017 was 59·4 (IQR 35·4–67·3), ranging from a low of 11·6 (95% uncertainty interval 9·6–14·0) to a high of 84·9 (83·1–86·7). SDG index values in countries assessed at the subnational level varied substantially, particularly in China and India, although scores in Japan and the UK were more homogeneous. Indicators also varied by SDI quintile and sex, with males having worse outcomes than females for non-communicable disease (NCD) mortality, alcohol use, and smoking, among others. Most countries were projected to have a higher health-related SDG index in 2030 than in 2017, while country-level probabilities of attainment by 2030 varied widely by indicator. Under-5 mortality, neonatal mortality, maternal mortality ratio, and malaria indicators had the most countries with at least 95% probability of target attainment. Other indicators, including NCD mortality and suicide mortality, had no countries projected to meet corresponding SDG targets on the basis of projected mean values for 2030 but showed some probability of attainment by 2030. For some indicators, including child malnutrition, several infectious diseases, and most violence measures, the annualised rates of change required to meet SDG targets far exceeded the pace of progress achieved by any country in the recent past. We found that applying the mean global annualised rate of change to indicators without defined targets would equate to about 19% and 22% reductions in global smoking and alcohol consumption, respectively; a 47% decline in adolescent birth rates; and a more than 85% increase in health worker density per 1000 population by 2030.

Interpretation The GBD study offers a unique, robust platform for monitoring the health-related SDGs across demographic and geographic dimensions. Our findings underscore the importance of increased collection and analysis of disaggregated data and highlight where more deliberate design or targeting of interventions could accelerate progress in attaining the SDGs. Current projections show that many health-related SDG indicators, NCDs, NCD-related risks, and violence-related indicators will require a concerted shift away from what might have driven past gains—curative interventions in the case of NCDs—towards multisectoral, prevention-oriented policy action and investments to achieve SDG aims. Notably, several targets, if they are to be met by 2030, demand a pace of progress that no country has achieved in the recent past. The future is fundamentally uncertain, and no model can fully predict what breakthroughs or events might alter the course of the SDGs. What is clear is that our actions—or inaction—today will ultimately dictate how close the world, collectively, can get to leaving no one behind by 2030.

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Research in context

Evidence before this study

Measuring country progress on the UN's Sustainable Development Goals (SDGs) has been an important international priority since the SDGs were introduced in 2015. The UN, the Sustainable Development Solutions Network, WHO, and the World Bank also report on the SDGs, but their analyses do not consistently measure indicators for each location and year. The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2015 estimated 33 health-related SDG indicators and the overall health-related SDG index from 1990 to 2015 for 188 countries. In GBD 2016, the number of indicators included was expanded to 37, and projections of health-related SDG achievement in 2030 were estimated for the first time. The ability of decision makers, particularly at the national level, to adequately monitor progress on the health-related SDGs and budget and plan for the future is potentially hampered by the scarcity of disaggregated data, such as by subnational unit, sex, and socioeconomic level. Complete estimates of SDG progress at these levels are needed to identify, and target programmes to, the populations that are most at risk of falling behind.

Added value of this study

GBD 2017 provides consistent, comparably generated estimates of the health-related SDG indicators for 195 countries and territories from 1990 to 2017. Additionally, GBD 2017 provides, for the first time, estimates of health-related SDGs at the subnational level for select countries and by sex. Newly estimated indicators in GBD 2017 include health worker density per 1000 population (SDG indicator 3.c.1), sexual violence by non-intimate partners (SDG indicator 5.2.2), and population census status (SDG indicator 17.19.2a), as well as disaggregation of SDG indicator 16.1.3 into prevalence of physical violence (SDG indicator 16.1.3a) and sexual violence (SDG indicator 16.1.3c) following the March, 2018, refinements accepted by the UN Statistical Commission. Measurement improvements included reporting on prevalence of current smoking rather than of daily smoking to better align with the UN's definition and internally consistent, systematic estimation of adolescent birth rates within the broader GBD study. We used a forecasting platform that systematically captures the effects of independent drivers of population health into the future to generate projections through 2030. On the basis of past trends, we assessed country-level probabilities of attainment for SDG indicators with defined targets. We also calculated the rates of change required to meet defined SDG targets at the global level from 2015 to 2030, and then compared them to annualised rates of change observed at the country level from 1990 to 2015; this analysis provided a way of benchmarking the pace of progress needed to meet ambitious SDG aims with what the world has achieved in the past. We then applied the mean percentile of the global required rates of change to all SDG indicators, providing a historically grounded foundation to evaluate progress for indicators without explicit targets and the relative feasibility of current ones.

Implications of all the available evidence

Most countries were projected to improve their health-related SDG index scores by 2030, although our results revealed gaps in potential progress at and beyond the national level. This information is urgently needed to inform strategies for attaining SDG targets, which for many countries will require rates of progress that are faster than rates achieved in the recent past. Most countries already have national action plans in place for, and are in a better position to meet indicator targets that have origins in, the Millennium Development Goals, whereas the SDGs have not been similarly operationalised in many national policies. In the remaining years of the SDG era, it is crucial that governments and international institutions invest in and implement SDG-related programmes and continue to monitor inequalities in the health-related SDGs within populations to truly deliver on the promise of leaving no one behind.

Introduction

During the early years of implementation of the UN's Sustainable Development Goals (SDGs), which were adopted in 2015,[1] various international efforts have sought to galvanise faster progress towards the SDGs' bold aims. A recent example includes WHO's 13th General Programme of Work (GPW13) for 2019–23,[2] which involves an ambitious agenda of measurable goals and interconnected strategies to ensure healthy lives and wellbeing for people of all ages. The GPW13 has three strategic priorities that will be measured by existing, or composites of existing, SDG indicators: achieving universal health coverage (UHC), addressing health emergencies, and promoting healthier populations.[3]

We are in the third year of the SDG era, and progress towards the world-changing aspirations of the SDGs remains a gradual, ongoing process. Although, for some indicators, many countries have maintained the pace of progress made during the era of the Millennium Development Goals, for other indicators, countries have seen gains slow.[4–7] These trends underscore the need to focus existing programmes and policies on the expanded scope of the SDG agenda. For instance, some countries in sub-Saharan Africa and Latin America will need to hasten progress against non-communicable diseases (NCDs) if corresponding SDG targets are to be met, and NCDs are a major component of the GPW13.[8,9] Although NCD prevention is a UN policy priority,[10] and many evidence-based policies and programmes exist to target NCDs, substantial implementation gaps remain. *The Lancet* has called for 2018 to be the year for action against NCDs,[9,11,12] and in the report Time to Deliver,[5,6] the WHO Independent High-Level Commission on Noncommunicable Diseases declared there is no excuse not to act.

The Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2015 was the first GBD effort to measure the health-related SDGs, producing estimates for 33 health-related SDG indicators and generating an overall measure, the health-related SDG index, from 1990 to 2015 for 188 countries.[13] For GBD 2016, this effort was expanded to include four additional SDG indicators, as well as projections of SDG attainment through 2030 based on past trends.[5] GBD 2016 also improved methods for measuring UHC service coverage.[5] Other organisations measure a subset of the health-related SDG indicators, but not consistently across locations and years.[4,6,7]

Although national SDG analyses can be useful for guiding health policy, the most vulnerable populations within countries are still at risk of being left behind. Country-level measures of population health likely mask disparities between and within subnational administrative divisions, particularly in low-income and middle-income countries.[14–18] National governments need subnational data to inform the localisation of global SDG policies and programmes, allowing decision makers to better target resource allocation and service delivery.[19,20] In many places, males and females also experience disparate risk exposures and corresponding health outcomes,[21] yet SDG reports do not typically provide data disaggregated by sex, with the exception of those on smoking prevalence. The Inter-agency and Expert Group on Sustainable Development Goal Indicators has requested that metadata be disaggregated by sex for 19 health-related SDG indicators,[22] and more detailed data will need to be collected and monitored to assess progress, identify high-risk populations, and develop targeted approaches to prevention and treatment. Although valuable, even data at this level might not be sufficient to capture inequalities underlying macro-level trends. Finally, in the absence of clearly defined targets, progress on several health-related SDG indicators cannot be benchmarked against SDG aims. Target setting is a complex process that requires a delicate balance of technical and political inputs; yet, without established targets, galvanising greater political and financial commitments to address health needs during the SDG era could be challenging.

In this study, we provide updated estimates for 41 of 52 health-related SDG indicators and the overall health-related SDG index for 195 countries and territories. For ten indicators, we compare progress from 1990 to 2017 by sex and by Socio-demographic Index (SDI), a composite measure of overall development. Using past trends, we project global progress and analyse attainment of the health-related SDGs through 2030. These estimates will provide a benchmark against which the feasibility of attaining SDG targets by 2030 can be assessed on the basis of what countries have achieved in the past. Compared with GBD 2016, GBD 2017 includes four additional health-related SDG indicators and improves the measurement of some previously included indicators. This analysis can support global efforts, such as the monitoring of the GPW13, and national-level decision making by international institutions, policy makers, and national governments who implement the health-related SDGs.

Methods

Overview of GBD

Each year, the GBD study produces age-specific, sex-specific, and location-specific estimates of all-cause and cause-specific mortality, non-fatal outcomes, overall disease burden (ie, disability-adjusted life-years), and risk factor exposure and attributable burden from 1990 to the current study year.

This analysis of the health-related SDGs is based on GBD 2017 estimates. Broader GBD 2017 methods are described elsewhere,[21,23–27] while further detail on data sources and estimation approaches used for this analysis are available in appendix 1 (part 1). We used previously established GBD methods to generate indicator-specific estimates for 1990–2017, including the Cause of Death

See Online for appendix 1

Ensemble model for causes of death,[23,28] DisMod-MR for many non-fatal causes,[26,29] and spatiotemporal Gaussian process regression for most risk factor exposures, measures of intervention coverage, and other SDG indicators (eg, well-certified death registration [SDG indicator 17.19.2c]).[21,30]

Each year, GBD includes subnational analyses for a few new countries and continues to provide subnational estimates for countries that were added in previous cycles. Subnational estimation in GBD 2017 includes five new countries (Ethiopia, Iran, New Zealand, Norway, Russia) and countries previously estimated at subnational levels (GBD 2013: China, Mexico, and the UK [regional level]; GBD 2015: Brazil, India, Japan, Kenya, South Africa, Sweden, and the USA; GBD 2016: Indonesia and the UK [local government authority level]). All analyses are at the first level of administrative organisation within each country except for New Zealand (by Māori ethnicity), Sweden (by Stockholm and non-Stockholm), and the UK (by local government authorities). All subnational estimates for these countries were incorporated into model development and evaluation as part of GBD 2017. To meet data use requirements, in this publication we present all subnational estimates excluding those pending publication (Brazil, India, Japan, Kenya, Mexico, Sweden, the UK, and the USA); these results are presented in appendix tables and figures (appendix 2). Subnational estimates for countries with populations larger than 200 million (as measured with our most recent year of published estimates) that have not yet been published elsewhere are presented wherever estimates are illustrated with maps, but are not included in data tables.

See Online for appendix 2

The GBD study uses standardised and replicable methods that comply with the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER).[31] Analyses were done with R version 3.4.4, Python version 2.7.14, or Stata version 13.1. The entire GBD time series is updated annually with improved methods and data sources, and thus GBD 2017 findings, including the SDG analysis presented here, supersede all previous GBD publications.

Indicators, definitions, and measurement approaches

The health-related SDG indicators are shown in table 1. GBD 2017 assesses four more indicators than assessed in GBD 2016. The first is health worker density (SDG indicator 3.c.1), which is defined by the UN as health workers per 1000 population, by cadre of health worker. For this analysis, we report estimates for three main groups of health workers: physicians, nurses and midwives, and pharmacists. We used International Standard Classification of Occupations (ISCO) 88 to map cadres of health workers from multiple data sources and coding systems, resulting in comparable and consistently defined groupings of health workers over time and across locations (appendix 1 part 1).

The second new indicator is sexual violence by non-intimate partners (SDG indicator 5.2.2), which is defined as the prevalence of females aged 15 years and older who have been subjected to sexual violence by non-intimate partners in the past 12 months. The third is the separate reporting of the prevalence of physical and sexual violence (SDG indicator 16.1.3). In March, 2018, the UN Statistical Commission approved refinements to SDG indicator 16.1.3, such that the indicator is now defined as the "proportion of population subjected to (a) physical violence, (b) psychological violence, and (c) sexual violence in the previous 12 months".[32,33] Following the GBD precedent of measuring each component of an SDG indicator (eg, reporting separately on child wasting and overweight [SDG indicators 2.2.2a and 2.2.2b] and on sanitation and access to handwashing facilities [SDG indicators 6.2.1a and 6.2.1b]),[5,13] we report the prevalence of physical violence and that of sexual violence separately. Owing to measurement challenges and data sparsity, we did not measure the prevalence of psychological violence.

The final new indicator is population census status (SDG indicator 17.19.2a), which was defined as covered if a location had conducted a population and housing census within the past 10 years or had an established population registry that routinely captured nationally representative demographic information (appendix 1 part 1). To assess population census status, we used data compiled for GBD 2017 population estimates,[24] as well as all available data on population census implementation since 1980 and documentation of population registries.

As well as adding new indicators, we have improved the measurement of several previously reported indicators. For smoking prevalence (SDG indicator 3.a.1), we now report prevalence of current smoking (daily and occasional smokers) rather than only daily smoking to better align with the UN's definition (appendix 1 part 1). For vaccine coverage (SDG indicator 3.b.1), we include all eight vaccines in the aggregate measure for each location-year, rather than limiting the aggregate to vaccines expressly included in national vaccine schedules. Additionally, we now take the arithmetic, rather than the geometric, mean across the eight vaccines. These revisions allow better comparability across locations over time, avoid inadvertently penalising countries for introducing and scaling up new vaccines, and provide a better reflection of overall vaccine coverage for target populations.

The UHC service coverage index includes nine measures of coverage for a subset of interventions for communicable diseases and maternal and child health and the 32 causes that comprise the Healthcare Access and Quality (HAQ) Index (appendix 1 part 1). The HAQ Index is an overall measure of health-care access and quality based on risk-standardised death rates or mortality-to-incidence ratios from causes amenable to health care.[34] Following updated HAQ methods,[34] we used mortality-to-incidence ratios for cancers rather than risk-standardised death rates for the UHC

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
Goal 1: End poverty in all its forms everywhere						
Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social, and environmental shocks and disasters	Disaster mortality (1.5.1; same as indicators 11.5.1 and 13.1.1)	Death rate due to exposure to forces of nature, per 100 000 population	Yes	Existing datasets do not comprehensively measure missing persons and people affected by natural disasters; we thus report deaths due to exposure to forces of nature	Undefined	··
Goal 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture						
Target 2.2: By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children younger than 5 years, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older people	Child stunting (2.2.1)	Prevalence of stunting in children younger than 5 years, %	Yes	Stunting is defined as below –2 SDs from the median height-for-age of the WHO reference population. No indicator modifications are required	Eliminate by 2030	≤0·5%
Target 2.2 (as above)	Child wasting (2.2.2a)	Prevalence of wasting in children younger than 5 years, %	Yes	We have separated reporting for indicator 2.2.2 into wasting (2.2.2a) and overweight (2.2.2b). Wasting is defined as below –2 SDs from the median weight-for-height of the WHO reference population	Eliminate by 2030	≤0·5%
Target 2.2 (as above)	Child overweight (2.2.2b)	Prevalence of overweight in children aged 2–4 years, %	Yes	We have separated reporting for indicator 2.2.2 into wasting (2.2.2a) and overweight (2.2.2b). We used the IOTF thresholds because the WHO cutoff at age 5 years can lead to an artificial shift in prevalence estimates when the analysis covers more age groups. Furthermore, considerably more studies use IOTF cutoffs, which allowed us to build a larger database for estimating child overweight	Eliminate by 2030	≤0·5%
Goal 3: Ensure healthy lives and promote wellbeing for all at all ages						
Target 3.1: By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 livebirths	Maternal mortality ratio (3.1.1)	Maternal deaths per 100 000 livebirths in females aged 10–54 years	Yes	No indicator modifications required	Reduce to <70 deaths per 100 000 livebirths by 2030	<70 deaths per 100 000 livebirths
Target 3.1 (as above)	Skilled birth attendance (3.1.2)	Proportion of births attended by skilled health personnel (doctors, nurses, midwives, or country-specific medical staff [eg, clinical officers]), %	Yes	No indicator modifications required	Universal access (100%)	≥99%
Target 3.2: By 2030, end preventable deaths of newborns and children younger than 5 years, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 livebirths and under-5 mortality to at least as low as 25 per 1000 livebirths	Under-5 mortality (3.2.1)	Probability of dying before age 5 years, per 1000 livebirths	Yes	No indicator modifications required	Reduce to 25 deaths per 1000 livebirths or lower by 2030	≤25 deaths per 1000 livebirths
Target 3.2 (as above)	Neonatal mortality (3.2.2)	Probability of dying during the first 28 days of life, per 1000 livebirths	Yes	No indicator modifications required	Reduce to 12 deaths per 1000 livebirths or lower by 2030	≤12 deaths per 1000 livebirths
Target 3.3: By 2030, end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases	HIV incidence (3.3.1)	Age-standardised rate of new HIV infections per 1000 population	Yes	We report HIV incidence of all populations and in terms of age-standardised rates	Eliminate by 2030	≤0·005 per 1000 population
Target 3.3 (as above)	Tuberculosis incidence (3.3.2)	Age-standardised rate of tuberculosis cases per 100 000 population	Yes	No indicator modifications required	Eliminate by 2030	≤0·5 per 100 000 population

(Table 1 continues on next page)

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
(Continued from previous page)						
Target 3.3 (as above)	Malaria incidence (3.3.3)	Age-standardised rate of malaria cases per 1000 population	Yes	No indicator modifications required	Eliminate by 2030	≤0·005 per 1000 population
Target 3.3 (as above)	Hepatitis B incidence (3.3.4)	Age-standardised rate of hepatitis B incidence per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 3.3 (as above)	Neglected tropical diseases prevalence (3.3.5)	Age-standardised prevalence of the sum of 15 neglected tropical diseases, %	Yes	People requiring interventions against neglected tropical diseases is not well defined; thus, this indicator is revised to the sum of the prevalence of 15 neglected tropical diseases currently measured in the GBD study: human African trypanosomiasis, Chagas disease, cystic echinococcosis, cysticercosis, dengue, food-borne trematodiases, Guinea worm disease, intestinal nematode infections, leishmaniasis, leprosy, lymphatic filariasis, onchocerciasis, rabies, schistosomiasis, and trachoma	Eliminate by 2030	≤0·5%
Target 3.4: By 2030, reduce by one-third premature mortality from NCDs through prevention and treatment and promote mental health and wellbeing	NCD mortality (3.4.1)	Age-standardised death rate due to cardiovascular disease, cancer, diabetes, and chronic respiratory disease in populations aged 30–70 years, per 100 000 population	Yes	No indicator modifications required	Reduce by one-third by 2030	Reduce by one-third
Target 3.4 (as above)	Suicide mortality (3.4.2)	Age-standardised death rate due to self-harm, per 100 000 population	Yes	No indicator modifications required	Reduce by one-third by 2030	Reduce by one-third
Target 3.5: Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol	Substance abuse coverage (3.5.1)	Coverage of treatment interventions (pharmacological, psychosocial, and rehabilitation and aftercare services) for substance use disorders, %	No	Prevalence of specific substance use disorders (opioid, cocaine, amphetamine, and cannabis use disorders), as well as alcohol use disorders, are presently estimated as part of GBD. Efforts to extract and synthesise data on coverage of specific interventions (eg, opioid substitution therapy) are currently in progress as part of the broader GBD study	Undefined	··
Target 3.5 (as above)	Alcohol use (3.5.2)	Risk-weighted prevalence of alcohol consumption, as measured by the SEV for alcohol use, %	Yes	For this indicator, we include three categories of alcohol consumption because national alcohol consumption per capita does not capture the distribution of use. The SEV for alcohol use is based on two primary dimensions: individual-level drinking (current drinkers and lifetime abstainers, and alcohol consumption by age and sex) and population-level consumption (litre per capita of pure alcohol stock). The SEV then weights these categories with their corresponding relative risks, which translates to a risk-weighted prevalence on a scale of 0% (no risk in the population) to 100% (the entire population experiences maximum risk associated with alcohol consumption)	Undefined	··
Target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents	Road injury mortality (3.6.1)	Age-standardised death rate due to road injuries, per 100 000 population	Yes	No indicator modifications required	Reduce by one-half by 2020	Reduce by 50%
Target 3.7: By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes	Family planning need met, modern contra-ception methods (3.7.1)	Proportion of women of reproductive age (15–49 years) who have their need for family planning satisfied with modern methods, %	Yes	No indicator modifications required	Universal access (100%)	≥99%
Target 3.7 (as above)	Adolescent birth rate (3.7.2)	Number of livebirths per 1000 females aged 10–14 years or 15–19 years	Yes	No indicator modifications required	Undefined	··

(Table 1 continues on next page)

service coverage index to better approximate access to quality cancer care. Considerable updates were made to measurement of adolescent birth rate (SDG indicator 3.7.2), which was based on comprehensive estimates of population and fertility from GBD 2017,[24] as well as of fatal discontinuities (mortality due to natural disasters or conflict and terrorism), among other indicators. Further detail can be found in appendix 1 (part 1) and accompanying GBD 2017 papers.[21,23–27]

We report estimates for all health-related SDG indicators with both sexes combined and sex-specific estimates for HIV incidence (SDG indicator 3.3.1),

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
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Target 3.8: Achieve UHC, including financial risk protection, access to quality essential health-care services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all	UHC service coverage index (3.8.1)	Coverage of essential health services, as defined by the UHC service coverage index of nine tracer interventions and risk-standardised death rates or mortality-to-incidence ratios from 32 causes amenable to personal health care	Yes	Tracer interventions included vaccination coverage (coverage of three doses of DPT3, one dose of measles vaccine, and three doses of the oral polio vaccine or inactivated polio vaccine), met need for family planning with modern contraception methods, antenatal care coverage (one visit and four visits), skilled birth attendance coverage, in-facility delivery rates, and coverage of antiretroviral therapy among people living with HIV. The 32 causes amenable to personal health care, which compose the Healthcare Access and Quality Index, included tuberculosis, diarrhoeal diseases, lower respiratory infections, upper respiratory infections, chronic respiratory diseases, diphtheria, whooping cough, tetanus, measles, maternal disorders, neonatal disorders, colon and rectum cancer, non-melanoma skin cancer, breast cancer, cervical cancer, uterine cancer, testicular cancer, Hodgkin lymphoma, leukaemia, rheumatic heart disease, ischaemic heart disease, cerebrovascular disease, hypertensive heart disease, peptic ulcer disease, appendicitis, hernia, gallbladder and biliary diseases, epilepsy, diabetes, chronic kidney disease, congenital heart anomalies, and adverse effects of medical treatment. We then scaled these 41 individual inputs on a scale of 0–100, with 0 reflecting the worst levels observed between 1990 and 2017 and 100 reflecting the best observed during this time. We took the arithmetic mean of these 41 scaled indicators so as to collectively capture a wide range of essential health services pertaining to reproductive, maternal, newborn, and child health; infectious diseases; NCDs; and service capacity and access	Universal access (100%)	≥99%
Target 3.8 (as above)	Financial risk protection (3.8.2)	Proportion of population with large household expenditures on health as a share of total household expenditure or income, %	No	Comprehensive and comparable datasets on household expenditures on health as a fraction of total household expenditure or income are not currently available across all locations and over time. Efforts to quantify incidence of catastrophic health spending, at both 10% and 25% of total expenditure or income, for the full time series and locations included in the GBD study are currently under way	<10% or <25% of total expenditure or income	··
Target 3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination	Air pollution mortality (3.9.1)	Age-standardised death rate attributable to household air pollution and ambient air pollution, per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 3.9 (as above)	WaSH mortality (3.9.2)	Age-standardised death rate attributable to unsafe WaSH, per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 3.9 (as above)	Poisoning mortality (3.9.3)	Age-standardised death rate due to unintentional poisonings, per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 3.a: Strengthen the implementation of the WHO Framework Convention on Tobacco Control in all countries, as appropriate	Smoking prevalence (3.a.1)	Age-standardised prevalence of current smoking in populations aged 10 years and older, %	Yes	We report on populations aged 10 years and older	Undefined	··

(Table 1 continues on next page)

tuberculosis incidence (SDG indicator 3.3.2), hepatitis B incidence (SDG indicator 3.3.4), NCD mortality (SDG indicator 3.4.1), suicide mortality (SDG indicator 3.4.2), alcohol use (SDG indicator 3.5.2), road injury mortality (SDG indicator 3.6.1), poisoning mortality (SDG indicator 3.9.3), smoking prevalence (SDG 3.a.1), and homicide (SDG indicator 16.1.1). We selected indicators for sex-specific analysis according to the availability of GBD sex-specific data and the utility of presenting sex-specific data by indicator.

We used SDI,[35] a composite measure of overall development based on rescaled values of fertility, education, and income, to compare performance on the health-related SDGs across quintiles of overall development. For GBD 2017, SDI was updated to include only fertility rates for females younger than 25 years rather than total fertility rates.[24] The GBD 2017 population and fertility analysis found that total fertility demonstrates a U-shaped pattern with SDI at higher levels of development, whereas fertility in females younger than

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
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Target 3.b: Support the research and development of vaccines and medicines for communicable and NCDs that primarily affect developing countries; provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration on the TRIPS Agreement and Public Health, which affirms the right of developing countries to use to the full the provisions in the Agreement on Trade-Related Aspects of Intellectual Property Rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all	Vaccine coverage (3.b.1)	Coverage of eight vaccines in target populations, %	Yes	Vaccines included DPT3, both doses of measles vaccine (one dose and two doses, reported separately), polio (three doses), hepatitis B (three doses), *Haemophilus influenzae* type b (three doses), pneumococcal conjugate vaccine (three doses), and rotavirus vaccine (two or three doses). We then used the arithmetic mean of coverage of these eight vaccines to calculate overall vaccine coverage of target populations. For GBD 2017, we made some methodological updates for this measure. We now assess coverage for all eight vaccines for every location-year rather than limiting the aggregate to vaccines expressly included in national vaccine schedules. This revision allows for greater comparability across locations over time and helps to avoid overly penalising countries for introducing and scaling up new vaccines. As a result, we were able to remove the 3 year lag that had previously been used for new vaccine introduction; its original utility was to provide a window in which coverage could be scaled up before it counted towards the aggregate. By replacing all location-year estimates with 0% coverage before a given vaccine's introduction, any amount of scale-up now contributes to improved overall coverage for this indicator. We also now take the arithmetic mean across the eight vaccines rather than the geometric mean to avoid over sensitivity to the 0% estimates for vaccines that have yet to be introduced in a given location-year and to provide a more easily interpretable measure of overall vaccine coverage	Coverage of all target populations (100%)	≥99%
Target 3.b (as above)	Developmental assistance for research and health (3.b.2)	Total net official development assistance to the medical research and basic health sectors	No	Development assistance for health is currently assessed within a comprehensive, comparable analytical framework by source, channel, recipient country, and health focus area from 1990 to 2017; however, funding specifically for medical research (eg, research and development of vaccines and medicines, as described in Target 3.b) is not systematically available across source and recipient countries. Additionally, the appropriate assessment of country-level performance remains unclear (eg, whether countries that receive high levels of developmental assistance for medical research are equivalent, in terms of indicator performance, to countries that disburse high levels of developmental assistance for medical research)	Undefined	..
Target 3.b (as above)	Essential medicines (3.b.3)	Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis, %	No	Across all locations and over time, comparable data on the stocking and stock-out rates of essential medicines for all types of facility (hospitals, primary care facilities, pharmacies, and other health-care outlets) and facility ownership (public, private, and informal) are not currently available. In the absence of robust measures of stock-outs in both the public and private sectors across countries and over time, the measurement strategy for producing comparable results for this indicator is unclear. Furthermore, what should constitute a core set of relevant essential medicines is likely to vary by location based on its epidemiological profile, and thus work is needed to more precisely define what these core sets of relevant essential medicines should be given known disease burden, risk factor profiles, and health risks across countries. Lastly, the proposed indicator stipulates measurement of not simply access to a core set of essential medicines but also access to affordable medicines. No comprehensive and comparable datasets on the status of essential medicine affordability, in addition to their stocks, presently exist	Universal access (100%)	..
Target 3.c: Substantially increase health financing and the recruitment, development, training, and retention of the health workforce in developing countries, especially in least developed countries and small island developing States	Health worker density (3.c.1)	Health worker density per 1000 population, by cadre and summed across cadres	Yes	Three health worker cadres—physicians, nurses and midwives, and pharmacists—currently comprise indicator 3.c.1; they are reported separately and summed across cadres in this study. Cadres are categorised based on International Standard Classification of Occupations 88 codes, against which alternative or earlier classification schemes and codes are systematically mapped to produce comparable and consistent measures of cadres over time and across locations	Undefined	..

(Table 1 continues on next page)

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
(Continued from previous page)						
Target 3.d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction, and management of national and global health risks	IHR capacity (3.d.1)	The WHO-recommended measure of IHR capacity and health emergency preparedness is the percentage of 13 core capacities that have been attained at a specific time (IHR core capacity index). The 13 core capacities are: national legislation, policy, and financing; coordination and national focal point communications; surveillance; response; preparedness; risk communication; human resources; laboratory; points of entry; zoonotic events; food safety; chemical events; and radionuclear emergencies	No	Comprehensive and comparable data for all components of the IHR core capacity index, for all locations and over time, are not currently openly available. Self-evaluations have been undertaken by some member states, with a subset followed up with independent assessments via the Joint External Evaluation process. To date, 23 countries have completed this process and made reports fully available out of a total of 43 completed Joint External Evaluations. An additional 30 countries are scheduled for assessment by the end of 2018. As these data become more openly available it might be possible to model regional and temporal trends to obtain estimates for outstanding countries, but this will likely necessitate creating bespoke covariates relating to policy status and types of surveillance system that are not currently reported in the GBD study	Undefined	··
Goal 5: Achieve gender equality and empower all women and girls						
Target 5.2: Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation	Intimate partner violence (5.2.1)	Age-standardised prevalence of ever-partnered women aged 15 years and older who experienced physical or sexual violence by a current or former intimate partner in the past 12 months, %	Yes	Data on exposure to subtypes of violence are not systematically available across locations and over time; we thus report physical or sexual violence by a current or former intimate partner	Eliminate by 2030	≤0·5%
Target 5.2 (as above)	Non-intimate partner violence (5.2.2)	Age-standardised prevalence of women aged 15 years and older who experienced physical or sexual violence by a non-intimate partner in the past 12 months, %	Yes	Data on exposure to subtypes of violence are not systematically available across locations and over time; we thus report physical or sexual violence by a non-intimate partner	Eliminate by 2030	≤0·5%
Target 5.6: Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the International Conference on Population and Development and the Beijing Platform for Action and the outcome documents of their review conferences	Female informed reproductive health (5.6.1)	Proportion of women aged 15–49 years who make their own informed decisions regarding sexual relations, contraceptive use, and reproductive health care, %	No	The proportion of women who make their own informed decisions regarding all three dimensions of this indicator—sexual relations, contraceptive use, and reproductive health care—are included in the Demographic and Health Survey series. Data availability for non-Demographic and Health Survey countries is unclear. The feasibility of measuring this indicator as part of future iterations of the GBD study is being considered	Universal access (100%)	··
Target 5.6 (as above)	Reproductive health equal access (5.6.2)	Number of countries with laws and regulations that guarantee full and equal access to women and men aged 15 years and older to sexual and reproductive health care, information, and education	No	Across all locations and over time, comprehensive and comparable data documenting the status of laws and regulations regarding access to sexual and reproductive health care, information, and education currently do not exist. Compiling the past and current status of such laws and regulations might be possible; however, systematically assessing their depth or intensity, enforcement, and effectiveness in guaranteeing access to reproductive health care, information, and education might be challenging across locations and over time	Universal access (100%)	··
Goal 6: Ensure availability and sustainable management of water and sanitation for all						
Target 6.1: By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Water (6.1.1)	Risk-weighted prevalence of populations using unsafe or unimproved water sources, as measured by the SEV for unsafe water, %	Yes	Different types of unsafe water sources have correspondingly different relative risks associated with poor health outcomes; we thus report on the SEV for water, which captures the relative risk of different types of unsafe water sources and then combines them into a risk-weighted prevalence on a scale of 0% (no risk in the population) to 100% (the entire population experiences maximum risk associated with unsafe water)	Universal access to safe water (100%); 0% on the SEV for unsafe water	≤1%

(Table 1 continues on next page)

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
(Continued from previous page)						
Target 6.2: By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	Sanitation (6.2.1a)	Risk-weighted prevalence of populations using unsafe or unimproved sanitation, as measured by the SEV for unsafe sanitation, %	Yes	We have three mutually exclusive, collectively exhaustive categories for sanitation at the household level: households with piped sanitation (with a sewer connection); households with improved sanitation without sewer connection (pit latrine, ventilated improved latrine, pit latrine with slab, composting toilet), as defined by the Joint Monitoring Programme; and households without improved sanitation (flush toilet that is not piped to sewer or septic tank, pit latrine without a slab or open pit, bucket, hanging toilet or hanging latrine, shared facilities, no facilities), as defined by the Joint Monitoring Programme	Universal access to safe sanitation (100%); 0% on the SEV for unsafe sanitation	≤1%
Target 6.2 (as above)	Hygiene (6.2.1b)	Risk-weighted prevalence of populations without access to a handwashing facility, as measured by the SEV for unsafe hygiene, %	Yes	Access to a handwashing facility was defined as having an observed handwashing station with soap and water available in the household	Universal access to handwashing facility (100%); 0% on the SEV for hygiene	≤1%
Target 6.3: By 2030, improve water quality by reducing pollution, eliminating dumping, minimising the release of hazardous chemicals and materials, halving the amount of untreated wastewater, and substantially increasing recycling and safe reuse globally	Treated wastewater (6.3.1)	Proportion of wastewater safely treated, %. UN Water defines this indicator as the proportion of total wastewater generated by both households (sewage and faecal sludge) and economic activities (based on International Standard Industrial Classification categories) that is safely treated. Although the definition conceptually includes wastewater generated from all economic activities, monitoring will focus on wastewater generated from hazardous industries (as defined by relevant International Standard Industrial Classification categories).	No	Across all locations and over time, comprehensive and comparable data containing information about total wastewater, as generated by both households and non-household entities (however they are defined), and wastewater treatment status do not currently exist. UN Water suggests that there will be sufficient data to generate estimates of global and regional levels of safely treated wastewater by 2018; however, in the absence of more country-level data, it is difficult to determine the representativeness of such global and regional estimates	Halve the proportion of untreated wastewater	..
Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all						
Target 7.1: By 2030, ensure universal access to affordable, reliable, and modern energy services	Household air pollution (7.1.2)	Risk-weighted prevalence of household air pollution, as measured by the SEV for household air pollution, %	Yes	Existing datasets do not comprehensively measure population use of clean fuels and technology for heating and lighting across locations; we thus report on the exposure to clean (or unclean) fuels used for cooking	Universal access to improved fuels (100%); 0% on the SEV for household air pollution	≤1%
Goal 8: Promote sustained, inclusive, and sustainable economic growth; full and productive employment; and decent work for all						
Target 8.8: Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment	Occupational risk burden (8.8.1)	Age-standardised all-cause DALY rates attributable to occupational risks, per 100 000 population	Yes	This indicator is reported as DALY rates attributable to occupational risks because DALYs combine measures of mortality and non-fatal outcomes into a single summary measure, and occupational risks represent the full range of safety hazards that might be encountered in working environments	Undefined	..
Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable						
Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	Disaster mortality (11.5.1; same as indicators 1.5.1 and 13.1.1)	Death rate due to exposure to forces of nature, per 100 000 population	Yes	Existing datasets do not comprehensively measure missing people and people affected by natural disasters; we thus report on deaths due to exposure to forces of nature	Undefined	..

(Table 1 continues on next page)

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
(Continued from previous page)						
Target 11.6: By 2030, reduce the adverse per-capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management	Mean $PM_{2·5}$ (11.6.2)	Population-weighted mean levels of fine particulate matter smaller than 2·5 μg in diameter ($PM_{2·5}$), μg/m^3	Yes	No indicator modifications required	Undefined	··
Goal 13: Take urgent action to combat climate change and its impacts						
Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries	Disaster mortality (13.1.1; same as indicators 1.5.1 and 11.5.1)	Death rate due to exposure to forces of nature, per 100 000 population	Yes	Existing datasets do not comprehensively measure missing people and people affected by natural disasters; we thus report on deaths due to exposure to forces of nature	Undefined	··
Goal 16. Promote peaceful and inclusive societies for sustainable development; provide access to justice for all; and build effective, accountable, and inclusive institutions at all levels						
Target 16.1: Significantly reduce all forms of violence and related death rates everywhere	Homicide (16.1.1)	Age-standardised death rate due to interpersonal violence, per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 16.1 (as above)	Conflict mortality (16.1.2)	Death rate due to conflict and terrorism, per 100 000 population	Yes	No indicator modifications required	Undefined	··
Target 16.1 (as above)	Physical violence (16.1.3a)	Age-standardised prevalence of physical violence experienced by populations in the past 12 months, %	Yes	No indicator modifications required	Undefined	··
Target 16.1 (as above)	Psycho-logical violence (16.1.3b)	Age-standardised prevalence of psychological violence experienced by populations in the past 12 months, %	No	Indicator 16.1.3 involves three separate types of violence experienced by populations: physical, psychological, and sexual. Current data availability allows for reporting of physical and sexual violence as part of the GBD study, whereas substantial challenges remain for the measurement of psychological violence across locations, by sex, and over time. These include issues with self-report and recall periods; non-standard classifications and reporting of types of psychological violence; and overall minimal data availability on psychological violence, particularly among males	Undefined	··
Target 16.1 (as above)	Sexual violence (16.1.3c)	Age-standardised prevalence of sexual violence experienced by populations in the past 12 months, %	Yes	No indicator modifications required	Undefined	··
Target 16.1 (as above)	Safety walking alone (16.1.4)	Proportion of people who feel safe walking alone around the area in which they live, %	No	The Gallup World Poll, which is currently active in more than 140 countries, includes questions about reported safety while walking alone near one's residence. Pending data sharing and access to currently available data, this indicator will be included in future iterations of the GBD study	Undefined	··
Target 16.2: End abuse, exploitations, trafficking, and all forms of violence against and torture of children	Child sex abuse (16.2.3)	Age-standardised prevalence of women and men aged 18–29 years who experienced sexual violence by age 18 years, %	Yes	No indicator modifications required	Eliminate by 2030	≤0·5%
Target 16.9: By 2030, provide legal identity for all, including birth registration	Birth registration (16.9.1; same as indicator 17.19.2b)	Proportion of children younger than 5 years whose births have been registered with a civil authority, by age, %	No	Currently, birth registration data reported to WHO do not fully cover all locations or years under analysis, and supplementary data sources, such as household survey data, are often required to estimate births and birth rates outside of high-income regions. Substantive data collation efforts would be required for birth registration by location and over time	Universal coverage (100%)	··

(Table 1 continues on next page)

25 years does not.[24] Quintile breaks were generated from the distribution of SDI at the national level in countries with populations greater than 1 million applied to all 195 locations. A complete list of SDI quintiles by location are available in appendix 1.[24]

Projection of the health-related SDG indicators to 2030

To generate projections to 2030, we used forecasting methods developed by Foreman and colleagues that produced reference forecasts and alternative health scenarios for life expectancy, all-cause mortality, and

	Health-related SDG indicator	Indicator definition	Currently measured by GBD	Further details	SDG target	SDG target used in this analysis
(Continued from previous page)						
Goal 17: Strengthen the means of implementation and revitalise the global partnership for sustainable development						
Target 17.19: By 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement gross domestic product, and support statistical capacity building in developing countries	Population census (17.19.2a)	Population census status within the past 10 years	Yes	Indicator 17.19.2 involves three separate country-level components pertaining to demographic and health data collection and monitoring: status of conducting at least one population and housing census in the past 10 years, birth registration, and death registration. Although these data collection and monitoring systems are interconnected, their actual status or functionality at a given time can vary. Thus, we have separated reporting on 17.19.2 into three indicators. For indicator 17.19.2a, census status was ascertained according to whether a population and housing census was conducted within the past 10 years for a given location-year or a population registry had been established. Census implementation was cross-checked against the World Population and Housing Census Programme online database	Census conducted within the past 10 years	··
Target 17.19 (as above)	Birth registration (17.19.2b; same as indicator 16.9.1)	Proportion of countries that have achieved 100% birth registration, %	No	Indicator 17.19.2 involves three separate country-level components pertaining to demographic and health data collection and monitoring: status of conducting at least one population and housing census in the past 10 years, birth registration, and death registration. Currently, birth registration data reported to WHO do not fully cover all locations or years under analysis, and supplementary data sources, such as household survey data, are often required to estimate births and birth rates outside of high-income regions. Substantive data collation efforts would be required for birth registration by location and over time	Universal coverage (100%)	··
Target 17.19 (as above)	Well-certified death registration (17.19.2c)	Percentage of well-certified deaths by a vital registration system among a country's total deaths, %	Yes	Indicator 17.19.2 involves three separate country-level components pertaining to demographic and health data collection and monitoring: status of conducting at least one population and housing census in the past 10 years, birth registration, and death registration. Although these data collection and monitoring systems are interconnected, their actual status or functionality at a given time can vary. Thus, we have separated reporting on 17.19.2 into three indicators. For indicator 17.19.2c, well-certified deaths were determined by three measures: completeness of death registration, fraction of deaths not assigned to major garbage codes (ie, causes that cannot or should not be underlying causes of death), and fraction of deaths assigned to detailed GBD causes	80% of total deaths	≥80%

Detailed descriptions of the data and methods used to estimate each of the 41 health-related SDG indicators included in the GBD 2017 study are located in appendix 1. For the 11 indicators currently not measured by GBD, additional information about data and measurement needs are provided in this table. DALY=disability-adjusted life-year. DPT=diphtheria-pertussis-tetanus. GBD=Global Burden of Diseases, Injuries, and Risk Factors Study. IHR=International Health Regulations. IOTF=International Obesity Task Force. NCDs=non-communicable diseases. $PM_{2·5}$=fine particulate matter smaller than 2·5 μm. SDG=Sustainable Development Goal. SEV=summary exposure value. TRIPS=World Trade Organization Agreement on Trade-Related Aspects of Intellectual Property Rights. UHC=universal health coverage. WaSH=water, sanitation, and hygiene.

Table 1: **Health-related goals, targets, and SDG indicators**

cause-specific mortality.[36] The modelling framework was designed to account for the relationships between risk factors and other independent drivers of health outcomes (eg, gains in sociodemographic development, select interventions such as vaccine coverage, and met need for family planning), thus better capturing causal pathways of health change shown in randomised controlled trials and cohort studies.

We generated projections for independent drivers by calculating the annual change in each location and year from 1990 to 2017 in logit or natural-log space, and then computing weighted annualised rates of change. If weights were closer to zero, annual rates of change over time were more equally weighted across years; if weights were closer to higher values, recent years were more heavily weighted than were earlier years. These weights were selected through out-of-sample predictive validity tests; further details on the overarching forecasting framework and weight selection are in appendix 1 (part 3). Some causes (eg, natural disasters, conflict and terrorism, and HIV) required model modifications or alternative estimation strategies to account for either their stochastic nature or, in the case of HIV, unique sensitivity to intervention coverage (see appendix 1 part 3, and elsewhere[36]).

Some indicators were inputs or outputs of the forecasting platform; for others, we used the weighted annualised rate of change method to produce projections to 2030 (appendix 1 part 3). For the UHC service coverage index, a modified version of the overarching forecasting

framework was used, modelling the relationship between total health spending per capita and the UHC service coverage index with stochastic frontier analysis.[37] We did not generate projections of census coverage because of its binary nature and the lack of documentation about planned censuses across all countries. Additionally, we do not currently project indicators by sex or subnationally.

Health-related SDG index

The health-related SDG index was originally developed in GBD 2015.[13] The overall index for GBD 2017 consisted of 40 health-related SDG indicators (population census coverage was not included because of its binary status and because it does not have forecasts). To create the health-related SDG index, we used a preference-weighted approach in which we considered the SDGs as representing the expressed preferences of UN member states and thus assumed that each SDG target should be weighted equally.

Each indicator was scaled to a value from 0 to 100, reflecting worst to best performance, to enable optimal comparison across diverse indicators, with 0 being the 2·5th percentile value and 100 being the 97·5th percentile value of 1000 observed or projected draws over the period 1990–2030. This approach reduced sensitivity to extreme outliers in given location-years. Negative indicators, for which lower values were more desirable than higher values (ie, mortality, incidence or prevalence, and risk exposure), were assigned 100 for the 2·5th percentile and 0 for the 97·5th percentile. For mortality and incidence, values were scaled in log-space.

We calculated the geometric mean of scaled health-related SDG indicators by target, and then took the geometric mean across all health-related SDG targets to produce the overall health-related SDG index. We used the geometric mean to allow for partial substitutability (ie, permitting high values for some indicators to only partially compensate for indicators with very low values). We restricted indicators to a minimum value of 1 when calculating the overall index to mitigate issues with values close to 0. To generate subnational SDG indices, we used the national-level 2·5th and 97·5th percentile values for each indicator to scale indicators for each subnational location. We used the same overall index construction methods for national and subnational locations.

For health worker density (SDG indicator 3.c.1), we used a modified scaling approach to reflect the importance of each health worker cadre (physicians, nurses and midwives, and pharmacists). On the basis of logistic regressions between each cadre and the HAQ Index,[34] we identified the values at which additional increases in health worker density resulted in diminishing returns on the HAQ Index.[34] In per 10 000 population space, these threshold values were 30 physicians, 100 nurses and midwives, and five pharmacists (appendix 1 part 1). Although we used the 2·5th percentile value of 1000 draws observed or projected from 1990 to 2030 to set the 0 threshold for all three cadres of health workers, we used cadre-specific thresholds to set the bounds for a 100 score rather than the 97·5th percentile of 1000 draws. We then took the geometric mean of scaled scores across the three cadres to estimate overall performance on the health worker density indicator.

Country and global SDG indicator attainment

Some health-related SDG indicators have targets explicitly defined by UN resolution 71/313,[38] including absolute targets and targets set in relation to 2015 values, whereas some indicators have undefined targets. In this analysis, 25 indicators had defined targets, for which we applied corresponding thresholds to analyse 2030 attainment (2020 in the case of road injury mortality, as set by the UN). For indicators with targets related to universal coverage or access, we set thresholds as 99%, whereas for indicators with targets related to achieving elimination or ending epidemics, we set thresholds as an incidence of 0·5 per 100 000 population or less or a prevalence of 0·5% or less. Thresholds or relative reductions for each target are shown in table 1.

For GBD 2017, we estimated the probability of each country attaining health-related SDG indicators with defined targets. We used our indicator projections to 2030 at the draw level (1000 draws in total), calculating at each draw whether or not a country would attain a target. The total probability of attainment was the number of draws in which the country would attain the target divided by the total number of draws. We also calculated the mean estimate in 2030 (the average of 1000 draws), and used that estimate to assess whether or not a country would attain a target. Consequently, countries could have some probability of attainment for given targets despite not having projected attainment at the mean level.

We also used past rates of change observed before the SDG era (ie, 1990–2015, or the monitoring period of the Millennium Development Goals) to analyse the feasibility of attaining SDG indicator targets in 2030. For SDG indicators with defined targets, we compared country-level annualised rates of change for 1990–2015 (ie, what has been achieved in the past) with the global pace of progress required to meet targets during the SDG era (2015–30) based on 2015 global estimates for each indicator; these estimates were derived from population-weighted means. For each indicator, we compared the required global annualised rate of change for 2015–30 against the distribution of past country-level annualised rates of change, and calculated in which percentile of performance the global required annualised rate of change would fall. We took the mean of those percentiles across the 25 indicators with defined targets and found that, on average, the required global annualised rates of change for 2015–30 would be in the 90th percentile of performance compared with the

	SDG index	Disaster mortality	Child stunting	Child wasting	Child overweight	Maternal mortality ratio	Skilled birth attendance	Under-5 mortality	Neonatal mortality	HIV incidence	Tuberculosis incidence	Malaria incidence	Hepatitis B incidence	NTD prevalence	NCD mortality	Suicide mortality	Alcohol use	Road injury mortality	FP need met, mod	Adolescent birth rate	UHC service coverage index	Air pollution mortality	WaSH mortality	Poisoning mortality	Smoking prevalence	Vaccine coverage	Health worker density	Intimate partner violence	Non-intimate partner sexual violence	Water	Sanitation	Hygiene	Household air pollution	Occupational risk burden	Mean $PM_{2.5}$	Homicide	Conflict mortality	Physical violence	Sexual violence	Child sex abuse	Well-certified death registration
1 Singapore	85	100	97	85	55	95	100	100	100	73	62	100	45	100	100	61	64	100	80	99	97	77	79	100	73	81	95	96	58	98	99	97	100	70	58	100	100	39	100	58	100
2 Norway	84	100	99	99	38	100	100	100	98	62	94	100	98	100	97	51	40	100	94	93	100	100	88	44	64	84	100	95	55	100	100	100	100	64	95	95	100	88	96	62	91
3 Sweden	83	100	99	99	46	100	100	98	96	60	91	100	98	100	99	43	31	100	89	95	100	99	89	73	81	85	100	88	43	100	100	100	100	70	98	84	100	84	84	42	92
4 Israel	82	100	98	98	49	96	99	92	89	58	100	100	90	100	99	72	77	80	91	74	93	76	85	99	50	97	95	91	61	100	99	100	100	74	55	69	40	88	100	39	86
5 UK	80	100	98	99	41	87	100	87	80	54	80	100	93	100	85	61	30	100	99	66	95	84	92	86	46	94	99	91	68	100	100	100	100	60	80	100	100	79	86	52	98
6 Netherlands	80	100	99	99	51	92	100	90	82	70	97	100	99	100	87	51	36	99	90	100	100	83	95	100	53	82	97	90	29	100	100	100	100	55	75	91	100	88	95	52	91
7 Canada	79	84	98	99	40	88	99	82	76	55	100	100	89	100	90	44	32	77	95	70	98	98	88	71	64	82	98	92	62	100	99	100	100	56	96	76	100	97	88	58	96
8 Switzerland	79	100	99	99	39	93	100	91	81	60	93	100	88	100	100	51	29	100	94	100	100	98	98	100	38	74	100	95	66	100	100	100	100	48	81	99	100	88	93	58	93
9 Malta	79	100	98	98	36	80	100	80	68	44	90	100	95	100	88	82	48	100	81	71	93	74	96	100	43	67	96	95	60	100	99	100	100	59	70	84	100	88	95	60	92
10 Finland	79	100	99	99	51	100	100	100	100	73	98	100	86	100	92	37	18	95	99	87	97	100	100	81	53	79	100	91	34	100	100	100	100	70	99	77	100	88	92	64	100
11 Japan	79	68	88	86	74	96	99	100	100	82	90	100	54	100	100	28	46	98	66	100	99	97	82	80	47	84	91	94	58	98	99	97	100	56	76	100	78	89	98	57	84
12 Iceland	79	36	99	99	23	100	100	100	100	61	97	100	99	100	98	49	43	99	97	78	100	98	96	76	67	64	100	95	56	100	100	100	100	53	96	95	100	88	95	60	96
13 Slovenia	78	100	90	91	21	92	100	100	98	89	94	100	48	100	85	32	67	82	74	96	94	79	100	85	31	79	95	100	84	98	98	100	96	52	64	92	100	90	93	70	94
14 Denmark	77	100	99	99	33	100	100	91	86	59	95	100	93	100	84	53	21	96	87	98	96	83	87	89	53	68	100	93	65	100	100	100	100	49	82	93	100	88	93	63	92
15 Belgium	77	100	99	99	42	91	100	92	89	56	89	100	89	100	88	32	22	76	94	85	98	82	86	76	49	98	100	89	62	100	100	100	100	63	72	82	100	88	93	59	88
16 Ireland	76	100	99	99	34	100	100	93	87	53	94	100	98	100	93	55	11	100	86	76	100	91	95	86	52	83	98	96	73	100	99	100	100	68	89	96	100	88	90	39	97
17 Cyprus	76	100	98	99	45	87	100	97	92	58	94	100	90	100	88	81	36	62	94	100	99	71	94	87	21	82	95	99	79	100	100	100	100	58	62	79	100	88	86	60	72
18 New Zealand	76	100	94	98	25	81	100	87	83	66	85	100	60	100	87	42	26	73	91	57	97	98	86	86	60	94	100	81	43	98	98	96	100	47	98	79	100	58	85	20	100
19 Germany	75	100	100	100	42	87	100	92	88	59	93	100	96	100	81	48	17	92	91	83	94	81	92	100	31	88	100	96	68	100	100	100	100	56	75	94	100	88	96	51	91
20 Brunei	75	100	82	85	53	50	99	70	66	60	42	100	41	100	48	68	92	44	77	71	73	80	75	61	63	72	92	94	59	98	99	97	100	48	98	78	100	89	100	60	81
21 USA	74	71	99	100	49	60	99	77	70	49	100	100	98	100	71	37	32	56	91	56	90	87	86	59	55	92	97	100	27	100	97	100	100	69	93	42	79	100	83	51	94
22 Spain	74	100	100	96	39	96	100	95	92	51	89	100	87	99	94	73	7	95	87	82	99	94	98	88	26	83	99	100	66	100	100	100	99	75	83	98	100	100	88	62	91
23 Slovakia	73	100	90	91	32	88	100	80	77	92	88	100	53	100	59	50	23	76	82	54	83	60	91	59	37	86	100	86	65	97	99	100	98	72	61	70	100	90	89	70	96
24 Jordan	72	100	86	92	69	67	100	59	47	90	85	100	44	96	78	96	97	57	55	51	74	55	69	51	38	84	90	73	87	89	94	84	100	92	38	64	37	54	84	69	75
25 Maldives	72	100	70	52	74	41	99	74	64	96	59	100	48	88	86	95	88	70	54	62	75	80	64	100	51	72	75	78	81	35	83	77	90	64	91	91	100	77	88	75	69
26 South Korea	72	100	98	97	41	83	100	94	96	75	55	63	24	95	100	16	38	66	82	100	97	75	80	72	48	85	88	94	58	98	99	97	100	37	48	85	100	89	98	61	90
27 Australia	72	64	95	99	46	98	99	90	85	62	100	100	75	100	95	44	22	81	98	69	100	96	92	86	71	98	99	100	0	98	99	97	100	57	89	80	100	89	92	64	97
28 Barbados	72	100	90	93	56	40	99	62	46	43	94	100	89	96	66	87	51	67	69	38	70	57	57	86	82	73	96	88	36	75	88	76	100	98	52	30	100	98	70	60	89
29 Austria	72	100	98	99	37	100	100	93	87	58	92	100	87	100	90	43	12	93	89	80	96	85	100	77	24	78	100	99	35	100	97	99	99	60	74	95	100	88	93	60	95
30 Mauritius	71	100	78	40	54	48	99	60	46	45	75	100	35	65	50	56	64	58	79	54	65	48	73	75	48	84	71	79	79	98	96	99	97	90	70	66	100	74	84	79	92
31 Portugal	71	100	97	98	47	87	100	93	91	28	77	100	81	98	87	59	6	78	88	76	94	89	86	84	37	84	97	90	77	99	95	99	99	58	90	84	100	88	90	59	86
32 Kuwait	71	100	97	92	1	81	99	74	64	94	73	100	56	100	96	100	100	51	78	82	85	58	73	65	61	87	98	69	86	90	97	90	100	73	15	92	100	38	89	68	87
33 The Bahamas	70	100	91	94	47	35	99	62	55	26	74	100	84	96	47	97	58	48	94	44	62	62	59	72	84	81	99	87	35	62	92	80	97	100	64	8	100	97	64	60	93
34 Italy	70	60	98	99	29	100	100	95	89	52	95	100	68	100	99	80	31	81	75	93	100	86	100	98	42	85	97	87	0	100	99	99	100	63	64	96	100	88	73	60	93
35 Panama	70	74	74	98	61	42	93	55	50	35	60	43	82	90	88	78	51	54	80	20	69	75	50	68	93	85	78	85	62	80	76	81	89	94	78	20	100	72	79	66	92
36 Bermuda	70	100	92	94	21	71	99	84	80	56	72	100	91	97	86	94	19	71	96	80	86	82	73	87	76	26	100	93	31	63	95	82	97	83	77	61	100	97	38	59	94
37 France	70	97	98	99	47	90	100	90	87	58	93	100	78	100	90	38	16	85	100	85	99	96	97	79	13	80	98	90	51	100	100	100	100	43	76	92	100	88	87	96	87
38 Taiwan (province of China)	70	77	90	95	23	74	100	86	82	84	61	100	4	95	78	35	59	53	100	100	88	63	79	75	58	85	79	81	44	96	96	97	97	80	51	82	100	91	0	81	90
39 Bahrain	70	100	91	90	49	70	99	75	76	80	71	100	42	97	81	85	90	64	70	66	80	40	65	93	82	100	96	61	87	85	93	87	100	60	10	79	30	40	86	68	61
40 Poland	69	100	90	91	47	98	100	87	80	77	83	100	73	100	57	33	26	68	50	71	85	61	90	60	26	71	91	100	72	96	98	100	95	54	55	78	100	90	93	65	80
41 Luxembourg	69	100	99	99	18	89	99	100	100	50	95	100	82	100	91	54	1	85	98	90	100	89	93	93	45	96	99	100	45	100	100	100	100	69	80	88	100	88	80	60	90
42 Czech Republic	69	100	97	88	33	95	100	98	98	83	98	100	64	100	70	44	15	78	81	71	91	66	84	56	23	71	100	94	42	97	100	100	99	50	65	87	100	90	85	67	92
43 Armenia	68	100	80	83	20	65	100	69	60	64	63	100	35	96	49	56	63	76	37	52	72	41	76	54	38	96	97	87	100	97	76	90	89	44	40	58	100	84	99	100	97
44 Estonia	68	100	89	92	38	100	100	96	99	48	74	100	63	100	64	37	5	83	81	68	86	88	96	60	40	83	95	98	56	95	93	97	93	76	96	55	100	80	77	18	99
45 Uruguay	68	100	86	96	62	64	99	70	62	43	72	100	100	99	60	26	43	48	79	30	74	79	66	55	43	82	53	80	79	94	98	95	98	52	86	44	100	94	95	79	84
46 Brazil	68	89	86	97	28	44	99	53	48	38	62	35	53	90	63	69	46	37	97	32	63	65	52	87	86	94	90	88	88	89	75	83	93	55	73	7	100	85	80	77	89
47 Seychelles	68	100	86	78	70	44	98	62	54	62	69	100	32	88	48	57	64	52	85	29	61	52	51	54	56	88	75	76	80	65	88	87	96	67	57	46	100	76	81	78	76
48 Algeria	67	100	79	79	36	44	96	48	34	80	61	85	48	96	74	86	94	43	80	78	66	53	68	44	59	83	80	62	87	86	92	85	100	74	36	86	37	37	87	68	63
49 Hungary	67	100	88	90	35	79	99	85	81	82	91	100	38	100	45	32	18	80	66	56	84	59	81	66	22	72	88	86	72	96	94	100	90	61	65	81	100	90	90	70	98
50 Grenada	67	100	86	91	76	36	99	59	44	62	83	100	83	94	43	79	48	64	85	34	59	47	53	61	77	58	80	85	43	54	75	74	96	93	53	47	100	98	68	61	90
51 Croatia	67	100	89	91	28	93	100	88	79	83	86	100	58	100	66	43	34	74	46	78	89	63	93	73	5	68	98	100	85	95	98	100	93	59	61	89	100	90	90	70	97
52 Argentina	67	95	89	91	76	50	99	66	56	42	71	100	100	94	62	45	35	52	80	28	70	65	64	47	44	86	84	69	88	91	95	94	97	40	74	44	100	75	92	77	76
53 Palestine	67	100	87	91	63	77	98	60	56	94	79	100	47	90	61	92	100	69	66	21	66	46	61	90	48	98	65	45	90	57	91	74	100	62	38	45	19	37	88	68	65
54 Tunisia	67	100	85	93	40	62	99	67	56	72	67	100	59	96	73	97	94	22	76	90	77	48	65	53	46	69	76	62	88	77	85	82	100	81	34	99	41	36	87	68	52
55 Saint Lucia	67	100	96	90	82	40	99	60	44	64	79	100	84	94	55	64	46	54	70	36	61	54	56	78	69	58	86	84	42	54	80	83	94	89	53	19	100	98	66	60	89
56 Antigua and Barbuda	66	13	90	93	66	46	99	65	59	56	77	100	86	95	66	100	71	76	90	32	65	60	55	59	84	62	92	88	38	54	85	75	98	100	60	48	100	97	75	60	81
57 Malaysia	66	72	70	48	37	47	99	76	69	51	52	50	54	90	57	58	83	32	83	74	67	48	54	46	51	66	73	82	78	86	98	96	98	67	66	72	100	75	89	79	54
58 Turkmenistan	66	100	81	87	28	82	99	42	31	71	47	100	24	95	23	54	58	79	81	59	60	40	61	52	54	65	94	86	100	78	53	86	100	57	57	54	100	84	99	100	83
59 Paraguay	66	100	92	98	51	42	92	60	61	44	55	100	60	92	63	72	44	34	87	26	62	53	53	80	71	96	65	88	78	79	82	73	71	49	77	27	100	85	82	91	81
60 Turkey	66	100	83	98	30	67	97	60	51	89	67	100	52	97	69	95	85	62	63	51	75	52	71	57	35	82	68	70	87	74	91	84	100	44	27	70	16	60	84	75	81
61 El Salvador	66	100	78	95	71	54	99	63	60	46	66	71	69	89	71	49	63	35	89	26	63	50	45	80	91	95	63	84	58	73	60	77	81	100	50	0	100	78	91	69	76
62 Colombia	66	21	80	99	78	50	96	60	51	47	71	30	64	84	91	73	49	50	95	26	70	76	62	88	75	89	74	62	81	78	93	83	91	91	66	7	100	36	84	66	95
63 Jamaica	66	100	90	91	64	42	99	59	42	36	77	100	98	95	48	91	58	66	92	38	64	53	58	75	63	77	86	88	27	53	64	56	91	79	72	6	100	98	77	7	90
64 Saint Vincent and the Grenadines	65	100	85	89	68	36	99	56	42	47	72	100	88	93	42	62	56	65	90	28	54	47	48	80	75	66	79	81	46	45	72	67	89	99	54	15	100	98	73	61	88
65 Uzbekistan	65	100	68	78	36	63	100	47	37	62	51	100	26	94	24	50	60	54	91	45	60	26	64	36	80	98	89	84	100	87	36	87	88	53	48	64	100	34	98	100	86
66 Trinidad and Tobago	65	100	95	85	56	48	99	56	42	40	78	100	87	95	47	47	69	51	63	39	59	46	58	86	62	48	70	85	39	60	86	76	99	100	52	14	100	98	79	60	93
67 Chile	65	46	97	99	52	66	100	75	65	45	80	100	85	95	83	47	34	59	82	38	80	71	70	74	14	79	75	78	84	96	92	95	94	58	56	52	100	86	94	78	96

Value: 100, 75, 50, 25, 0

(Figure 1 continues on next page)

	SDG index	Disaster mortality	Child stunting	Child wasting	Child overweight	Maternal mortality ratio	Skilled birth attendance	Under-5 mortality	Neonatal mortality	HIV incidence	Tuberculosis incidence	Malaria incidence	Hepatitis B incidence	NTD prevalence	NCD mortality	Suicide mortality	Alcohol use	Road injury mortality	FP need met, mod	Adolescent birth rate	UHC service coverage index	Air pollution mortality	WaSH mortality	Poisoning mortality	Smoking prevalence	Vaccine coverage	Health worker density	Intimate partner violence	Non-intimate partner sexual violence	Water	Sanitation	Hygiene	Household air pollution	Occupational risk burden	Mean $PM_{2.5}$	Homicide	Conflict mortality	Physical violence	Sexual violence	Child sex abuse	Well-certified death registration
68 Cuba	65	56	88	93	45	50	99	84	84	45	96	100	91	95	64	42	55	71	98	35	75	63	58	82	30	68	100	88	40	54	80	81	98	34	60	46	100	98	78	60	98
69 Nicaragua	65	40	75	94	66	48	95	58	47	41	62	32	81	86	88	71	67	59	96	19	65	60	53	67	79	100	49	85	68	65	55	75	65	79	62	39	100	83	86	79	95
70 Albania	65	69	64	63	22	84	99	62	54	100	79	100	64	100	72	77	53	71	13	60	78	55	86	67	25	88	83	97	89	79	86	97	76	41	60	66	100	89	99	75	78
71 Northern Mariana Islands	65	100	86	82	28	54	99	72	66	78	55	100	16	94	57	39	88	59	85	40	69	60	66	70	33	26	86	74	67	81	96	96	88	80	83	49	100	86	40	7	82
72 Sri Lanka	65	45	76	39	68	60	100	72	60	80	58	100	43	89	71	19	67	55	66	60	74	56	52	69	74	71	63	61	89	62	69	85	71	66	81	58	75	87	85	67	74
73 Greece	64	40	98	98	34	84	100	87	81	61	100	100	57	100	77	93	21	63	62	79	95	72	100	91	5	89	93	88	66	100	99	100	100	69	65	86	100	88	91	60	82
74 Macedonia	64	100	91	90	39	85	99	69	56	92	70	100	67	100	49	64	74	79	10	64	75	48	91	70	8	61	83	91	80	93	93	99	85	70	42	76	100	90	100	53	87
75 Mexico	64	30	79	94	49	52	98	57	54	50	76	66	65	83	73	70	58	46	82	23	64	53	56	55	64	84	78	97	75	92	88	86	87	71	54	4	100	72	71	72	94
76 Ecuador	64	100	64	94	58	41	99	55	50	47	63	46	56	86	81	51	52	26	77	28	60	67	54	52	78	76	67	76	79	81	88	78	95	57	68	24	100	62	73	46	75
77 Latvia	64	100	88	92	53	76	100	85	82	44	64	100	65	100	44	25	13	66	77	60	81	61	90	43	15	96	96	88	58	94	88	96	95	67	72	46	100	80	88	18	99
78 Oman	64	100	76	60	20	71	99	66	59	57	72	100	47	96	64	98	95	6	39	71	77	45	64	56	92	87	92	68	86	80	98	86	100	76	31	100	100	41	90	70	60
79 Dominica	63	100	88	92	58	27	99	41	27	55	64	100	87	95	52	82	47	46	90	36	54	55	51	29	84	60	83	86	40	50	80	72	92	90	58	28	100	98	66	60	85
80 Andorra	63	100	99	99	20	97	100	100	100	68	92	100	97	100	92	58	20	95	97	96	99	91	95	83	35	85	100	95	56	100	100	100	100	57	81	96	100	88	89	60	0
81 Azerbaijan	63	100	75	79	19	63	96	38	24	71	42	100	25	95	29	86	53	80	26	37	61	35	58	44	43	72	96	87	100	38	59	93	87	52	59	57	100	82	93	100	86
82 Costa Rica	63	30	88	96	47	61	99	73	61	58	88	100	75	86	82	58	54	46	95	30	73	76	64	75	75	87	73	73	0	93	99	78	92	86	65	33	100	68	84	15	97
83 Georgia	62	100	82	93	18	55	99	65	55	56	49	100	38	96	33	60	44	42	52	35	65	38	76	44	36	85	90	98	100	89	63	92	75	52	54	57	100	95	100	100	66
84 Bosnia and Herzegovina	62	100	88	92	28	90	100	78	62	100	66	100	63	100	54	64	32	79	17	77	73	43	92	62	10	52	75	89	81	92	94	98	77	63	45	70	100	90	92	70	80
85 Peru	62	35	79	99	34	43	92	58	54	46	46	28	59	91	97	97	46	50	67	20	66	62	48	51	92	73	82	74	84	79	65	76	78	63	52	56	100	70	88	46	72
86 Iran	62	14	84	78	46	65	98	59	48	68	78	77	59	97	71	74	100	28	93	50	73	51	67	34	73	72	73	53	87	84	92	88	100	77	31	67	47	37	88	66	78
87 Kazakhstan	62	100	84	90	39	74	100	60	54	52	48	100	32	96	34	12	30	48	86	47	68	51	73	12	40	67	97	93	94	89	59	92	90	47	74	37	100	88	99	96	88
88 China	62	68	84	93	65	76	98	64	63	74	54	97	19	88	60	62	60	46	100	80	79	39	74	24	41	88	91	71	53	79	73	88	84	48	20	87	100	91	0	76	79
89 Serbia	62	100	88	86	50	78	100	84	76	79	71	100	66	100	46	38	15	76	32	65	79	42	89	70	17	68	71	90	80	94	95	99	79	53	49	70	100	90	91	58	75
90 Libya	62	100	69	73	35	54	98	59	62	79	66	100	41	78	42	58	100	30	58	69	64	37	61	38	69	88	87	59	86	82	86	78	100	79	26	68	0	37	89	68	65
91 Bulgaria	61	100	86	88	30	69	100	74	69	75	74	100	53	100	36	50	29	68	60	39	74	49	89	61	4	82	93	84	59	93	99	99	90	67	58	70	100	90	88	70	80
92 American Samoa	61	100	83	80	37	35	99	68	65	82	77	100	24	98	32	65	85	67	79	42	53	42	54	46	29	25	78	70	69	77	92	94	86	65	75	46	100	86	38	7	77
93 Qatar	61	100	85	89	3	80	100	75	70	96	65	100	33	98	84	81	82	30	74	74	84	40	76	75	80	97	99	67	86	88	96	89	100	52	4	91	100	44	90	72	52
94 United Arab Emirates	61	100	80	54	25	74	100	76	69	77	75	100	48	98	32	77	60	4	75	71	61	35	56	81	74	94	99	67	86	87	99	88	100	59	31	86	100	42	85	70	74
95 Syria	61	100	56	38	36	73	93	52	61	98	71	100	46	92	49	97	97	58	58	43	63	42	73	58	61	36	66	50	89	84	90	85	100	63	29	69	0	37	87	68	63
96 Venezuela	61	100	78	74	53	44	98	57	45	43	70	17	76	60	64	54	48	34	86	16	64	61	52	68	66	59	64	82	63	83	90	85	100	51	65	0	100	72	76	66	95
97 Morocco	60	100	74	88	47	30	82	52	38	77	36	100	44	93	44	62	95	37	75	58	49	40	52	37	82	95	66	51	89	68	87	75	98	50	40	84	73	37	87	58	25
98 Montenegro	59	100	86	90	13	89	99	89	82	82	80	100	70	100	49	50	20	72	41	74	79	50	99	54	4	54	85	91	79	85	97	99	80	76	55	61	100	90	94	70	86
99 Moldova	59	100	89	91	86	70	100	59	42	47	48	100	31	100	39	34	23	61	62	54	67	50	70	0	51	68	80	78	81	74	39	86	91	76	65	49	100	78	90	18	90
100 Fiji	59	100	90	65	52	45	99	45	37	64	61	100	39	89	6	48	77	63	76	43	48	25	36	58	35	87	70	65	72	74	80	91	77	74	81	54	100	86	42	5	74
101 Tonga	59	100	85	70	43	33	98	56	51	73	62	100	8	92	34	70	88	56	36	62	49	36	51	26	26	65	59	67	72	68	83	91	72	62	81	68	100	86	54	14	68
102 Belize	59	100	75	91	66	45	96	54	42	31	62	60	76	92	57	58	39	39	74	28	57	51	46	52	83	64	76	80	83	19	73	69	85	61	54	9	100	98	65	85	92
103 Saudi Arabia	59	84	84	91	4	63	98	73	67	78	59	60	36	97	68	98	97	15	40	78	75	40	62	46	86	100	94	73	86	89	97	86	100	85	10	94	10	39	90	69	55
104 Kyrgyzstan	59	32	73	93	66	55	100	51	36	51	40	100	24	93	41	48	52	49	68	41	61	40	60	29	52	73	85	66	100	82	19	88	76	54	57	51	100	69	91	100	98
105 Thailand	59	52	78	65	58	54	99	71	67	39	49	50	24	82	79	46	53	30	99	45	73	60	46	76	53	54	71	75	80	39	98	74	88	41	47	46	55	74	77	92	67
106 Guam	58	100	87	84	0	53	99	61	52	65	57	100	17	95	34	17	91	52	89	36	64	53	71	67	34	26	90	76	65	83	97	96	93	76	77	49	100	86	38	2	83
107 Bolivia	58	100	71	96	35	27	81	42	34	51	45	35	56	85	59	67	71	36	50	22	49	45	44	43	90	78	88	50	71	79	82	77	81	52	56	44	100	1	69	46	69
108 Lithuania	58	100	89	92	57	84	100	85	85	64	59	100	62	100	47	4	2	66	75	65	80	63	86	13	26	83	96	94	86	94	88	97	99	67	76	49	100	80	79	18	100
109 Romania	57	66	83	84	36	72	100	71	67	63	52	100	47	100	45	51	3	65	53	43	78	56	78	31	30	61	87	87	91	90	82	97	89	45	68	74	100	90	89	70	91
110 Cape Verde	57	100	82	86	66	50	88	51	38	33	37	42	17	92	72	26	63	69	75	42	60	46	36	50	95	67	64	58	85	49	52	21	70	59	38	27	100	33	62	32	73
111 Russia	57	84	83	85	43	74	100	75	68	26	50	100	53	95	35	8	21	48	64	52	80	54	82	2	26	80	98	82	73	91	78	96	100	53	64	27	49	80	84	13	93
112 Iraq	57	76	64	68	46	67	90	46	37	92	60	100	52	92	74	86	94	65	60	28	64	52	67	75	56	59	57	15	89	75	78	93	100	64	17	45	0	37	88	68	58
113 Suriname	57	100	87	80	82	34	96	43	27	38	73	44	76	93	47	9	42	44	68	29	52	48	41	62	49	58	78	84	44	49	82	66	88	97	51	35	100	98	69	60	79
114 Dominican Republic	57	100	86	92	63	34	98	42	25	39	53	49	72	90	52	53	57	23	92	17	54	59	45	68	85	53	78	72	83	28	79	35	87	60	73	14	100	82	77	60	71
115 Tajikistan	57	48	48	44	69	64	92	31	22	61	41	100	32	86	34	71	82	73	52	30	49	28	33	53	86	83	78	70	100	73	32	76	71	49	30	60	100	71	93	100	61
116 Virgin Islands	56	0	93	94	18	49	99	71	59	48	79	100	84	100	43	68	73	59	96	31	67	65	66	65	96	56	98	96	23	62	95	80	99	67	82	8	100	100	73	59	80
117 Guatemala	56	52	18	98	68	34	95	46	46	53	70	36	56	82	71	70	68	43	74	21	50	37	28	27	84	77	60	84	83	50	60	69	62	58	50	2	100	86	90	74	84
118 Belarus	55	100	95	94	54	79	100	78	72	44	64	100	66	100	40	20	1	68	77	60	84	49	95	14	7	87	99	86	75	94	83	96	100	72	59	46	100	80	79	18	92
119 Lebanon	55	100	81	83	45	67	85	73	67	78	74	100	41	97	58	80	82	77	64	29	80	49	66	53	20	75	86	58	87	69	98	85	100	78	41	53	14	37	84	68	0
120 Honduras	54	48	64	97	75	34	95	59	51	64	59	36	64	75	62	83	73	45	84	17	52	47	34	36	76	80	29	82	71	73	64	83	60	60	56	0	100	76	82	64	41
121 Puerto Rico	54	0	92	95	2	65	99	68	60	63	100	100	78	100	84	69	41	62	96	46	81	84	63	85	79	78	96	97	2	64	98	83	100	100	89	13	100	100	77	60	93
122 Guyana	54	100	79	68	70	32	92	46	30	28	51	12	74	81	28	7	58	46	56	24	49	40	38	58	70	96	73	80	47	28	73	43	88	84	56	20	100	98	73	60	83
123 Greenland	54	100	96	98	56	75	89	60	54	47	54	100	95	100	46	0	54	95	82	37	74	67	75	35	0	68	90	92	54	100	94	99	99	36	78	38	100	100	88	57	80
124 Philippines	54	60	44	66	88	40	69	45	38	52	25	47	26	71	34	70	68	58	58	31	44	22	36	76	43	75	45	87	76	43	88	77	63	48	62	21	27	88	75	83	80
125 Egypt	53	100	68	72	25	46	93	52	52	89	73	100	0	91	27	74	96	21	92	27	56	22	46	77	56	69	78	67	89	90	74	89	100	71	8	95	26	47	94	68	53
126 Mongolia	51	26	75	96	46	53	99	45	33	77	35	100	6	92	17	29	55	45	72	50	56	32	61	11	33	81	96	82	100	65	26	71	72	57	34	38	100	84	96	100	73
127 São Tomé and Príncipe	51	100	71	72	84	25	87	42	35	86	38	17	0	81	46	92	58	46	58	29	46	22	28	38	100	95	54	43	86	48	49	32	53	58	45	47	100	17	64	32	51
128 South Africa	50	74	59	85	28	34	99	39	36	5	4	53	48	84	53	43	36	25	84	28	56	43	23	42	52	82	61	78	62	68	66	44	90	55	48	8	47	62	80	28	78
129 Bhutan	50	100	45	82	76	26	67	42	26	60	40	56	42	86	61	72	90	72	87	42	54	39	29	74	94	71	71	70	97	74	56	83	76	23	34	88	100	64	56	33	0
130 Ukraine	48	100	75	78	68	58	99	69	64	32	52	100	49	99	25	7	0	50	70	50	71	42	81	12	25	37	96	70	75	84	67	92	96	66	58	35	27	83	84	13	91
131 Samoa	48	100	84	89	59	60	78	60	55	64	59	100	25	85	39	48	77	60	42	37	48	33	53	48	25	38	45	63	74	83	96	94	57	72	79	57	100	86	56	4	0
132 Vietnam	46	42	62	71	83	76	96	61	53	47	37	46	21	66	49	60	31	35	80	52	66	42	52	43	50	63	58	80	82	60	71	63	74	44	44	78	100	74	78	82	0
133 Botswana	44	100	52	70	53	40	97	48	40	8	6	38	37	89	60	48	48	48	88	35	58	37	20	39	62	80	63	62	80	61	52	33	71	56	53	40	100	51	74	0	0

Value: 100, 75, 50, 25, 0

(Figure 1 continues on next page)

country-level annualised rates of change for 1990–2015. To see what global progress could be achieved if performance on all indicators was projected at that level from 2015 to 2030, we calculated the annualised rate of change required to meet the 90th percentile for each indicator, including those without defined targets, and

	SDG index	Disaster mortality	Child stunting	Child wasting	Child overweight	Maternal mortality ratio	Skilled birth attendance	Under-5 mortality	Neonatal mortality	HIV incidence	Tuberculosis incidence	Malaria incidence	Hepatitis B incidence	NTD prevalence	NCD mortality	Suicide mortality	Alcohol use	Road injury mortality	FP need met, mod	Adolescent birth rate	UHC service coverage index	Air pollution mortality	WaSH mortality	Poisoning mortality	Smoking prevalence	Vaccine coverage	Health worker density	Intimate partner violence	Non-intimate partner sexual violence	Water	Sanitation	Hygiene	Household air pollution	Occupational risk burden	Mean $PM_{2.5}$	Homicide	Conflict mortality	Physical violence	Sexual violence	Child sex abuse	Well-certified death registration
134 North Korea	43	100	59	73	93	40	87	48	44	77	32	40	10	86	31	44	78	38	86	100	55	18	59	20	52	71	46	58	62	89	64	93	48	21	39	64	100	91	0	82	0
135 Indonesia	43	68	41	30	71	26	85	45	34	60	27	25	30	75	38	97	98	49	84	49	50	39	21	64	21	43	62	74	28	59	78	75	72	28	63	87	69	74	90	78	0
136 Federated States of Micronesia	43	100	76	73	72	28	98	55	47	43	38	100	19	80	10	25	88	42	63	41	40	29	46	37	24	51	54	60	74	61	75	88	73	57	79	45	100	86	46	4	0
137 Myanmar	40	90	46	64	86	21	68	32	22	48	28	25	19	66	37	77	87	36	83	52	45	21	27	22	48	57	55	76	97	32	48	59	51	34	36	75	53	82	92	79	0
138 Cambodia	40	100	32	53	98	34	93	40	30	63	24	28	4	80	48	82	45	26	60	37	51	21	29	52	49	78	62	80	74	53	53	68	35	22	49	66	72	79	82	60	0
139 Marshall Islands	40	100	74	71	77	20	93	49	40	64	30	100	13	85	0	13	86	30	89	25	32	28	42	32	57	50	62	59	74	57	69	86	77	57	82	43	100	86	42	4	0
140 Namibia	40	100	59	58	78	36	89	35	29	7	2	18	47	76	55	41	32	34	90	29	50	34	18	35	63	85	54	41	84	47	44	47	66	56	50	22	56	49	71	32	0
141 Ghana	39	61	68	65	88	31	68	27	16	29	20	4	8	81	44	49	46	30	39	33	43	22	18	32	100	93	70	62	66	13	27	8	53	49	40	62	44	36	64	31	24
142 Gabon	37	100	68	89	62	22	93	38	28	37	18	4	28	78	47	38	58	25	46	26	42	35	21	39	83	37	55	17	44	60	50	26	90	64	31	49	100	26	33	36	0
143 Senegal	37	100	65	59	90	15	49	30	23	45	25	13	11	49	49	37	97	42	47	21	36	22	12	31	86	85	44	56	88	44	30	22	30	48	32	84	100	32	84	31	0
144 Laos	36	100	22	69	94	24	49	26	17	67	34	24	24	79	31	56	69	27	67	27	37	19	23	51	43	49	47	73	84	38	31	62	39	30	50	59	59	74	79	79	0
145 Timor-Leste	36	100	13	14	82	18	47	38	30	60	31	48	32	65	42	62	100	62	43	28	39	26	29	55	11	59	40	42	84	46	21	74	37	43	60	61	100	36	90	67	0
146 Comoros	36	100	38	55	51	25	83	31	17	83	25	25	39	84	47	57	98	36	26	36	28	26	14	28	86	54	51	66	76	32	14	11	36	23	57	36	100	62	89	44	0
147 Solomon Islands	35	100	55	74	87	28	92	45	37	65	46	4	18	73	10	27	88	35	59	27	41	4	30	33	34	56	27	49	78	52	22	82	27	65	79	45	100	86	47	2	0
148 Sudan	35	100	35	21	82	24	78	31	21	48	43	12	22	89	39	78	87	23	23	18	48	27	30	30	97	83	53	40	91	31	12	25	58	49	25	84	17	36	82	68	0
149 Zimbabwe	35	100	50	89	82	17	79	27	19	12	0	12	17	82	30	6	72	29	92	14	33	17	15	3	65	80	37	40	79	23	35	14	44	29	55	35	58	42	19	31	52
150 India	35	48	32	13	82	26	81	34	19	60	27	21	56	84	39	29	73	43	76	52	43	18	11	65	81	58	53	50	98	41	62	55	69	39	2	60	53	49	56	56	2
151 Pakistan	34	78	23	33	98	13	55	26	8	67	30	15	45	78	24	83	100	24	45	37	35	20	19	57	74	68	55	35	97	17	62	56	64	42	18	52	41	46	61	33	0
152 Vanuatu	34	100	54	71	75	34	82	42	34	64	48	20	11	64	4	24	93	36	49	32	28	15	27	32	51	29	48	59	77	31	24	63	40	20	79	73	100	86	49	8	0
153 Haiti	34	38	61	80	92	12	26	26	18	30	46	20	76	71	21	55	62	10	42	33	28	18	21	42	94	46	52	58	0	14	18	20	32	71	70	18	100	85	36	59	61
154 Kiribati	33	100	58	51	81	19	84	33	27	90	22	100	17	74	0	6	86	59	40	40	23	11	15	20	0	57	43	55	78	40	38	78	31	67	81	75	100	86	6	7	43
155 Bangladesh	33	53	32	32	100	26	35	39	22	92	37	49	43	51	44	69	100	70	84	23	47	23	24	69	50	77	49	38	98	11	29	25	49	22	15	76	50	45	61	2	0
156 Djibouti	33	100	44	8	42	9	95	32	26	31	17	14	35	92	45	56	91	33	50	33	31	32	19	31	68	58	48	42	38	28	25	8	73	48	31	37	49	27	63	43	0
157 Swaziland (eSwatini)	33	100	48	96	49	34	88	32	31	18	0	43	26	85	22	14	75	14	89	22	40	23	12	23	100	87	37	54	0	32	29	36	69	50	62	12	100	51	72	65	0
158 The Gambia	32	100	63	45	85	5	59	31	21	32	19	18	4	51	37	50	88	36	24	22	34	15	16	31	83	85	43	82	94	25	26	5	27	49	39	89	45	54	90	31	0
159 Yemen	32	46	21	13	89	21	38	32	22	76	52	12	33	80	28	70	100	14	41	20	42	28	28	28	62	53	49	29	91	38	52	49	75	45	28	60	0	37	88	68	0
160 Zambia	32	100	27	70	13	33	70	24	21	12	5	5	24	66	47	36	74	38	64	12	39	25	10	28	66	96	64	28	61	29	22	10	38	29	48	43	73	24	24	50	0
161 Kenya	32	63	39	74	76	14	64	33	26	16	15	11	39	72	58	44	59	41	78	23	38	27	10	22	85	69	57	33	58	29	23	5	41	27	42	28	29	44	35	3	0
162 Mauritania	31	28	50	0	83	6	73	32	19	83	36	13	10	77	57	67	99	32	22	23	42	30	15	41	64	68	45	60	86	26	16	23	59	60	32	51	54	33	85	31	0
163 Togo	31	100	58	46	88	20	57	23	18	36	22	0	8	60	46	39	80	33	35	31	38	19	12	35	95	72	48	76	82	10	19	6	29	35	38	43	39	52	74	31	0
164 Nigeria	31	86	34	45	66	19	20	12	8	23	19	4	9	46	76	60	68	52	35	16	27	30	11	42	100	16	50	78	83	12	45	7	56	46	22	54	22	48	64	24	9
165 Congo (Brazzaville)	31	100	65	55	75	8	94	27	24	20	14	4	27	68	33	33	65	24	38	24	30	21	10	34	85	47	49	30	57	31	24	12	63	46	31	47	34	16	38	36	0
166 Nepal	30	26	42	63	99	20	57	41	25	67	32	46	63	55	44	56	89	28	61	28	46	18	15	73	48	68	52	69	98	22	51	58	59	6	4	75	100	67	38	34	0
167 Côte d'Ivoire	30	62	48	69	74	13	57	18	11	21	21	6	10	60	44	34	76	34	30	14	33	18	13	31	79	59	48	52	87	24	28	11	32	40	50	28	48	28	80	37	0
168 Tanzania	30	82	38	78	75	18	63	25	19	32	14	6	34	47	58	53	66	47	46	14	33	25	15	30	79	85	61	25	13	27	22	3	25	25	46	43	50	37	32	32	0
169 Equatorial Guinea	29	100	65	87	2	24	95	28	24	19	15	2	26	81	62	51	40	36	27	12	36	32	22	46	91	6	52	42	55	39	70	18	64	59	24	56	100	17	5	38	0
170 Cameroon	29	84	47	76	56	14	57	20	20	24	21	3	3	62	47	33	57	32	42	16	37	20	12	35	94	69	67	32	86	21	24	8	59	30	15	62	23	33	59	31	0
171 Rwanda	29	75	30	89	56	25	90	31	26	33	15	11	25	59	64	44	50	19	56	46	33	24	15	31	81	98	52	26	30	29	16	0	28	19	32	59	58	24	44	44	0
172 Mozambique	28	75	36	80	62	21	52	20	18	5	2	2	24	64	30	25	76	26	45	14	26	16	12	20	79	85	21	42	16	13	10	5	13	23	56	38	32	29	49	66	37
173 Malawi	28	100	34	83	60	25	89	23	17	19	8	4	22	82	50	40	81	38	76	11	36	22	11	29	84	83	40	49	38	16	10	3	15	24	53	74	51	0	8	45	0
174 Eritrea	26	100	28	44	79	6	30	31	28	42	9	19	24	73	27	29	84	19	22	34	18	15	4	20	100	100	41	29	44	20	11	3	39	34	29	26	100	27	59	44	0
175 Papua New Guinea	26	100	24	35	86	4	56	28	22	46	31	5	21	55	0	13	59	17	37	28	27	0	12	25	13	39	34	48	79	25	12	57	29	13	78	30	100	86	43	4	42
176 Angola	26	68	26	74	64	22	44	23	20	29	13	5	19	70	46	40	67	24	24	9	22	26	8	31	85	27	33	14	63	11	38	5	53	37	42	56	42	15	26	36	0
177 Mali	26	100	46	32	87	14	39	9	6	36	31	3	2	54	47	66	93	37	26	3	27	22	7	28	86	45	23	38	95	12	10	6	9	31	40	44	14	20	45	31	26
178 Guinea-Bissau	26	100	55	67	67	22	30	20	12	22	21	14	3	43	22	35	76	20	47	16	25	9	6	28	100	62	39	42	88	8	14	5	16	38	44	33	100	32	76	31	0
179 Burkina Faso	24	86	53	31	78	20	68	12	16	52	21	1	3	70	47	36	61	30	40	14	34	14	9	23	89	87	34	74	89	5	3	5	14	38	34	24	34	56	90	31	0
180 Madagascar	24	35	13	48	83	16	40	20	17	44	28	9	24	50	26	44	83	36	38	7	20	10	5	29	77	67	41	31	49	13	0	4	11	3	53	75	31	27	58	44	34
181 Liberia	24	100	42	74	85	5	57	20	17	34	22	4	2	1	50	36	67	46	43	14	35	20	9	36	96	56	39	16	89	4	21	0	10	42	62	67	50	10	60	31	0
182 Ethiopia	23	52	23	50	84	22	20	27	20	50	23	19	20	41	65	49	78	47	61	17	24	27	9	28	100	41	17	10	49	20	1	0	21	17	32	33	27	27	44	24	0
183 Lesotho	23	100	34	90	67	14	79	22	14	1	0	100	32	86	15	1	36	8	84	24	36	12	8	19	62	95	26	42	70	16	12	0	54	42	44	2	42	51	70	33	0
184 Benin	22	100	34	50	63	16	85	18	13	40	26	1	7	49	53	43	81	11	17	18	33	20	10	33	95	45	0	51	88	22	10	5	26	32	37	44	47	33	80	31	0
185 Uganda	22	67	40	84	71	34	72	25	18	27	8	2	29	48	53	42	63	28	47	11	28	26	14	33	86	61	4	7	28	27	12	7	29	24	24	51	51	0	4	46	0
186 Guinea	21	100	44	60	85	5	34	14	11	33	19	2	1	56	30	44	96	30	12	9	11	9	11	27	96	16	37	45	89	9	16	4	12	24	51	38	40	32	83	31	0
187 Afghanistan	21	28	14	75	97	14	50	28	20	78	35	18	27	65	1	52	97	19	38	15	26	6	31	31	82	46	31	0	93	4	21	41	32	18	20	27	13	0	88	68	0
188 Burundi	20	63	6	61	91	16	82	18	16	42	4	4	31	59	43	38	34	17	33	31	25	12	9	23	86	91	35	33	50	6	7	1	14	10	35	96	21	28	5	44	0
189 Sierra Leone	20	0	36	61	54	5	37	11	10	39	17	0	1	62	39	49	63	33	39	14	32	11	8	31	67	80	59	30	86	6	11	6	14	41	56	78	100	0	62	31	0
190 Democratic Republic of the Congo	18	22	24	62	68	10	53	18	17	49	8	2	23	11	42	42	77	24	12	18	23	13	10	28	86	48	20	0	73	11	18	0	24	21	32	58	16	0	1	36	0
191 Niger	17	33	17	11	94	14	18	11	19	54	25	2	4	68	53	61	95	41	38	0	28	13	6	29	93	65	11	33	91	7	1	9	12	22	15	43	24	33	85	32	0
192 Chad	15	100	26	25	92	8	3	9	11	31	18	6	5	42	45	44	79	29	5	0	17	9	2	27	89	19	20	57	93	3	2	8	15	27	22	39	22	37	58	31	0
193 South Sudan	12	100	43	6	78	11	24	12	9	42	16	5	27	39	39	40	95	25	0	7	4	10	3	21	88	15	28	15	52	1	0	0	11	9	30	32	0	27	61	44	0
194 Somalia	12	100	42	31	85	11	31	12	12	58	16	14	20	60	26	49	95	5	0	15	0	8	8	20	95	0	25	18	54	13	10	2	4	4	42	30	0	28	63	43	0
195 Central African Republic	12	100	25	63	84	1	36	8	5	26	1	2	25	53	15	26	66	0	12	17	3	2	0	19	88	25	16	36	68	1	4	9	22	19	26	37	0	31	64	36	0

Value: 100, 75, 50, 25, 0

projected the 2030 value and corresponding percentage change from 2015 to 2030 based on these annualised rates of change.

Uncertainty analysis

For all indicator estimates, GBD 2017 produced 1000 draws by location, age, and sex and for all years. Draws from the posterior distribution represent uncertainty in steps in the estimation process as well as in underlying data sources. For each scaled SDG indicator and the health-related SDG index, we calculated 95% uncertainty intervals (UIs) on the basis of these 1000 draws using simulation analysis. Further information about GBD uncertainty analysis is provided in related GBD publications.[21,23–27]

Role of the funding source

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

Results

Health-related SDGs in 2017

The global median health-related SDG index was 59·4 (IQR 35·4–67·3) in 2017, ranging from a low of 11·6 (95% UI 9·6–14·0) to a high of 84·9 (83·1–86·7; figure 1). The overall health-related SDG index masked substantial variation across indicators within countries. Many countries with low overall index scores performed reasonably well on some individual indicators and vice versa. For example, although Kenya scored only 31·7 (30·6–32·9) on the overall health-related SDG index for 2017, the country scored much better on met need for family planning (77·8, 74·6–80·9) and smoking prevalence (85·4, 82·6–88·0). By contrast, South Korea, which scored 72·2 (69·0–74·4) on the overall index, scored comparatively worse on suicide mortality (16·3, 11·5–21·1). Results for each indicator and country can be explored through the online data visualisation tool.

Scores for NCD mortality were worst in Afghanistan and in many countries in Oceania; the best scores were primarily among higher-SDI countries, with the exception of Peru (figure 1). Most countries with the best alcohol use scores were in north Africa and the Middle East, whereas countries with the worst values were generally concentrated in Europe. The worst smoking prevalence scores were found among a heterogeneous set of locations (eg, Greenland, Kiribati, and Montenegro), and the best were primarily found in sub-Saharan Africa. Suicide mortality scores were generally best in countries in the Middle East and worst in a variety of countries (eg, Greenland, Lesotho, and Lithuania).

The worst scores for health worker density were primarily in sub-Saharan African countries; by contrast, Cuba, Qatar, and many European countries recorded among the best scores for this indicator. Several Latin American countries had the worst scores for sexual violence by non-intimate partners, whereas several countries in central Asia, eastern Europe, and south Asia had the best scores for this indicator.

During 2008–17, 165 countries conducted at least one population and housing census. 30 countries had existing or had implemented population registries during this time, and eight of these countries had conducted at least one census since 2008 (appendix 2). Eight countries did not have this important source of demographic information over the full time period.

Global and subnational variation

Performance on the health-related SDG index in 2017 varied globally (figure 2) and at the subnational level (figure 3). Countries in the tenth decile of performance—those with the best index values—were primarily in western Europe, although Canada, Japan, and Singapore were also in this decile. Afghanistan was in the first decile of performance, which otherwise predominantly included countries in sub-Saharan Africa.

Among the countries with subnational SDG index scores (figure 3), India (which ranked in the third decile nationally) had the largest range in 2017, with a 34·9-point difference between states with the highest and lowest scores. China also had considerable subnational differences, performing in the sixth decile nationally but recording a 19·3-point difference in scores across provinces, followed by the USA (ninth decile nationally and a 14·8-point difference across states) and Mexico (seventh decile nationally and a 15·3-point difference across states). Scores were most homogeneous in Japan (tenth decile nationally and a 3·0-point difference across subnational locations), the UK (tenth decile nationally and a 3·6-point difference across regions in England), and Brazil (eighth decile nationally and an 8·0-point difference across states).

For the **online data visualisation tool** see https://vizhub.healthdata.org/sdg

Variation by sex and SDI

Globally, the median age-standardised NCD mortality rate, as it aligns with the UN definition, was higher for males (472·0 [IQR 330·5–604·9] per 100 000) than for

Figure 1: **Performance on the health-related SDG index and 40 individual health-related indicators, by location, in 2017**

Countries and territories are ranked by their health-related SDG index from highest to lowest in 2017. Indices and individual indicators are reported on a scale of 0 to 100, with 0 representing the worst scores from 1990 to 2030 and 100 reflecting the best during that time. SDG indicator 17.19.2a, population census status within the past 10 years, was not included in the health-related SDG index because projections were not generated for this indicator. Definitions of health-related SDG indicators are shown in table 1. FP need met, mod=family planning need met with modern contraception methods. NCD=non-communicable disease. NTD=neglected tropical disease. $PM_{2·5}$=fine particulate matter smaller than 2·5 μm. SDG=Sustainable Development Goal. UHC=universal health coverage. WaSH=water, sanitation, and hygiene.

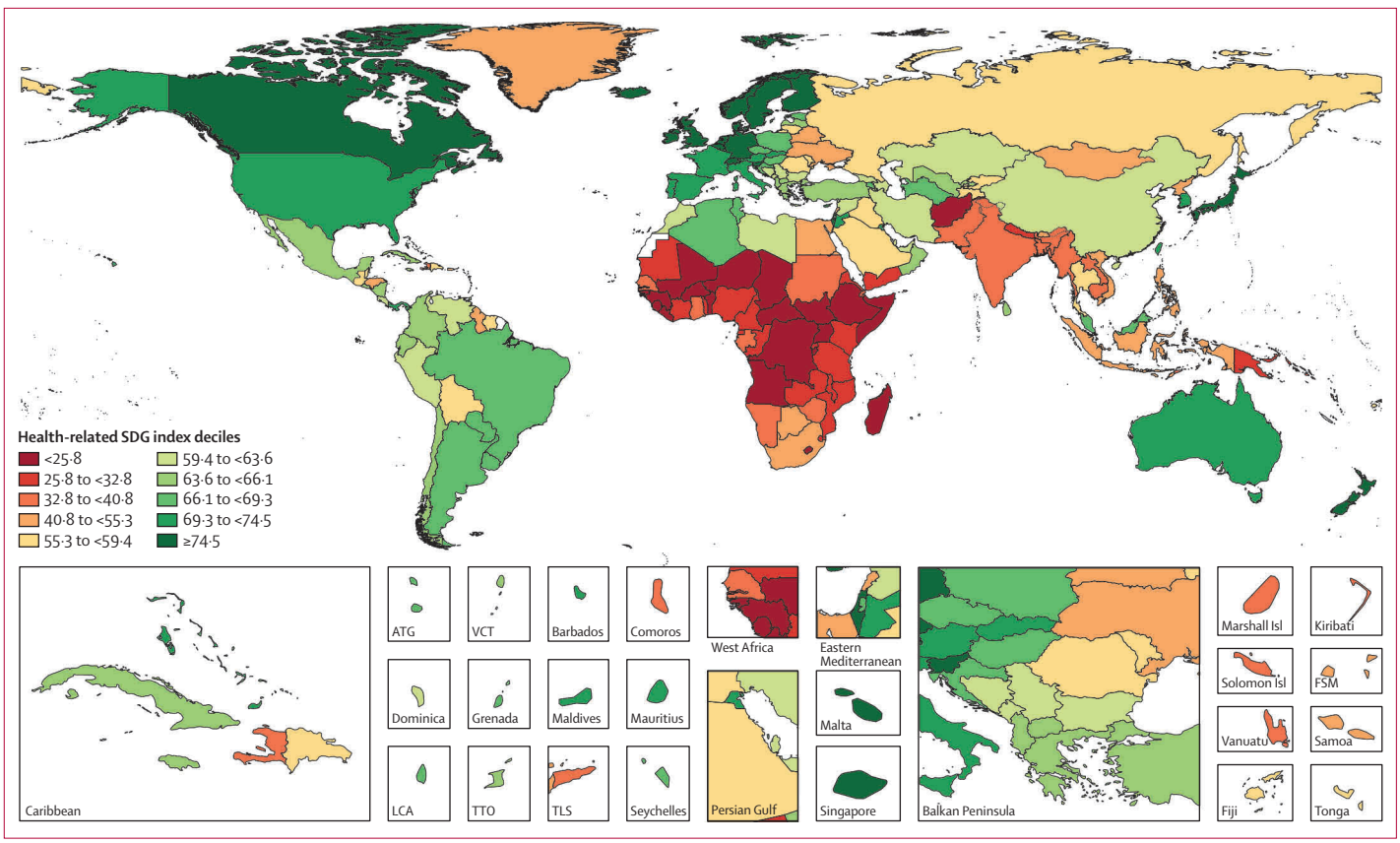


Figure 2: **Health-related SDG index by decile, 2017**

Deciles are based on the distribution of health-related SDG indices for countries and territories in 2017. ATG=Antigua and Barbuda. FSM=Federated States of Micronesia. Isl=Islands. LCA=Saint Lucia. SDG=Sustainable Development Goal. TLS=Timor-Leste. TTO=Trinidad and Tobago. VCT=Saint Vincent and the Grenadines.

females (307·8 [215·4–417·9] per 100 000; figure 4). Variation by sex was also pronounced for alcohol use (18·5% [IQR 8·4–27·3] of males *vs* 6·4% [2·2–11·8] of females), smoking prevalence (25·0% [IQR 17·2–34·7] of males *vs* 6·1% [3·0–15·8] of females), and suicide mortality (13·8 [IQR 8·8–19·7] per 100 000 males *vs* 4·0 [2·5–5·6] per 100 000 females; figure 4).

NCD mortality showed an inverse association with SDI quintile, with the lowest mortality in high-SDI countries. Males in high-middle-SDI countries were the exception, recording higher mortality rates than males in middle-SDI and low-middle-SDI countries. Disparities in NCD mortality by sex emerged across SDI quintiles, particularly among high-middle-SDI countries, for which the median age-standardised mortality rate was 512·4 (IQR 356·2–643·9) per 100 000 males and 285·9 (250·1–333·6) per 100 000 females. Alcohol use was generally higher among higher-SDI quintiles, although differences between sexes were smallest in low-SDI and low-middle-SDI countries. Smoking prevalence was also higher among higher-SDI quintiles, with the exception of males in high-SDI countries who had a lower smoking prevalence than males in high-middle-SDI countries. Differences between sexes were pronounced across SDI quintiles but were often smallest in high-SDI countries. The median age-standardised suicide mortality rate showed a U-shaped pattern, with the highest rates in high-SDI and low-SDI countries.

Overall, males had worse health outcomes—higher mortality, incidence, and risk exposure—than females for all ten disaggregated indicators globally and across SDI quintiles; the primary exception was HIV incidence among low-SDI countries, where the incidence was higher in females than in males (figure 4). In 2017, the global median age-standardised incidence of HIV was 0·14 (IQR 0·04–0·37) per 1000 males versus 0·07 (0·02–0·30) per 1000 females. For tuberculosis, the global median age-standardised incidence was 48·9 (IQR 18·6–211·2) per 100 000 males and 39·7 (14·8–187·0) per 100 000 females. Overall, age-standardised mortality rates for road injuries and poisoning were lower among higher-SDI countries. In 2017, the global median mortality rate from road injuries was 21·5 (IQR 12·9–32·5) per 100 000 males and 7·0 (4·0–12·1) per 100 000 females, while the equivalent for poisoning mortality was 0·8 (0·4–1·7) per 100 000 males and 0·4 (0·2–0·8) per 100 000 females.

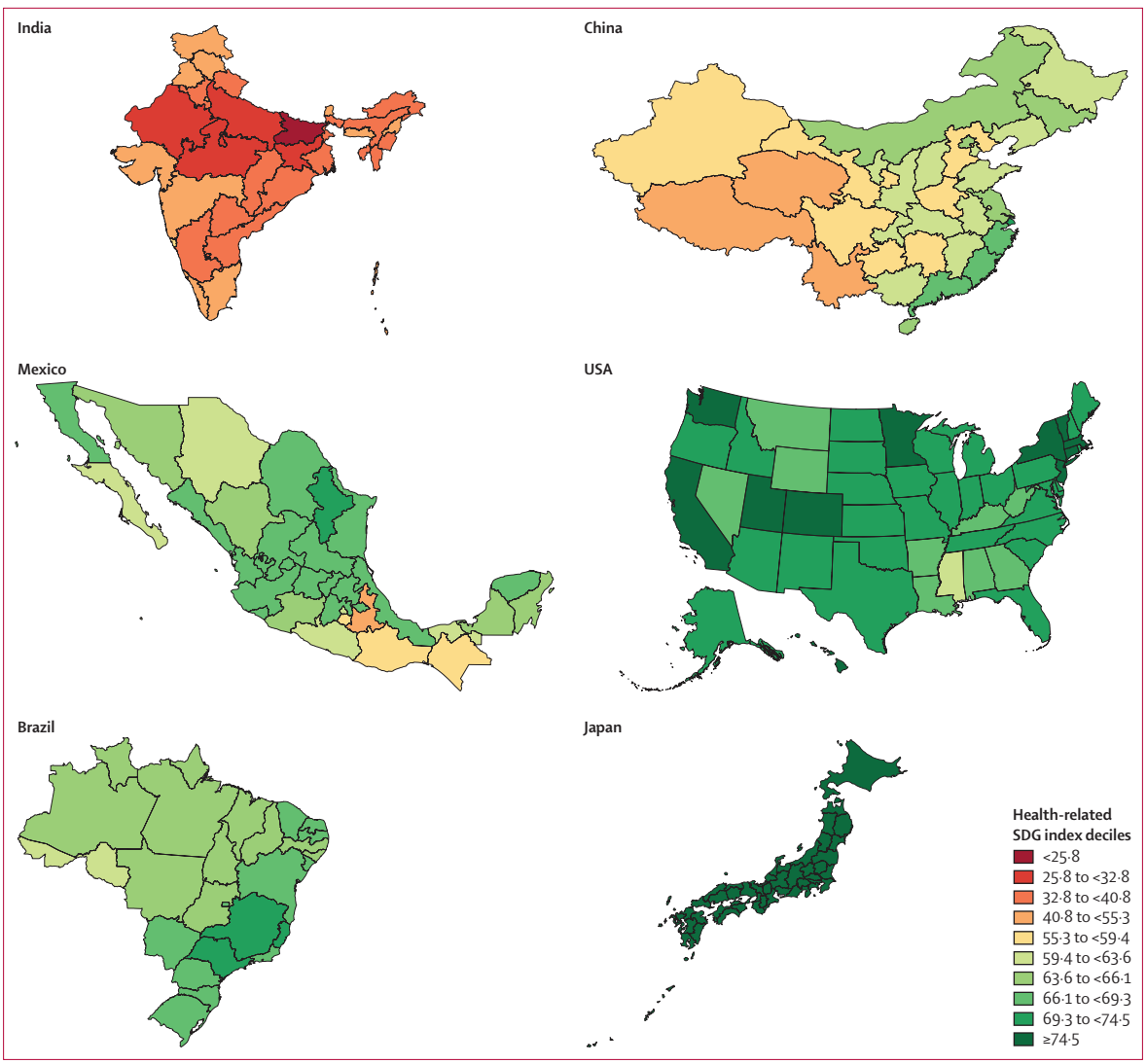
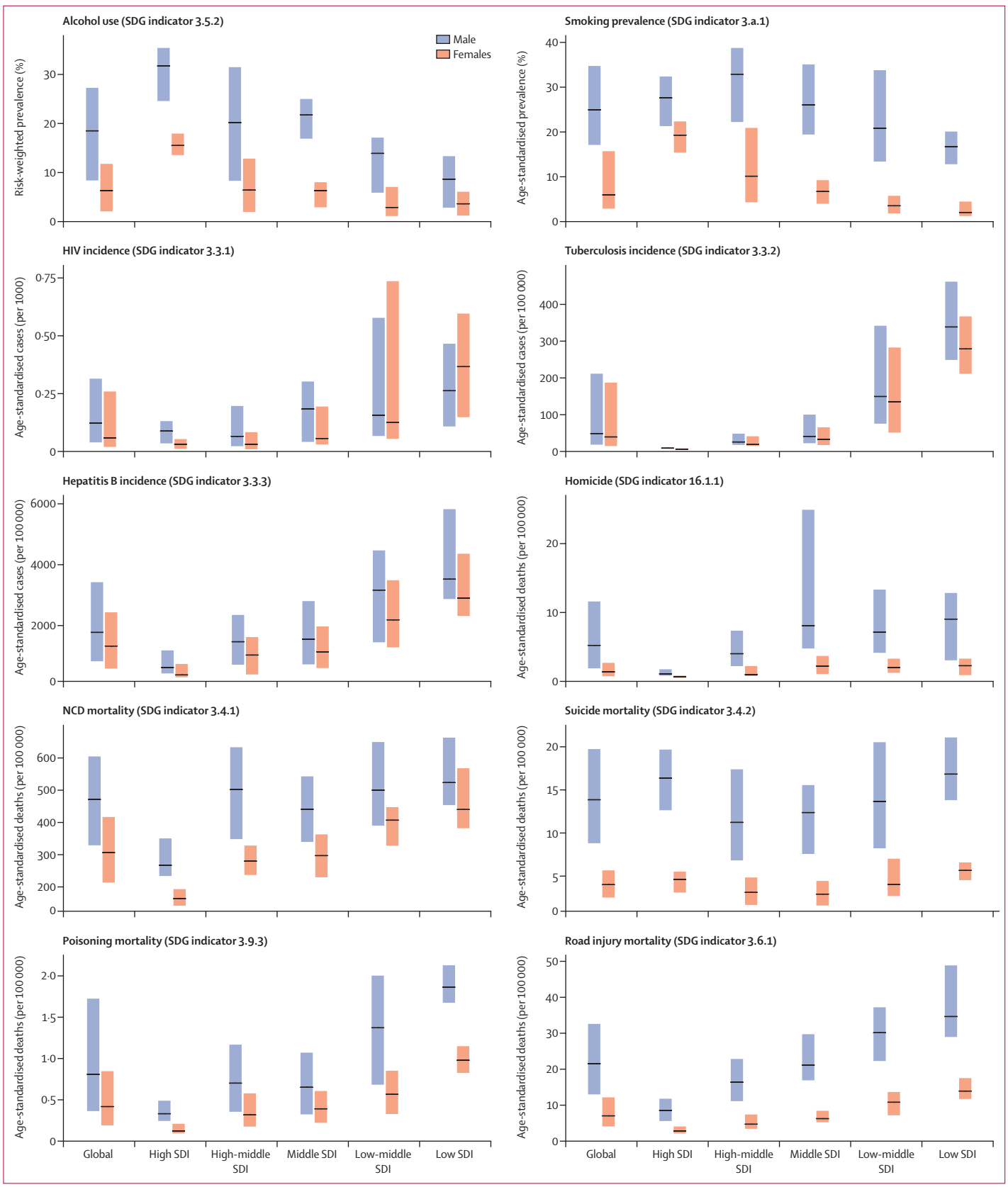


Figure 3: **Health-related SDG index for selected subnational locations, 2017**
Deciles are based on the distribution of health-related SDG indices for countries and territories in 2017, and then applied for subnational locations. SDG=Sustainable Development Goal.

Health-related SDGs in 2030 and target attainment

On the basis of past trends, most countries were projected to have higher health-related indices in 2030 than in 2017 (appendix 2). For the health-related SDG indicators with defined targets (figure 5; appendix 2), the probability of attainment by 2030 varied substantially across locations and by indicator. Under-5 mortality, neonatal mortality, maternal mortality ratio, and malaria had at least 100 countries or territories with at least a 95% probability of attaining defined targets in 2030. Indicators including vaccine coverage, HIV incidence, neglected tropical diseases prevalence, non-intimate partner violence, well-certified death registration, and environmental risks such as sanitation and household air pollution showed substantial heterogeneity in terms of projected attainment, with many locations recording probabilities of less than 10% and others recording probabilities of 95% or higher. For nine indicators, including child overweight, road injury mortality, and tuberculosis, all 195 countries and territories had lower than 5% probability of attainment by 2030.

Figure 6 shows the distribution of annualised rates of change in 195 locations for 1990–2015. For several indicators, the global required annualised rates of change were met or exceeded by many countries not in the top decile of performance from 1990 to 2015. These indicators generally had value-specific SDG targets, such as under-5 mortality (ie, ≤25 deaths per 1000 livebirths), or had targets linked to universal access or coverage of specific interventions (ie, vaccine coverage and met need for family planning). Furthermore, most of these indicators


Alcohol use (SDG indicator 3.5.2)
Male
Females
Risk-weighted prevalence (%)
Smoking prevalence (SDG indicator 3.a.1)
Age-standardised prevalence (%)
HIV incidence (SDG indicator 3.3.1)
Age-standardised cases (per 1000)
Tuberculosis incidence (SDG indicator 3.3.2)
Age-standardised cases (per 100 000)
Hepatitis B incidence (SDG indicator 3.3.3)
Age-standardised cases (per 100 000)
Homicide (SDG indicator 16.1.1)
Age-standardised deaths (per 100 000)
NCD mortality (SDG indicator 3.4.1)
Age-standardised deaths (per 100 000)
Suicide mortality (SDG indicator 3.4.2)
Age-standardised deaths (per 100 000)
Poisoning mortality (SDG indicator 3.9.3)
Age-standardised deaths (per 100 000)
Road injury mortality (SDG indicator 3.6.1)
Age-standardised deaths (per 100 000)
Global
High SDI
High-middle SDI
Middle SDI
Low-middle SDI
Low SDI

had origins in the Millennium Development Goals era. Despite substantial progress in the past, only countries in the top decile of performance for 1990–2015 met or surpassed the global rate of change required to meet the maternal mortality ratio target for 2030 (ie, <70 deaths per 100 000 livebirths), and very few countries recorded the rates of change required at the global level to meet the UHC service coverage target by 2030. A similar pattern emerged for NCD mortality. For other health-related SDG indicators, the global annualised rates of change required to meet their SDG targets far exceeded the pace of progress ever recorded by any country in the past (figure 6). These included several elimination indicators for infectious diseases, such as HIV and tuberculosis, and environmental risks such as household air pollution, among others (figure 6; appendix 1).

For NCD mortality and suicide mortality, performance at the global mean percentile of past rates of change (90th percentile) aligned with defined SDG targets of reducing rates by a third from 2015 to 2030 (ie, the equivalent of a 32·5% reduction for NCD mortality and a 31·4% reduction for suicide mortality; table 2). Yet, for several indicators, performance at the 90th percentile would not equate to meeting established SDG targets. Many indicators with elimination targets saw the widest gaps in how the 90th percentile could translate into global attainment in the SDG era. For example, indicators under SDG target 2.2, which aims to end all forms of malnutrition, would see the global average for child stunting decrease to 18·0% and wasting to 5·0% in 2030 if the 90th percentiles of past rates of change are achieved. For child overweight, the 90th percentile equated to a 0·5% decrease by 2030, from a global average of 15·9% in 2015 to 15·8% in 2030. SDG target 3.3 calls for ending the epidemics of several infectious diseases, including tuberculosis, HIV, and neglected tropical diseases; based on the 90th global mean percentile, the global percentage change from 2015 to 2030 would fall short of such aspirations for most of these causes (ie, decrease of 7·9% for hepatitis B, 35·6% for tuberculosis, 53·4% for HIV, and 48·2% for neglected tropical diseases). The exception was malaria, which would decrease by 94·0% at the 90th percentile.

For two leading risk factors, alcohol use (SDG indicator 3.5.2) and prevalence of current smoking (SDG indicator 3.a.1), annualised rates of change in the 90th percentile would equate with 18·7% and 21·9% reductions, respectively, at the global level from 2015 to 2030 (table 2). Global percentage declines would range from 41·5% for mortality attributable to ambient air pollution and household air pollution (SDG indicator 3.9.1) to 68·1% for mortality attributable to unsafe water, sanitation, and hygiene (SDG indicator 3.9.2), reflecting the substantive improvements in reducing mortality attributable to these risks that many countries achieved in 1990–2015. If the 90th percentile was used as an SDG target, adolescent birth rates would need to decrease by 47·4%, or to a global average of 11·4 per 1000 females aged 10–19 years in 2030, and health worker density would need to increase by 85·4%, from an average of 5·9 per 1000 population in 2015 to 10·9 per 1000 population in 2030.

Figure 4: **Median values for select SDG indicators, by sex, at the global level and by SDI quintile, 2017**

The lengths of the coloured rectangles represent the IQRs. More detail on the SDG indicators included in this figure can be found in table 1. SDG=Sustainable Development Goal. SDI=Socio-demographic Index.

Discussion

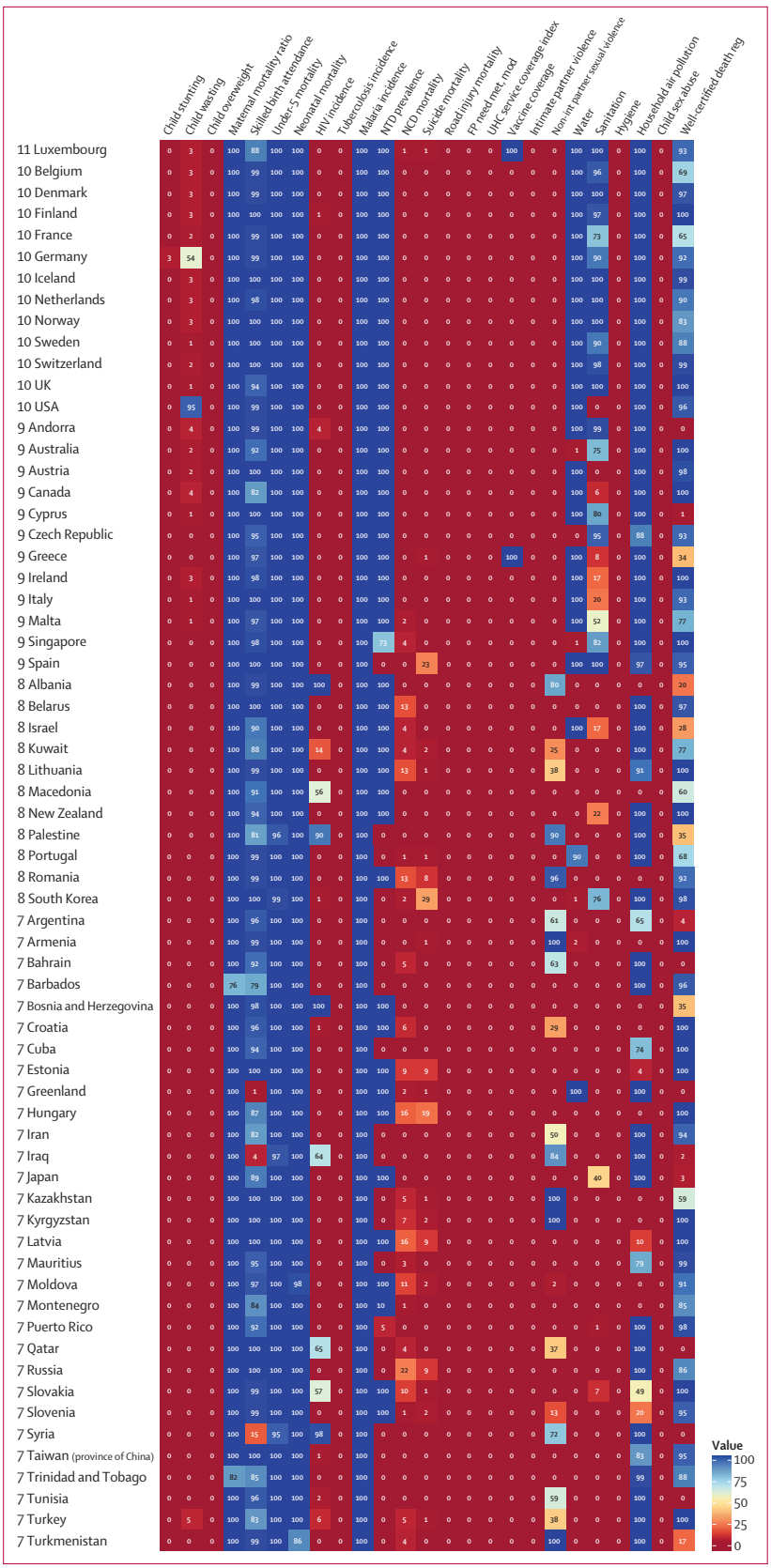
Summary of findings

Although nearly all countries were projected to have improved health-related SDG index scores by 2030, progress varied by country and across individual indicators. Performance on health-related SDG indicators differed subnationally for several countries, as well as by sex and across SDI quintiles, highlighting the need for disaggregated data to ensure that no one is left behind. For many indicators, the annualised rate of change required to meet defined targets far exceeded the pace of progress achieved by any country in the recent past. Yet, even for those indicators with a mean projected value that fell short of the 2030 target, there was some probability of attainment by 2030, highlighting the potential for future SDG achievements if progress can be accelerated in the coming years. These results highlight the need for more rapid yet strategic implementation of programmes and continued monitoring of inequalities in the health-related SDGs within populations.

SDG indicator progress and challenges

Health-related SDG index scores were projected to be higher in 2030 than in 2017 in almost all countries; however, improved index performance does not inherently reflect whether or not countries will attain individual SDG targets. The composite nature of the index means that many factors have a part in determining a country's overall score, and ensuring that progress on the index score translates into progress across indicators and equitably across populations will continue to be a challenge for countries.

Countries that performed well on the health-related SDG index commonly scored worse on the individual indicators of childhood overweight and alcohol use than on other indicators. Among countries that performed worst on the health-related SDG index, well-certified death registration was a frequent challenge. As populations age, all countries will need to strengthen health information systems to ensure death registration keeps pace with increasing mortality in older populations.[23] Although suicide mortality and alcohol use prevalence appeared to be lowest in many countries in north Africa and the Middle East, in places where these practices are



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deemed illegal or shameful, our results might reflect a dearth of accurate data rather than true circumstances.[39,40]

Without a concerted scale-up of efforts to prevent and treat NCDs, most countries will fall short of the 2030 SDG target.[9] The NCDs included in SDG indicator 3.4.1—cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases—accounted for 82·8% of all deaths due to NCDs in 2017.[21] Total deaths due to NCDs increased from 9·5 million in the population aged 30–69 years in 1990 to 12·9 million in 2017 (or 62·9% of all deaths in that age group).[23] Of those 12·9 million deaths, 6·3 million were due to cardiovascular diseases, 4·9 million to cancers, 1·1 million to chronic respiratory diseases, and 0·6 million to diabetes.[23] Although the absolute number of deaths due to NCDs is rising annually, in most countries, this increase is the result of population ageing and growth; with the exception of diabetes, age-standardised NCD mortality rates for NCDs included in the SDG indicator have generally decreased.[23] Nonetheless, many NCD-related risk exposures have seen minimal changes over time or are increasing, portending future challenges if more deliberate action is not taken against NCDs.[21]

In many countries, reductions in mortality due to cardiovascular diseases have been driven by improved access to antihypertensives and statins for addressing high cholesterol.[41,42] Investing in programmes that promote the early diagnosis and control of such metabolic risks should be prioritised by national governments and development partners.[43] Furthermore, prevention of other modifiable risk factors, such as smoking, harmful alcohol consumption, and obesity, should also be a priority, as advocated by WHO's best buys for NCD control, including taxation of alcohol and tobacco and reduced salt intake.[44] Yet, national financing of NCD programmes remains low, with patients often paying out-of-pocket for related services,[45] and surveillance and reporting of NCDs are still sparse in many regions.[46] The lack of action against NCDs is a current paradox of global health: despite numerous high-profile commitments and robust evidence underscoring the impact of NCDs, the actual scale-up and maintenance of NCD-related interventions and programmes is lacklustre at best.[9] Inadequate access to affordable diagnostics and treatment, poor prioritisation of NCD risk-prevention programmes, and low overall UHC are among challenges facing many low-SDI and middle-SDI countries.[42,47] Political influences and corporate interests might also affect the effectiveness of NCD programmes and policies, particularly those targeting sugar and alcohol consumption.[48,49]

Our estimates from 2017 indicate that 47·2% of countries and territories have less than one physician per 1000 population and 46·2% have less than three nurses or midwives per 1000 population. The largest gaps in health worker density were found in sub-Saharan Africa, although density was also low in southeast Asia, south

Asia, and some countries in Oceania. GBD 2017 provides consistently estimated time series across locations for health worker density as an SDG indicator and by cadre, which supports supplementary analyses of the types and numbers of health workers required to deliver particular sets of interventions or health programmes. For instance, the threshold of 23 physicians, nurses, or midwives per 10 000 population, which was set by WHO in 2006, was a widely referenced minimum required to provide essential maternal and child health services during the Millennium Development Goals era.[50] 12 years later, this recommendation persists, despite it being likely that very different health workforce quantities, composition, and quality of training are needed to provide a broader range of effective health-care services—particularly as more countries aim to make progress towards UHC.

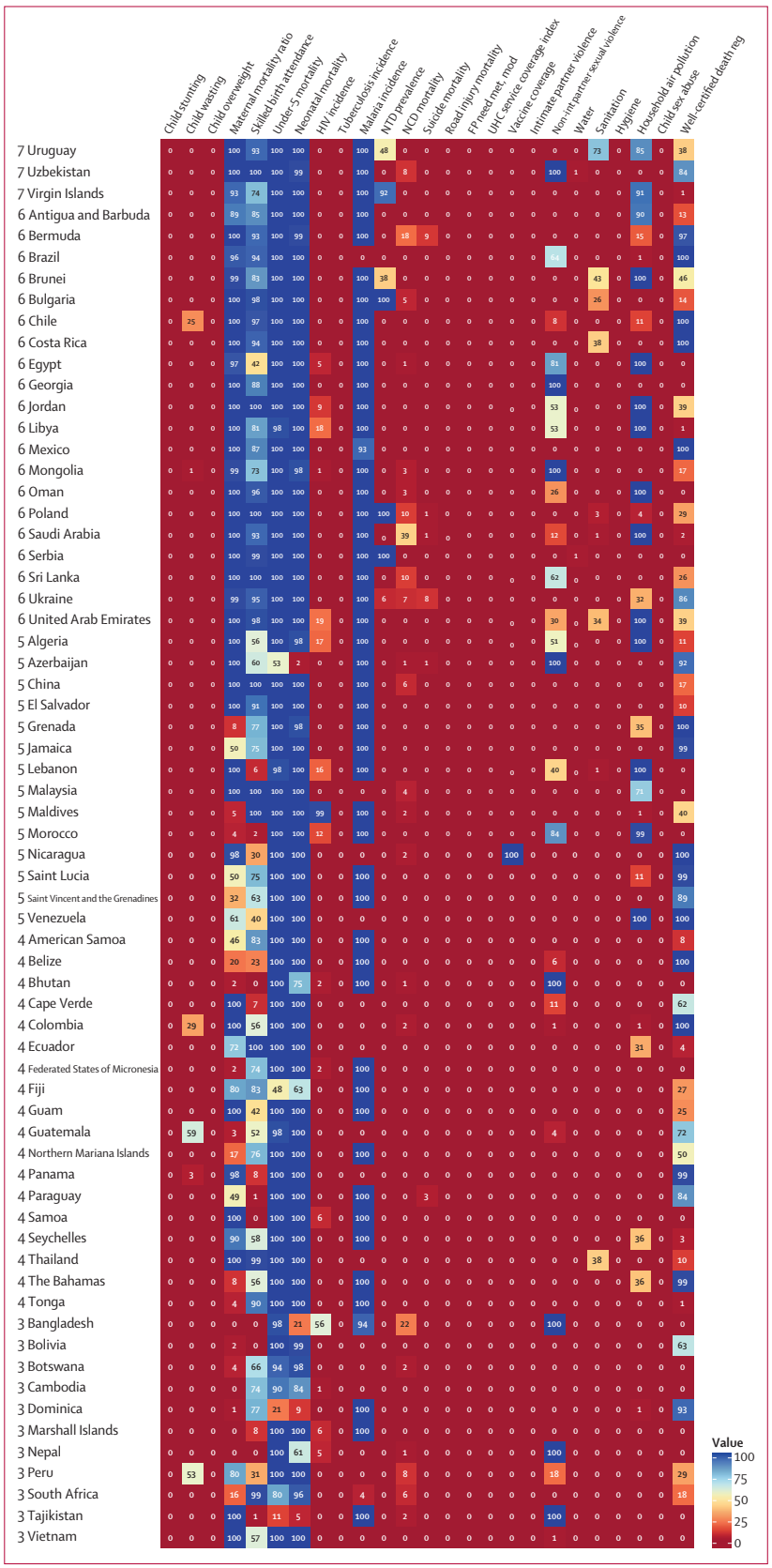
With their explicit emphasis on eliminating violence, the SDGs offer an opportunity to reduce and prevent violence against females and children.[51] This is the first time that a global development agenda has prioritised all forms of violence, including violence against females and children, homicides, and armed conflicts. Reliable information and evidence are required to develop programmes and policies to prevent violence, as well as to demand accountability and resources from governments, civil society, and international institutions when violent acts occur. As a result, it is vital to strengthen routine reporting of violence across all ages, and to ensure that accurate, timely measures of violence are accompanied by effective support and systems for survivors of violent acts to enable long-term recovery.

Monitoring the health-related SDGs by sex and SDI

Despite the major part sex has in determining health behaviours and outcomes, only a third of the global health organisations included in the Global Health 50/50 report produce data disaggregated by sex.[52] Data disaggregated by sex are crucial to uncovering key sex inequalities in health from which gender inequalities can be inferred or extrapolated.

Several studies[53–58] have shown that sex differences in health outcomes vary across causes of disease and disability. However, differences in health between sexes are less clear than is often assumed.[59] Although males generally had worse outcomes than females for most indicators disaggregated in this study, this pattern might not hold true for many of the health-related SDG indicators that are not currently disaggregated by sex. Increased sex-specific collection of data, modelling, and reporting are needed, particularly for health-related SDG indicators related to child or neonatal mortality.

We showed that SDI quintile is also related to sex-specific patterns. For example, although globally, HIV incidence is higher in males, a large portion of the global HIV incidence occurs in lower-SDI countries in sub-Saharan Africa, where incidence is higher in females.[23] Prevalence of alcohol use and current smoking showed



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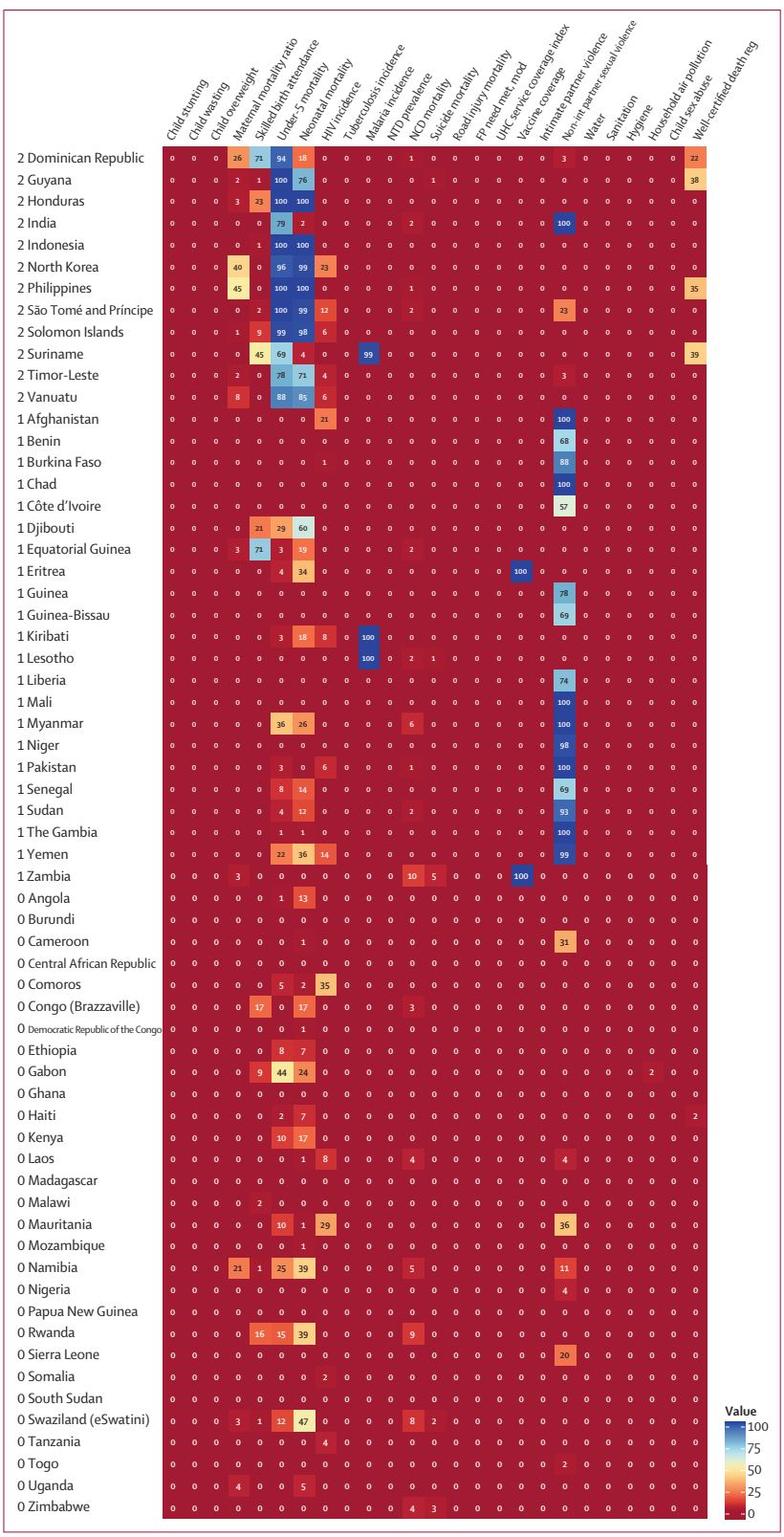

similar patterns by sex: on average, males were more likely than females to smoke and consume harmful levels of alcohol, and while use was often higher among people living in higher-SDI countries, sex differences in these countries were also more pronounced.[60,61] Although the global smoking prevalence decreased from 1990 to 2017, particularly in males in high-SDI countries, some low-SDI and middle-SDI countries saw increasing prevalence in females.[61] Alcohol use did not show similar rates of decline, which is unlikely to change in the absence of effective legal instruments and taxation policies.[62–65] Further research is needed to understand the role of attitudes and practices associated with smoking and alcohol use by sex.[66–70]

Measuring progress at the subnational level

It is well known that national averages mask subnational disparities within countries, and the results of the health-related SDG index at the subnational level showed substantial differences in performance within countries, particularly in India and China. Differences between localities were lowest in Japan and the UK. Across countries, the states with the lowest SDG index scores in the USA (Mississippi, Arkansas, West Virginia, and Nevada) had lower scores than did 17 states in Mexico and 12 states in Brazil, while ten states in the USA had lower scores than Shanghai.

Disparities on the health-related SDGs at the subnational level were particularly pronounced among low-SDI and middle-SDI countries, indicating that greater investments in targeting the most vulnerable or disadvantaged people in a country are probably required to improve the health of the entire population. Generally, we found that higher-SDI countries had less variation in their performance among first administrative levels; however, differences at more focal levels (eg, counties in the USA and municipalities in Brazil) and by age and sex might still present considerable challenges to reaching the SDG aims of leaving no one behind. Identifying such gaps is a necessary first step to focus the attention of local decision makers when targeting resources and

Figure 5: **Comparing the probability of attainment for defined health-related SDG indicator targets based on past trends, by location, in 2030**

Countries and territories are ranked from highest to lowest by the total number of SDG indicator targets they are projected to attain on the basis of mean estimates for 2030. Numbers preceding the country names are the numbers of targets projected to be met by each country or territory based on means. Values reported reflect the probability of projected attainment based on the percentage of draws that fell above or below defined targets in 2030. Of the 41 health-related indicators measured in this study, 25 had defined targets linked to each indicator. SDG target 3.6 aims to reduce road injury mortality by 50% between 2015 and 2020, and thus attainment for this indicator is based on estimates from 2015 to 2020 rather than 2015 to 2030. Definitions of health-related SDG indicators and targets associated with them, as well as the specific target thresholds applied, are shown in table 1. FP need met, mod=family planning need met with modern contraception methods. NCD=non-communicable disease. Non-int=non-intimate. NTD=neglected tropical disease. reg=registration. SDG=Sustainable Development Goal. UHC=universal health coverage.

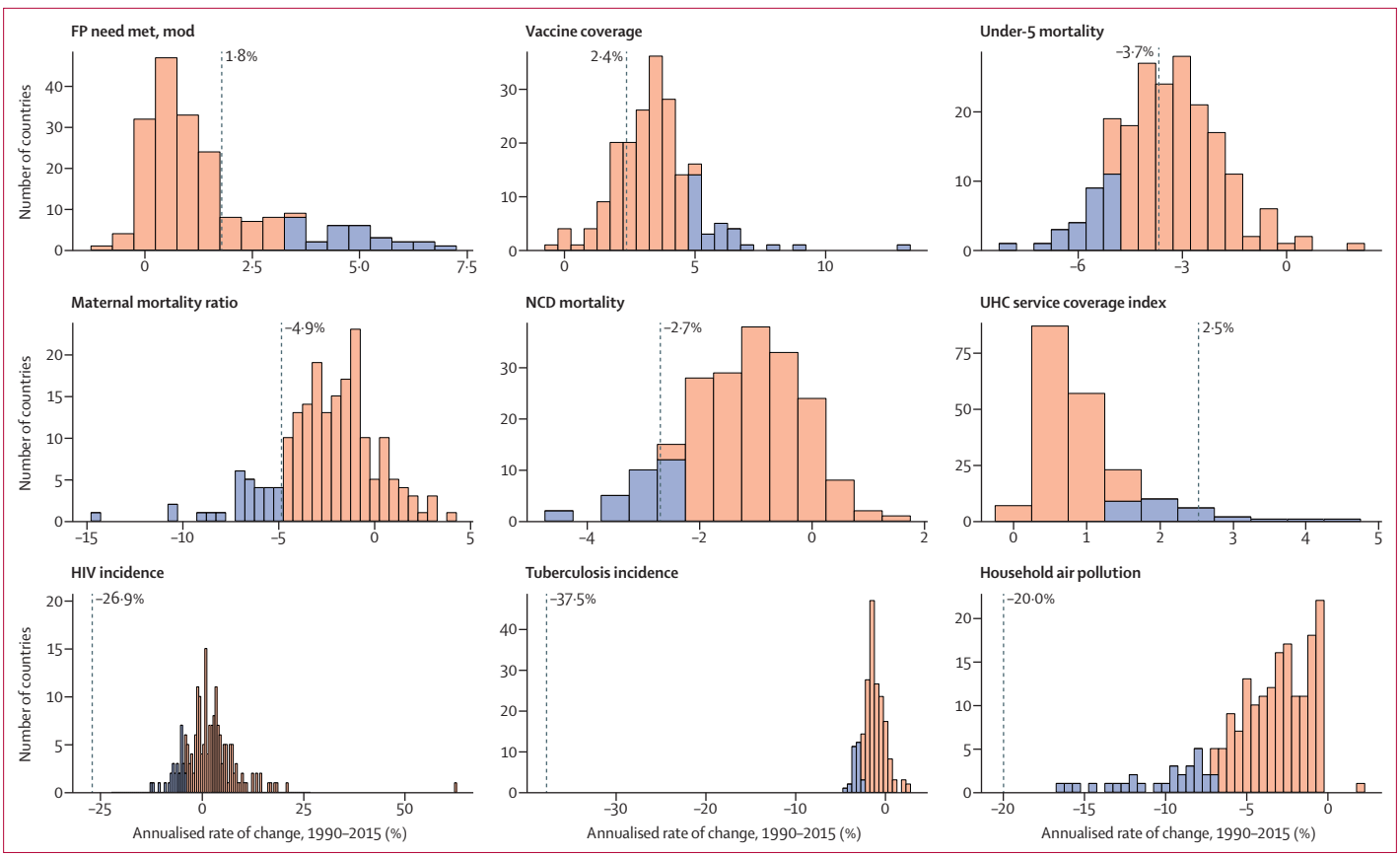

Figure 6: **Global annualised rate of change required to meet selected SDG targets based on annualised rate of change achieved by countries or territories, 1990–2015**
For the 25 SDG indicators with defined targets, we estimated the required global annualised rate of change (dotted line) required to meet each target using the global average in 2015 and specific thresholds to be met by 2030 or relative reductions to be achieved by 2030. The top performing decile (the 10th decile) is shown in blue and all other annualised rates of change are shown in red. A subset of SDG indicators with defined targets are shown here; the remaining plots can be found in appendix 2. Definitions of health-related SDG indicators and targets associated with them are shown in table 1. FP need met, mod=family planning need met with modern contraceptive methods. NCD=non-communicable disease. SDG=Sustainable Development Goal. UHC=universal health coverage.

programmes. Few reports of countries seeking to address SDGs at the local level exist, although many countries have published voluntary reports of SDG progress with national-level data.[71–77]

Owing to the broad and multisectoral nature of the health-related SDG indicators, a whole-government approach is needed to strengthen their monitoring. Data are needed to inform planning and investment. Disaggregation of data can empower local administrations and improve local health information systems—an important government need beyond reporting indicator progress—but it is unlikely that it will be sufficient to identify all health inequalities.[19,20] The increased number of national and subnational units included in GBD 2017 is in line with the recommendation of the High Level Political Forum on Sustainable Development to produce regular voluntary national reviews of progress at national and subnational levels.[78] The production of subnational estimates for the GBD study is not intended to substitute for country-level reporting; on the contrary, we hope that the dissemination of these results might help stimulate subnational reporting in a proactive manner.[79]

Setting and assessing SDG targets

Projected attainment differed substantially among indicators with defined SDG targets. This pattern was particularly true for indicators that had few countries projected to meet targets based on mean values but had relatively more countries that showed some probability of attaining them by 2030. For some indicators with strong links to the Millennium Development Goals era—eg, maternal mortality ratio, child mortality, malaria, and skilled birth attendance—more than 50% of countries were projected to meet 2030 targets; furthermore, of those countries not projected to achieve these targets based on their mean values, many showed some probability of attainment by 2030. These findings highlight possible trajectories for meeting targets if progress can be accelerated in the future.

Nonetheless, based on past rates of progress, no country is currently on track to meet all defined health-related SDG targets. For under-5 mortality, which has many countries on track for or already achieving the target of 25 deaths or fewer per 1000 livebirths by 2030, 31 countries or territories would need to achieve annual

	2030 target used in this analysis	Projected attainment in 2030	Global average in 2015	Global required annualised rates of change to meet SDG target by 2030	Global percentile based on country-level annualised rates of change from 1990 to 2015	Country-level annualised rates of change from 1990 to 2015 based on the mean percentiles for defined targets (90th percentile)	Global average in 2030	Global percentage change, 2015–30
Indicator 1.5.1: Death rate due to exposure to forces of nature	Undefined	..	0·2 per 100 000 population	..	..	–9·3%	0·05 per 100 000 population	–76·8%
Indicator 2.2.1: Prevalence of stunting in children younger than 5 years	≤0·5%	0%	28·7%	–27·0%	100	–3·1%	18·0%	–37·6%
Indicator 2.2.2a: Prevalence of wasting in children younger than 5 years	≤0·5%	1%	8·0%	–18·5%	100	–3·2%	5·0%	–38·3%
Indicator 2.2.2b: Prevalence of overweight in children aged 2–4 years	≤0·5%	0%	15·9%	–23·1%	100	–0·5%	15·8%	–0·5%
Indicator 3.1.1: Maternal mortality ratio in females aged 10–54 years	<70 deaths per 100 000 livebirths	56%	145·0 per 100 000 livebirths	–4·9%	86	–6·0%	57·0 per 100 000 livebirths	–60·7%
Indicator 3.1.2: Proportion of births attended by skilled health personnel	≥99%	54%	80·1%	1·4%	76	3·0%	>99%	>22·8%
Indicator 3.2.1: Under-5 mortality rate	≤25 deaths per 1000 livebirths	72%	43·3 per 1000 livebirths	–3·7%	56	–5·2%	19·4 per 1000 livebirths	–55·3%
Indicator 3.2.2: Neonatal mortality rate	≤12 deaths per 1000 livebirths	71%	18·6 per 1000 livebirths	–2·9%	58	–5·0%	8·6 per 1000 livebirths	–53·7%
Indicator 3.3.1: Age-standardised rate of new HIV infections	≤0·005 per 1000 population	4%	0·3 per 1000 population	–26·9%	100	–5·0%	0·1 per 1000 population	–53·4%
Indicator 3.3.2: Age-standardised rate of tuberculosis cases	≤0·5 per 100 000 population	0%	139·6 per 100 000 population	–37·6%	100	–2·9%	89·9 per 100 000 population	–35·6%
Indicator 3.3.3: Age-standardised rate of malaria cases	≤0·005 per 1000 population	61%	31·8 per 1000 population	–58·4%	97	–17·1%	1·9 per 1000 population	–94·0%
Indicator 3.3.4: Age-standardised rate of hepatitis B incidence	Undefined	..	2123·8 per 100 000 population	..	..	–0·6%	1955·2 per 100 000 population	–7·9%
Indicator 3.3.5: Age-standardised prevalence of the sum of 15 neglected tropical diseases	≤0·5%	24%	18·2%	–24·0%	100	–4·3%	9·4%	–48·2%
Indicator 3.4.1: Age-standardised death rate due to cardiovascular disease, cancer, diabetes, and chronic respiratory disease in populations aged 30–70 years	Reduce by one-third from 2015 to 2030	0%	382·7 per 100 000 population	–2·7%	91	–2·6%	258·2 per 100 000 population	–32·5%
Indicator 3.4.2: Age-standardised death rate due to self-harm	Reduce by one-third from 2015 to 2030	0%	10·0 per 100 000 population	–2·7%	93	–2·5%	6·8 per 100 000 population	–31·4%
Indicator 3.5.2: Risk-weighted prevalence of alcohol consumption, as measured by the summary exposure value or alcohol use	Undefined	..	11·6%	..	..	–1·4%	9·4%	–18·7%
Indicator 3.6.1: Age-standardised death rate due to road injuries	Reduce by 50% from 2015 to 2020	0%	16·1 per 100 000 population	–13·9%	100	–4·3%	13·0 per 100 000 population	–19·6%
Indicator 3.7.1: Proportion of females of reproductive age (15–49 years) who have their need for family planning satisfied with modern contraception methods	≥99%	0%	75·7%	1·8%	72	4·1%	>99%	>27·3%
Indicator 3.7.2: Number of livebirths per 1000 females aged 10–19 years	Undefined	..	21·7 per 1000 females	..	..	–4·2%	11·4 per 1000 females	–47·4%
Indicator 3.8.1: Coverage of essential health services, as defined by the universal health coverage index	≥99%	0%	67·7	2·5%	97	1·8%	88·3	30·4%
Indicator 3.9.1: Age-standardised death rate attributable to household air pollution and ambient air pollution	Undefined	..	55·6 per 100 000 population	..	..	–3·5%	32·5 per 100 000 population	–41·5%
Indicator 3.9.2: Age-standardised death rate attributable to unsafe water, sanitation, and hygiene	Undefined	..	35·7 per 100 000 population	..	..	–7·3%	11·4 per 100 000 population	–68·1%

(Table 2 continues on next page)

	2030 target used in this analysis	Projected attainment in 2030	Global average in 2015	Global required annualised rates of change to meet SDG target by 2030	Global percentile based on country-level annualised rates of change from 1990 to 2015	Country-level annualised rates of change from 1990 to 2015 based on the mean percentiles for defined targets (90th percentile)	Global average in 2030	Global percentage change, 2015–30
(Continued from previous page)								
Indicator 3.9.3: Age-standardised death rate due to unintentional poisonings	Undefined	..	1·0 per 100 000 population	..	..	–4·7%	0·5 per 100 000 population	–51·5%
Indicator 3.a.1: Age-standardised prevalence of current smoking in populations aged 10 years and older	Undefined	..	18·4%	..	..	–1·6%	14·4%	–21·9%
Indicator 3.b.1: Coverage of eight vaccines among target populations	≥99%	3%	69·3%	2·4%	23	5·2%	>99%	>42·7%
Indicator 3.c.1: Health worker density (physicians, nurses and midwives, and pharmacists) per 1000 population	Undefined	..	5·9 per 1000 population	..	..	4·2%	10·9 per 1000 population	85·4%
Indicator 5.2.1: Age-standardised prevalence of ever-partnered females aged 15 years and older who experienced physical or sexual violence by a current or former intimate partner in the past 12 months	≤0·5%	0%	13·4%	–21·9%	100	–1·4%	10·9%	–18·5%
Indicator 5.2.2: Age-standardised prevalence of females aged 15 years and older who experienced physical or sexual violence by non-intimate partner in the past 12 months	≤0·5%	21%	1·0%	–4·3%	100	0·2%	1·0%	3·5%
Indicator 6.1.1: Risk-weighted prevalence of populations using unsafe or unimproved water sources, as measured by the summary exposure value for unsafe water	≤1%	13%	34·3%	–23·6%	100	–4·3%	17·7%	–48·3%
Indicator 6.2.1a: Risk-weighted prevalence of populations using unsafe or unimproved sanitation, as measured by the summary exposure value for unsafe sanitation	≤1%	10%	31·7%	–23·1%	100	–6·2%	12·2%	–61·4%
Indicator 6.2.1b: Risk-weighted prevalence of populations without access to a handwashing facility, as measured by the summary exposure value for unsafe hygiene	≤1%	0%	33·2%	–23·3%	100	–2·5%	22·8%	–31·3%
Indicator 7.1.2: Risk-weighted prevalence of household air pollution, as measured by the summary exposure value for household air pollution	≤1%	34%	20·1%	–20·0%	100	–8·3%	5·5%	–72·6%
Indicator 8.8.1: Age-standardised all-cause disability-adjusted life-years attributable to occupational risks	Undefined	..	830·0 per 100 000 population	..	..	–1·7%	646·2 per 100 000 population	–22·1%
Indicator 11.6.2: Population-weighted mean levels of $PM_{2·5}$	Undefined	..	47·5	..	..	–0·9%	41·4	–12·9%
Indicator 16.1.1: Age-standardised death rate due to interpersonal violence	Undefined	..	5·1 per 100 000 population	..	..	–3·3%	3·1 per 100 000 population	–39·1%
Indicator 16.1.2: Death rate due to conflict and terrorism (per 100 000 population)	Undefined	..	1·9 per 100 000 population	..	..	–47·5%	<0·01 per 100 000 population	–100·0%
Indicator 16.1.3a: Age-standardised prevalence of physical violence experienced by populations in the past 12 months	Undefined	..	7·8%	..	..	–0·1%	7·7%	–0·9%
Indicator 16.1.3c: Age-standardised prevalence of sexual violence experienced by populations in the past 12 months	Undefined	..	3·3%	..	..	–0·9%	2·9%	–12·1%
Indicator 16.2.3: Age-standardised prevalence of females and males aged 18–29 years who experienced sexual violence by age 18 years	≤0·5%	0%	9·8%	–19·8%	100	–0·1%	9·6%	–1·8%

(Table 2 continues on next page)

	2030 target used in this analysis	Projected attainment in 2030	Global average in 2015	Global required annualised rates of change to meet SDG target by 2030	Global percentile based on country-level annualised rates of change from 1990 to 2015	Country-level annualised rates of change from 1990 to 2015 based on the mean percentiles for defined targets (90th percentile)	Global average in 2030	Global percentage change, 2015–30
(Continued from previous page)								
Indicator 17.19.2c: Percentage of well-certified deaths by a vital registration system among a country's total population	≥80%	37%	43·5%	4·1%	98	1·9%	57·4%	32·0%

Using the global average observed in 2015 for each of the 25 health-related indicators with defined targets, we calculated the global annualised rates of change required to meet these targets by 2030 (or by 2020 in the case of road injury mortality). The global required annualised rates of change were then compared with country-level annualised rates of change calculated from 1990 to 2015. The percentiles in which the global required annualised rates of change fell among country-level annualised rates of change in the past were ascertained, and then the average of these percentiles was computed (90th percentile) to serve as a way to assess defined SDG targets and potential targets for indicators that do not currently have defined SDG targets. The 90th percentile annualised rates of change observed for each indicator was applied to the global average in 2015 to compute the equivalent average in 2030 and percentage change from 2015 to 2030 if these rates of change are achieved during the SDG era. SDG=Sustainable Development Goal.

Table 2: **Predicting global attainment of health-related SDG indicators on the basis of past pace of progress observed across countries**

rates of decline from 2015 to 2030 that are two to ten times higher than what was recorded for 1990–2015. To bring such ambition closer to reality for all populations, the UN and other agencies will need to provide technical leadership and financial support, particularly for the countries with the lowest health-related SDG performance.

A subset of SDG indicators, such as NCD mortality and suicide mortality, represent both the expansion of the SDG agenda to encompass broader health priorities beyond the narrower focus of the Millennium Development Goals and the establishment of ambitious yet potentially more feasible targets to meet within a 15 year time frame. At first glance, reducing NCD or suicide mortality by a third from 2015 to 2030—on average, the equivalent of a 2·7% reduction per year—might not seem particularly ambitious. Yet, amid the rising number of total deaths due to NCDs and challenges associated with providing quality NCD services in many countries,[23,34] this rate of change ranked in the 91st to 93rd percentiles of country-level annualised rates of change achieved from 1990 to 2015. However, to truly eliminate many health challenges, as the SDGs set out to do by 2030, most—if not all—countries will need to achieve rates of change that surpass those ever achieved in the past. This is particularly true for child overweight, for which most countries have only seen rising prevalence since 1990; tuberculosis, a disease that has received comparably less international funding than have HIV and malaria;[79] road injury mortality; and most non-fatal violence measures. All countries had less than 5% probability of attaining child overweight and road injury mortality targets, highlighting priority areas for intervention globally.

Our global attainment analysis, which is grounded in historical rates of change, offers a mechanism to assess the ambitiousness of undefined targets. For instance, SDG target 3.a calls for strengthening the implementation of the WHO Framework Convention on Tobacco Control in all countries, a target against which changes in current smoking prevalence are not easily evaluated. The 90th mean global percentile of country-level rates of change in current smoking prevalence was a 1·6% decline per year from 1990 to 2015, which equated to a 21·9% decrease from 2015 to 2030 at the global level. Notably, the GPW13 calls for a 25% reduction in current tobacco use within 5 years (ie, a 5·8% decline per year),[3] a pace that far exceeds what countries have achieved in the recent past.

The setting of targets is both a technical and political exercise, aiming to balance important societal objectives with the reality that many bold targets might be challenging, if not impossible, to achieve within short periods of time. Instituting targets solely on the basis of past rates of change and data is unlikely to happen within global and national policy circles; even if it could occur, such an approach might be equally unhelpful given that galvanising new funds, innovations, and commitments to improving population health worldwide often requires setting sights beyond what seems possible today. Instead, we hope that the methods used in this study will be useful in providing technical underpinnings for setting realistic and achievable targets; in the long run, such targets are likely to be more effective in driving action. We view these results as an important entry point for charting possible pathways to accelerated gains by 2030, as well as identifying more tangible interim goalposts against which countries can track ongoing advances and needs. As the Inter-agency and Expert Group on Sustainable Development Goal Indicators and UN Statistical Commission prepare for their formal review and revision of the global indicator framework in 2020, these findings might serve as inputs for consideration.

The perceived feasibility of target attainment can shape how international institutions, funding agencies, and countries approach health challenges. In particular, strict interpretation of the UN's targets for elimination or universal coverage sets very high bars for success (eg, 100% coverage or elimination). Although elimination

has been achieved for some diseases in various settings (eg, malaria and a subset of neglected tropical diseases), truly ending an epidemic is much more complex for others, especially in the absence of fully effective vaccines or a radical cure. For other SDG indicators, such as intimate partner violence, elimination should be wholly feasible; yet to completely end all violent acts would require societal, cultural, political, and legal structures to fully align. Without more concrete strategies and funding for elimination, setting such ambitious targets could risk setting countries up for short-term failure and longer-term obstacles to instituting sustainable programmes; such arguments have been recently made about ambitions to eliminate HIV.[80] Nonetheless, HIV remains a massive public health threat, particularly because global financing has plateaued, domestic health spending on HIV has stayed low among high-burden countries,[79] and its incidence has not declined as quickly in younger as in older populations.[26] It could also be argued that aiming for elimination but falling short in 2030 would still substantially improve the lives of millions and facilitate medical breakthroughs that might not be funded without a global elimination campaign. How best to galvanise accelerated action against the world's largest health challenges is far from clear; going forward, the GBD study can offer international agencies and countries alike a platform through which different operationalisations of SDG targets can be tested.

Comparisons with other assessments

International agencies and the GBD study began producing annual reports of country estimates for the health-related SDG indicators in 2016. Of the 52 health-related indicators, GBD 2017 reported on 41, WHO reported on 37 in its 2018 World Health Statistics report,[6] the World Bank covered 33 in its 2018 SDG Atlas,[7] and the Sustainable Development Solutions Network included 27.[4] Standardisation of definitions and methods used to calculate the health-related SDG indicators could improve comparability across organisations and collaborations involved in monitoring the SDGs. The complete set of metadata for SDG indicators, provided by the UN and other international organisations, comes with instructions on how indicators should be measured.[81] However, GBD approaches to measurement differ from WHO approaches in various ways. For example, we use age-standardised rates for indicators that include mortality or incidence (eg, NCD mortality, suicide mortality, probability of death), whereas WHO generally use all-age rates. Furthermore, we define child overweight in terms of body-mass index for age and sex to align with the definition of overweight and obesity for adults, rather than in terms of weight for height. We also include all women of reproductive age in measurement of the met need for family planning indicator rather than limiting this measure to only women who are married or in a union. GBD also offers estimates for more years and locations than other organisations currently do, supporting the overarching SDG endeavour of leaving no one behind.

Strengths

An important strength of GBD 2017 is the increasing number of collaborators involved: participation increased by more than 44% from 2016, with collaborators from 144 countries and two territories. The collaborator network offers multiple benefits to the GBD study, and in the case of the SDGs, it provides the particular benefit of supporting international and national policy dialogue, connecting technical information to the political needs of the health-related SDGs. Health programmes and plans have a limited chance of success in the absence of robust evidence and policy dialogue. The benchmarking presented in GBD 2017 can help countries to promote and increase accountability at the national level. The bottom line is the need to enhance mutual understanding of the SDG agenda across the entire global range of stakeholders and to champion the importance of national ownership of local guidance, monitoring, and management in achieving SDG targets.

To facilitate comparisons across locations and over time of the diverse array of health-related SDG indicators, we have produced an overall SDG index since GBD 2015.[5,13] The health-related SDG index is not presented in lieu of monitoring individual indicators, which we also do here. Instead, this index provides a mechanism by which overall performance across health-related SDGs can be more easily compared. A single, robust measurement such as the health-related SDG index is a useful tool for policy makers and other decision makers to interpret the performance of a particular location. With the production of time trends for several indicators, the SDG index also facilitates the understanding of the pace of progress. While index values represent a combination of different dimensions considered together as a proxy of health-related SDG indicator performance, results reported by individual indicator allow for more nuanced analyses.

Limitations of indicator measurement

Our measurement of the health-related SDG indicators is subject to the limitations of the broader GBD 2017 study and its estimation processes; details can be found in the accompanying GBD 2017 capstone papers[23–27] and in appendix 1 (part 1). Beyond these limitations, there are other important limitations that are specific to this analysis.

First, for measurement of health worker density we used ISCO 88 codes as the base classification system instead of ISCO 08, which is a more recent system than ISCO 88 that offers greater detail and standardisation. However, few occupational data sources currently include ISCO 08 codes, and benchmarking all past surveys to ISCO 08 would have resulted in substantial information

loss. In future GBD iterations, we aim to collate more recent occupational data and to further refine health worker cadre mapping. Additionally, the UN includes density of dentist personnel in health worker density estimates, but the GBD study does not because including the four health cadres leads to counterintuitive results. Finally, the measure of health worker density can reveal only the quantity, not the quality, of available care.

Second, continued data sparsity for many violence measures, particularly for males and non-intimate partners, results in comparatively high uncertainty for these SDG indicators. Data on the prevalence of any form of violence are also subject to a number of measurement biases. All data for these indicators are self-reported and subject to recall bias and varying interpretations of survey questions. Variation in case-definitions or survey questions used by different surveys might also lead to increased uncertainty. We did not estimate psychological violence because there was no good standard for how to consistently measure it. Cultural influences, legal barriers to reporting, and stigma can also lead to underreporting and make the interpretation of self-reported data challenging, particularly for sensitive topics such as violence and other self-reported SDG indicators. Suicide is another indicator that might be affected by religious, cultural, and legal barriers to reporting. Accurate monitoring of violence measures requires routine, carefully implemented data collection, experienced interviewers, and thoughtful design for data intake, as well as ensuring that adequate protections and resources are available for victims of violence.

Third, owing to overall data sparsity, many challenges remain in modelling of both temporal and age patterns for non-fatal health outcomes; for the SDGs, this challenge is particularly pronounced for hepatitis B. Our current hepatitis B vaccine coverage covariate, a key input into hepatitis B incidence modelling, is limited to infant vaccination coverage. Because the current iteration of DisMod-MR cannot accommodate age-specific covariates, the effects of vaccination in older children and young adults for countries with long-running hepatitis B vaccination programmes (eg, Taiwan [province of China]) are not well captured. A priority of future GBD iterations is to use a version of DisMod that will allow for age-specific covariates, which will benefit hepatitis B modelling. Additionally, expanding the underlying data inputs for hepatitis seroprevalence, particularly for age groups that have benefited from vaccination programmes, has the potential to substantially improve hepatitis B estimation; for instance, the Polaris Observatory has markedly increased its seroprevalence data collection efforts in recent years, and such data have yet to be incorporated into the GBD study.

Fourth, our estimates of UHC currently only capture service coverage and do not include the second dimension of financial risk protection. The addition of financial risk protection and catastrophic health spending is a priority for future iterations of the GBD study. Ongoing review by the WHO Task Force on Metrics for GPW13 will likely yield recommendations that will inform future GBD revisions of how to measure UHC service coverage.

Fifth, the UN's metadata definition for vaccine coverage includes the human papillomavirus vaccine, but we do not currently include this vaccine owing to the limited number of countries with available data. Future iterations of the GBD study will aim to estimate human papillomavirus vaccine coverage.

Sixth, conflicts and refugee populations might affect SDG indicator trends in ways not well captured by our data. Although these factors introduce additional uncertainty to our estimates, these populations cannot be ignored, and GBD strives to make the best estimates based on the available data.

Limitations of forecasting and attainment analyses

Generating forecasts has inherent limitations: when forecasts are grounded in past rates of change, we cannot fully account for what might occur between now and 2030, including changes in health financing and global health priorities, conflict, and climate change. Positive developments, such as new medical advances, can be challenging to predict, as are negative events, such as the emergence of drug resistance. Continued improvements in our overall forecasting framework and specific approaches by cause, risk, and intervention have the potential to further advance our ability to understand how and where the largest challenges in making progress on the health-related SDGs might occur.

Limitations of indicator scaling and index construction

Ideally, we would systematically implement a scaling approach that accounts for the lowest possible levels of avoidable mortality, non-fatal outcomes, and risk exposures given current medical technologies and population-level interventions and the highest levels of coverage conditional upon measurable scale-up constraints or system inefficiencies. Scaling these indicators to the 2·5th and 97·5th percentiles of 1000 draws over time approximates this approach and allows consistent comparison of performance across indicators and locations. Nonetheless, our scaling strategy can either mask the potential for further improvements or imply worse performance, especially in relation to more modest SDG targets. Although the addition or refinement of new health-related SDG indicators with each GBD cycle is viewed as supportive of a more comprehensive assessment of the health-related SDGs, such updates can result in changes in individual countries' overall index values and relative rankings (appendix 2). These changes reflect our efforts to collectively improve the data for and science of monitoring the health-related SDGs. Overall index scores can be affected by indicators linked to fatal

discontinuities, whereby an abrupt increase in deaths one year might not be present in the following year. We continue to use the geometric mean for the health-related SDG index. This decision might result in lower overall index scores for some locations if they experience worsening performance on particular indicators; however, it provides a more direct reflection of how the SDGs have been established by the UN and UN member states.[82]

Limitations of data availability and disaggregation

GBD data are currently only available by sex, and not by gender, which limits the scope of analyses that can be conducted. The binary application of sex does not encompass differences in transgender and other populations. We currently only present data disaggregated by sex for ten indicators. Further collection and disaggregation of data would strengthen the ability of the GBD to support additional sex-specific analyses. For some new indicators, such as violence, some countries have better data collection systems in place than do others, and increased data collection is needed to make accurate comparisons between countries. Overall, the availability and representativeness of reported numbers from each country, particularly low-SDI and middle-SDI countries, could be improved by increased data collection, surveillance, and reporting at the national level.

Future directions

Important refinements to our estimation process are made with each GBD iteration. As discussed already, one priority is to improve our measurement of UHC service coverage (SDG indicator 3.8.1), generate comprehensive estimates of catastrophic health expenditures (SDG indicator 3.8.2), and then ultimately develop an overall measure of UHC. In theory, UHC service coverage and catastrophic health expenditures (the inverse of financial risk protection) should be linked; however, to date, their measurement has generally involved separate en—deavours. GBD and collaborators are working to update estimates of UHC in this direction in the near future, in line with the WHO/World Bank framework.[83] We currently use the arithmetic mean to construct the UHC service coverage index; however, other methods of index construction might be considered for future analyses. Other future priorities include analysing results by age as well as by sex, generating subnational projections, decomposing potential drivers of indicator-level progress, and further advancing the quantity and quality of data used in overall GBD estimation. Two other indicators, coverage of substance use disorder treatment (SDG indicator 3.5.1) and populations who feel safe walking home alone (SDG indicator 16.1.4), also are candidates for future inclusion pending data availability and access. Furthermore, it might be worthwhile to revisit what constitutes health-related SDGs, particularly as the UN Statistical Commission prepares for its formal review of current indicators and proposed additions. Finally, in view of the reasonably short window for the SDG era, there is increasing interest in developing model-based scenarios wherein the effects of investment "X" or introduction of intervention "Y" can be explored. The forecasting framework developed by Foreman and colleagues sets the foundation for such work[36] given that the causal relationships captured and propagated through projections can be set at different levels or altered in response to funding changes (eg, 10% budget cut and its effects on HIV).[83]

Conclusion

International institutions are increasingly calling for disaggregated data to guide decision making in health, and the SDGs are no exception. The SDG health-related index varied greatly at the subnational level in many countries, reflecting the need to focus on subnational health inequalities in the SDG era. Globally, males generally experienced a greater toll than did females from the ten health-related indicators analysed, emphasising the importance of both health data and programmes that incorporate sex-specific dimensions. Although most countries were projected to have improved SDG index scores in 2030, progress is slower than what is needed to attain defined targets across a wide range of health domains, including NCDs, which have many recommended best buy policies that have yet to be widely implemented. Countries and supporting international agencies must move beyond commitment to implementation, with a special focus on monitoring gains and gaps on the health-related SDGs beyond national trends. As shown by past rates of country-level progress, we have the opportunity to catalyse substantial gains in the future if the right investments and focus can occur today.

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Please see appendix 1 for more detailed information about individual author's contributions to the research, divided into the following categories: managing the estimation process; writing the first draft of the manuscript; providing data or critical feedback on data sources; developing methods or computational machinery; applying analytical methods to produce estimates; providing critical feedback on methods or results; drafting the work or revising it critically for important intellectual content; extracting, cleaning, or cataloguing data; designing or coding figures and tables; and managing the overall research enterprise.

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Data sharing

To download the data used in these analyses, please visit the Global Health Data Exchange at http://ghdx.healthdata.org/gbd–2017.

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For the **HBSC website** see http://www.hbsc.org

For more on **SHARE** see http://www.share-project.org

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