

Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services



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Summary

Background Achieving universal health coverage, including quality essential service coverage and financial protection for all, is target 3.8 of the Sustainable Development Goals (SDG). As a result, an index of essential health service coverage indicators was selected by the UN as SDG indicator 3.8.1. We have developed an index for measuring SDG 3.8.1, describe methods for compiling the index, and report baseline results for 2015.

Methods 16 tracer indicators were selected for the index, which included four from within each of the categories of reproductive, maternal, newborn, and child health; infectious disease; non-communicable diseases; and service capacity and access. Indicator data for 183 countries were taken from UN agency estimates or databases, supplemented with submissions from national focal points during a WHO country consultation. The index was computed using geometric means, and a subset of tracer indicators were used to summarise inequalities.

Findings On average, countries had primary data since 2010 for 72% of the final set of indicators. The median national value for the service coverage index was 65 out of 100 (range 22–86). The index was highly correlated with other summary measures of health, and after controlling for gross national income and mean years of adult education, was associated with 21 additional years of life expectancy over the observed range of country values. Across 52 countries with sufficient data, coverage was 1% to 66% lower among the poorest quintile as compared with the national population. Sensitivity analyses suggested ranks implied by the index are fairly stable across alternative calculation methods.

Interpretation Service coverage within universal health coverage can be measured with an index of tracer indicators. Our universal health coverage service coverage index is simple to compute by use of available country data and can be refined to incorporate relevant indicators as they become available through SDG monitoring.

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Introduction

Universal health coverage (UHC) is the goal that all people receive the essential health services that they need, without being exposed to financial hardship, and is central to the health-related targets of the Sustainable Development Goals (SDGs). UHC is both an end in itself, as expressed in SDG target 3.8, as well as the most logical way to ensure progress towards meeting other health-related SDG targets. Two indicators were adopted by the UN Statistical Commission in March, 2017, to monitor progress towards SDG target 3.8 on UHC, namely the coverage of essential health services (SDG indicator 3.8.1) and the proportion of households with large expenditures on health as a share of total household consumption or income (SDG indicator 3.8.2). Measurement of service coverage for SDG 3.8.1 is the focus of this paper, with a companion paper on SDG 3.8.2.¹

SDG indicator 3.8.1 is: "Coverage of essential health services (defined as the average coverage of essential services based on tracer interventions that include reproductive, maternal, newborn, and child health, infectious diseases, non-communicable diseases, and service capacity and access, among the general and the most disadvantaged population)."² This definition acknowledges that countries provide a wide range of services for health promotion, prevention, treatment, and care, including rehabilitation and palliation, and that tracer indicators should be selected to represent overall coverage of essential services.^{3,4} These tracer indicators can be selected to track progress in UHC service coverage, but they do not define service coverage within UHC or provide a comprehensive measurement of service coverage within UHC. These tracer indicators can be summarised in an index that aims to track the coverage of essential health and health-related services with a single

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Research in context

Evidence before the study

Previous work on summarising national levels of service coverage to monitor progress towards universal health coverage (UHC) has focused on particular regions or has made use of mortality-based indicators that are poorly measured in most developing countries. The Sustainable Development Goals (SDGs) monitoring framework calls for an index of essential service coverage to monitor progress towards SDG target 3.8 on UHC across countries.

Added value of the study

For the first time, this study developed a measure of SDG indicator 3.8.1 on the coverage of essential health services, presenting methods and 2015 baseline results for 183 countries. The UHC service coverage index is straightforward to calculate,

and can be computed with available country data, which allows for country-led monitoring of UHC progress. Our results show a wide range of progress towards UHC across and within countries, and the service coverage index is highly correlated with other summary measures of population health even after controlling for countries' level of wealth.

Implications of all the available evidence

Global, regional, and national tracking of progress towards UHC needs to start with tracking of coverage of essential services, along with an indicator of financial protection. All countries can monitor the coverage of essential services by use of a simple index based on a small but diverse set of indicators. The index shows that the road to effective coverage with essential services for all is still long for many countries.

numerical value. In this paper, we use the term service coverage index to refer to an index of essential health services.

The use of indices to summarise information about an underlying health construct is becoming increasingly common in the global health literature, often deriving motivation from the Human Development Index. For example, indices have been developed for global assessments such as maternal and child health interventions,⁵ health and the SDGs,^{6,7} assessments of progress towards UHC,^{8,9} and in some countries for subnational health programme performance monitoring.¹⁰ In this Report we describe the use of an index of essential health services for monitoring SDG indicator 3.8.1, and present baseline results for 183 countries with populations larger than 90 000 for 2015. The approach was developed as part of the implementation of the WHO and World Bank joint UHC monitoring framework,¹¹ was shared with WHO member states for direct feedback, and will inform SDG reporting.

Methods

Index component selection

The index was developed over several years, and the process included reviews of global datasets, country case studies, and consultations with ministry of health officials.^{3,4,11–16} The development of the index followed four guiding principles. The first principle concerned the preference for effective service coverage indicators as the most relevant and direct result of country efforts to meet people's needs for quality health services. Effective coverage is defined here as the proportion of people in need of services who receive services of sufficient quality to obtain potential health gains.⁴ Second, in line with the definition of UHC, the index should include indicators for different types of services, namely prevention, comprising health promotion and illness prevention, and indicators for treatment, comprising curative services, rehabilitation, and palliation.³ This definition includes public health

services, including interventions that are not implemented by the health sector but for which health improvement is a key motivation.⁴ Third, the index should cover the main health areas of reproductive, maternal, newborn, and child health (RMNCH), infectious diseases, non-communicable diseases, and injuries. Following the definition of SDG 3.8.1, four categories of indicators were established: RMNCH, infectious disease, non-communicable diseases, and service capacity and access. Finally, the index should be disaggregated by key inequality dimensions.

In each of the four categories described above, four tracer indicators were selected, on the basis of four criteria³ and ensuring that within each category, the indicators reflected a range of programme service delivery strategies. First, an indicator should be relevant, reflecting epidemiological burden and the presence of cost-effective interventions. Second, an indicator should be conceptually sound, with a measurable numerator and denominator, a clear target and, ideally, a definition that captures effective coverage.¹⁷ Third, it must also be feasible, with current, comparable data available for most countries, which preferably can be disaggregated for equity analysis. Lastly, an indicator should be usable, in the sense it is easy to communicate; indicators that are already reported across countries, including those in the SDG monitoring framework, are appealing as they reduce reporting burden.

Identifying indicators that fulfil these criteria is challenging, and few of the selected indicators fulfil all criteria. The greatest challenge is lack of available data on indicators of effective service coverage. Measuring service coverage for many conditions of interest is difficult because it requires identifying the number of people requiring a particular health service, including those who have never been diagnosed. When data were not available to do this, we used proxy indicators to track effective service coverage. Proxy indicators are not direct measures of service coverage, effective or otherwise. The use of

proxies ensured that other criteria, especially on relevance and feasibility, were met for all indicators.

For indicators of cardiovascular disease prevention and diabetes management, no standardised datasets for indicators of effective coverage of cardiovascular disease and diabetes treatment exist, nor do datasets for indicators of treatment of increased cardiovascular risk. Until they become available, the prevalence of non-raised blood pressure (including those whose blood pressure is controlled by medication) and mean fasting plasma glucose (an indicator for diabetes) are used as proxy measures. These reflect the success of both effective health promotion programmes and effective screening and treatment programmes. Non-smoking of tobacco is included as a proxy for effective coverage of measures to reduce tobacco use.

The second area where proxy indicators are used extensively is the service capacity and access category, which includes hospital bed density; the density of physicians, psychiatrists, and surgeons; and access to essential medicines; along with compliance with the International Health Regulations to reflect health security. These indicators were selected largely due to challenges measuring coverage in all health areas, which leaves major gaps for important areas such as routine medical exams, treatment for mental illnesses, emergency care, and surgical procedures. It should be noted that measures of service capacity and access, including hospital bed density, physician density, and the use of health services, are difficult to interpret because the optimal level for those indicators is unknown and they do not relate to a specific need for services. Despite this fact, low levels for these indicators are indicative of poor access to and use of essential health services. In the absence of better data, tracking health system capacity or access up to a threshold could be useful for tracking UHC progress. To address this in the index, these indicators were rescaled against a maximum threshold, to reflect low rates of coverage; no attempt was made to measure overcapacity or overuse. This is described in more detail below.

In developing the index, an expert group recommended that inpatient admission rates be included as a tracer indicator in this category,¹⁶ however, few countries in Africa and south Asia reported this indicator. In low-income and middle-income countries where both inpatient admission rates and hospital bed density were available, correlation between the two variables was high (appendix). Hospital bed density was therefore selected as a tracer indicator because of more data availability. Inclusion of outpatient visits in the index was discouraged by the expert group because of concerns about comparability between countries. Similarly, nurses and midwives were not included with physician density because country data were not comparable in current public datasets.

The final set of selected tracer indicators was as follows. In the area of RMNCH, family planning demand satisfied

with a modern method,¹⁸ four or more antenatal-care visits,¹⁹ child immunisation for infants with three doses of diphtheria, tetanus, and pertussis vaccine,²⁰ and care seeking for children with suspected pneumonia.²¹ For infectious diseases, indicators were tuberculosis effective treatment coverage,²² HIV treatment coverage,²³ use of insecticide treated bed nets in populations at risk of malaria,²⁴ and household access to at least basic sanitation services.²⁵ For non-communicable diseases, measures were prevalence of non-raised blood pressure,²⁶ mean fasting plasma glucose,²⁷ attendance at cervical cancer screening, and prevalence of tobacco non-smoking.²⁸ Finally, for service capacity and access, measures were hospital bed density,²⁹ health worker density (physicians, psychiatrists, and surgeons per person),³⁰ access to essential medicines, and International Health Regulations core capacity index.³¹

Indicator data

For most indicators included in the index, the preferred primary data sources were nationally representative, population-based surveys, which enabled the measurement of those who needed an intervention, in addition to counting those who received that intervention, and allowed for the disaggregation of service coverage by different subpopulations for equity analysis. In some cases, other health-system data were used, such as administrative data, facility surveys, or surveillance data. UN agencies already lead substantial measurement and reporting efforts for many of the selected indicators. To take advantage of this subject matter expertise, and to maintain consistency with UN agency and UN SDG reporting, priority was given to the use of official UN estimates for the year 2015. If estimates were not available for 2015, UN estimates for a previous year or UN or WHO databases were used. In this case, the most recent available value since 2000 for each indicator in each country was used to estimate the current (2015) indicator value. If no data or estimates were available for a country from 2000 or later, values were imputed as follows. For the measure of four antenatal care visits, hospital beds per person, physicians and psychiatrists per person, and International Health Regulations core capacity, a regional median from countries with data was computed and used as a placeholder. For analyses of care seeking for suspected pneumonia in children and surgeons per person, there were not enough data across all regions to compute stable regional medians. Missing values for data on care seeking for suspected pneumonia in children were imputed using a regression on the log of estimated pneumonia mortality rates for children under age 5 years,³² and missing data for surgeon density were imputed using a regression on the log of gross domestic product per capita (2011 purchasing power parity).³³ We did not impute missing values on the use of insecticide treated bednets for malaria prevention, which was only included for 40 countries with high malaria burden.

Index construction

The UHC service coverage index was intended to be straightforward to calculate to facilitate country ownership and use for monitoring UHC within the SDGs. The index

was constructed from geometric means of the 14 tracer indicators with sufficient data (cervical cancer screening and access to essential medicines were excluded because of low data availability), first within each of the four

Tracer indicator	Type	Primary data sources	Measurability of key inequality dimensions	Countries with primary data since 2010	Data source	Rationale, limitations, and possible refinements
Reproductive, maternal, newborn and child health						
Family planning	Demand satisfied with modern methods in women aged 15–49 years who are married or in a union (%)	Effective service coverage	Household survey	W,E,R,A	112	UNPD estimates ¹⁸ Demand satisfied with a modern method is SDG indicator 3.7.1. However, it has a relatively complex denominator derived from multiple survey questions, and data collection often focuses on women in unions, as opposed to all sexually active women.
Pregnancy and delivery care	Four of more visits to antenatal care (%)	Service coverage	Household survey	W,E,R,A	98	WHO global database ¹⁹ The number of antenatal care visits captures the amount of contact with the health-care system but does not capture quality of care received and might not lead to a reduction in mortality. Skilled attendance at birth (SDG indicator 3.1.2) is a preferred alternative; however insufficient standardised measurement of skilled health-care personnel makes cross-country comparisons difficult. Efforts to improve reporting on SDG 3.1.2 should resolve these comparability issues and allow 3.1.2 to replace four or more visits to antenatal care in the index.
Child immunisation	Children aged 1 year who have received three doses of a diphtheria, tetanus, and pertussis vaccine (%)	Service coverage	Administrative system and household survey	W,E,R,S	183	WHO/ UNICEF estimates ²⁰ Three doses of diphtheria, tetanus, and pertussis vaccine, which is identical to coverage with pentavalent vaccine in most countries, is an indicator of routine infant immunisation system. However, several other vaccines, such as those for measles (second dose), pneumococcal pneumonia, and rotavirus diarrhoea, typically have lower coverage and the fraction of children receiving all vaccines in a national schedule is typically much lower (although not possible to measure directly with existing data systems in most countries). Once metadata for SDG 3.b.1 are defined, an indicator consistent with 3.b.1 could be used in the index in place of the diphtheria, tetanus, and pertussis vaccine measure.
Child treatment	Care-seeking behaviour for children with suspected pneumonia (%)	Service coverage	Household survey	W,E,R,S	94	UNICEF global database ²¹ Pneumonia is a leading cause of child illness and death. Suspected pneumonia is identified on the basis of a series of survey questions about illnesses in the past 2 weeks, which might include mild respiratory illnesses. However, the indicator does not currently capture the quality of care received as a mother's recall of treatment specifics can be poor. The main alternative indicator for child treatment that is widely measured is use of oral rehydration solution therapy for child diarrhoea, which is also a leading cause of child death. The inclusion of the sanitation indicator in the index is relevant for diarrhoea prevention.
Infectious diseases						
Tuberculosis treatment	Tuberculosis effective treatment coverage (%)	Effective service coverage	Administrative system and household survey	(R)	179	WHO estimates ²² This indicator combines two more common ones—the rates of case detection and of treatment success—to estimate the proportion of all people with tuberculosis who successfully complete treatment. Calculation of the case detection rate requires estimates of incident cases (including those not identified by the health-care system). Treatment success is measured through administrative data, and includes all patients who successfully completed treatment without bacteriological evidence of treatment failure.
HIV treatment	People with HIV receiving antiretroviral therapy (%)	Service coverage	Administrative system, household survey, and surveillance system	(R),(S),(A)	136	UNAIDS estimates ²³ Provision of antiretroviral therapy averts a substantial number of deaths in high-burden HIV countries and can be a marker of how well a health system reaches marginalised populations with higher HIV prevalence in countries with lower HIV burden. Recent surveys have begun to measure effective coverage of antiretroviral therapy by obtaining data on viral load suppression. The numerator—people taking antiretroviral therapy—is generally obtained from health facility data, whereas the denominator is estimated from HIV epidemiological data.
Malaria prevention	Population at risk who sleep under insecticide-treated bednets (%)	Service coverage	Administrative system and household survey	W,E,R,S	29*	WHO/ Malaria Atlas Project estimates ²⁴ Insecticide-treated bednet distribution is a major programme in malaria-endemic countries. Coverage estimates should account for geographical heterogeneity in malaria risk when analysing national household surveys. Because the nets deteriorate over time, effective coverage can decline without resupply.
Water and sanitation	Households with access to at least basic sanitation (%)	Service coverage	Household survey	W,R	176	WHO/ UNICEF estimates ²⁵ Although access to clean water and safely managed sanitation are not always implemented by the health sector, these interventions are important to public health. The current indicator of at least basic sanitation typically has lower coverage than access to at least a basic water source, and therefore is used as the tracer indicator for this area. This tracer indicator could be replaced with SDG 6.1.1 or 6.2.1 once they are more widely reported.

(Table continues on next page)

Tracer indicator	Type	Primary data sources	Measurability of key inequality dimensions	Countries with primary data since 2010	Data source	Rationale, limitations, and possible refinements	
(Continued from previous page)							
Non-communicable diseases							
Prevention of cardiovascular disease	Prevalence of non-raised blood pressure regardless of treatment status (%)†	Proxy	Household survey	(E),(R),S,A	85	NCD-RisC/WHO estimates ²⁶	Hypertension is the leading risk factor for cardiovascular disease. The prevalence of normal blood pressure is the sum of the percentage of individuals who do not have hypertension and the percentage of individuals whose hypertension is controlled by medication. The absence of hypertension is a result of prevention efforts via promotion of physical activity and healthy diets, and other factors. Hypertension controlled with medication is a result of effective treatment. This indicator is therefore a proxy for both effective health promotion and effective medical services. This indicator will be replaced with treatment coverage in people with hypertension once data become available.
Management of diabetes	Mean fasting plasma glucose (mmol/L)†	Proxy	Household survey	(E),(R),S,A	6‡	WHO estimates ²⁷	Mean fasting plasma glucose can be reduced through effective treatment of individuals with diabetes and through diabetes prevention with effective promotion of protective behaviours and diets. However, diabetes treatment guidelines do not recommend lowering blood glucose to non-diabetic concentrations for all patients, meaning that a population with a high prevalence of diabetes should not necessarily attain a low mean fasting plasma glucose. This indicator will be replaced with the proportion of people with diabetes receiving treatment once data become available.
Cancer detection and treatment	Cervical cancer screening in women aged 30–49 years (%)	Service coverage	Household survey	..	<30	Insufficient data currently available	Data on this indicator are obtained in some household surveys, although these data are not yet available widely enough to be used for global monitoring. The indicator does not reflect whether effective treatment is available. This indicator was chosen over other potential cancer screening indicators, such as for breast or prostate cancer, because of clearer guidelines for cervical cancer, and because cervical cancer screening is the only cancer screening indicator included in the core indicator set of the non-communicable diseases global monitoring framework.
Tobacco control	Adults aged at least 15 years who had not smoked tobacco in the previous 30 days (%)†	Proxy	Household survey	(W),(E),(R),S,(A)	125	WHO estimates ²⁸	Prevalence of smoking (SDG indicator 3.a.1) is a proxy for adoption and enforcement of effective anti-tobacco measures. This indicator could be replaced with an indicator of implementation of tobacco control measures.
Service capacity and access							
Hospital access	Number of hospital beds per person	Proxy	Facility data	(R)	158	WHO global database ²⁹	This indicator is a proxy for access to essential inpatient services. It has more data available in low-income and middle-income countries than number of inpatient hospital admissions, with which it is highly correlated ($\rho=0.84$ in low-income and middle-income countries). A threshold is used to capture only low capacity levels because high values might represent overcapacity or inefficient allocation of resources.
Health-care worker density	Number of health professionals per person: comprising physicians, psychiatrists, and surgeons	Proxy	Administrative system	(R)	180	WHO global database ³⁰	Comparable data on patient use of outpatient facilities are not readily available in low-income and middle-income countries. Physician density, part of SDG indicator 3.c.1, is included as a proxy for access to outpatient services that are not captured by tracer indicators included elsewhere in the index. Nurses and midwives are currently excluded because of limited comparability between countries in existing global databases. The density of psychiatrists is a proxy for availability of mental health services, and surgeon density is a proxy for access to surgical and emergency care. As with hospital beds per capita, a threshold is used to capture low densities for all three cadres.
Access to essential medicines	Proportion of health facilities with availability of the WHO-recommended core list of essential medicines	Proxy	Facility survey	(R)	<30	Insufficient data currently available	Medicines are the main intervention resulting from clinical services, and their availability provides a proxy for access to services beyond mere contacts with professionals. This tracer will be included once data become widely available.
Health security	International Health Regulations core capacity index	Proxy	Key informant	..	181	WHO database ³¹	Because many health risks are rare, preparedness must be measured to capture health security. This indicator—SDG 3.d.1—is currently based on key informant reports to WHO, but could be informed by Joint External Evaluations in the future.
<p>Letters in parentheses indicate that data sources exist to estimate coverage by the indicated dimension but that more analytical work is needed to prepare disaggregated estimates. W=household wealth quintile. E=educational attainment. R=place of residence (typically urban vs rural). S=sex. A=age. SDG=Sustainable Development Goals. UNPD=United Nations Procurement Division. NCD=non-communicable diseases. *Only pertains to countries with highly endemic malaria. †Age-standardised. ‡Data availability for 178 countries is based on the 2011 analysis used to calculate the index.²⁷ This analysis used predominantly older data, but included one data source obtained in 2010. During the country consultation process, five countries submitted recent data on mean fasting plasma glucose. Estimates of mean fasting plasma glucose have not been updated because the aim is to move towards a true coverage indicator. The NCD-RisC collaboration has estimated that since 2010, national or subnational household survey data, including a measure of diabetes, are available for 87 countries or territories.</p>							
Table: UHC tracer indicators selected to monitor progress on health service coverage, their type, data sources, and data availability across 183 countries and their rationale, limitations, and possible refinements.							

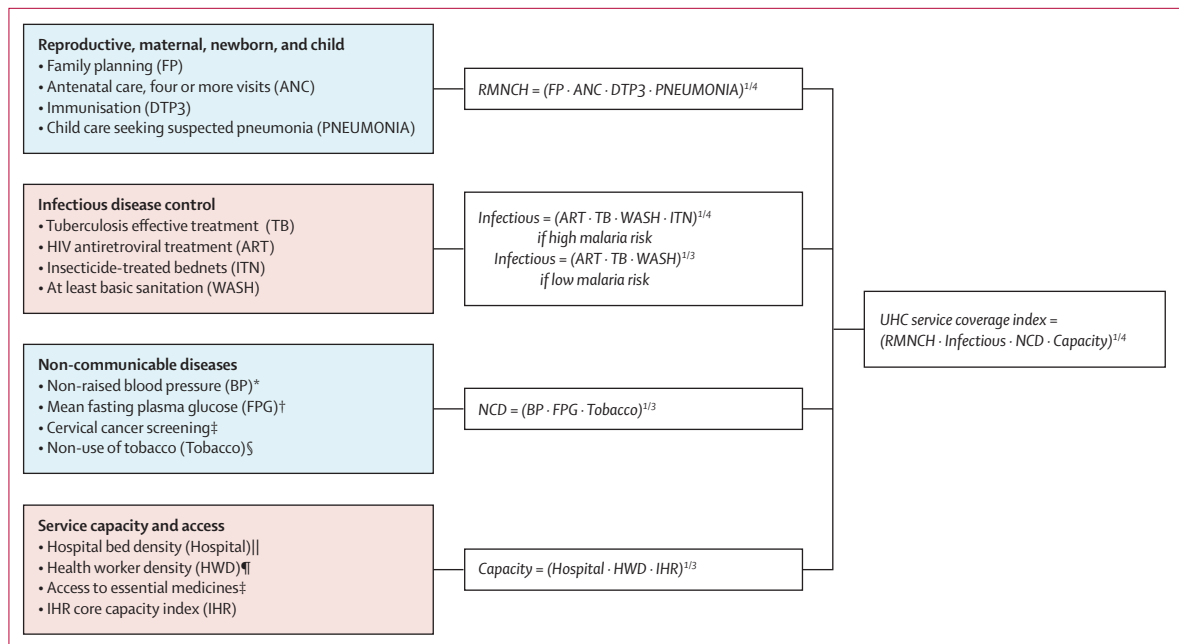


Figure 1: Calculation of universal health coverage service coverage index on the basis of national levels of coverage
 IHR=International health regulations. *The percentage of the adult population with non-raised blood pressure is based on age-standardised estimates. These distributions were rescaled to provide a finer resolution for the index, based on the observed minima across countries. †Mean fasting plasma glucose was not measured on a scale bounded by 0 and 100. Although very high concentrations are unhealthy, very low concentrations were not expected to provide additional health benefits and could even be harmful. ‡Cervical cancer screening and access to essential medicines were excluded because of low data availability. §Non-use of tobacco was also based on age-standardised estimates and rescaled to provide finer resolution on the basis of a minimum bound of 50%. ||Hospital bed density values were rescaled and capped on the basis of a threshold of 18 per 10 000 population on the basis of minimum rates observed in high-income Organization for Economic Co-operation and Development countries. ¶Health worker density was rescaled and capped on the basis of threshold values. Physician density had a threshold of 0.9 per 1000, psychiatrists had a threshold of 1 per 100 000, and surgeons had a threshold of 14 per 100 000 population.

categories, and then across the four category-specific means to obtain the final summary index. Geometric means were used instead of arithmetic means as they favoured equal coverage levels across services as opposed to higher coverage for some services at the expense of others. The Human Development Index was recently revised to use geometric means as opposed to arithmetic means,³⁴ and geometric means were used in earlier work on a UHC index.⁸

Service coverage is typically measured on a scale of 0–100%, with 100% as the target, and therefore the UHC service coverage index is presented on a scale of 0–100. Most of the tracer indicators can be incorporated directly into the index on their natural scale, for example the percentage of people with HIV who were receiving antiretroviral therapy. There were three exceptions requiring further manipulation of the data: first, the distributions of non-raised blood pressure and non-use of tobacco were narrow across countries. To obtain finer resolution, we stretched those distributions by using a minimum value of 50% and linearly rescaling the distribution so that a value of 50 became 0, with the maximum possible value held at 100. The rescaled indicator values were equal to $(x - 50) / (100 - 50) \times 100$, for which x is the prevalence of non-raised blood pressure or the prevalence of non-use of tobacco. Second, the proxy

indicator of treatment for diabetes, mean fasting plasma glucose, was measured on a continuous scale. Although very high concentrations of fasting plasma glucose are unhealthy, very low concentrations were not expected to provide additional health benefits or could be harmful. To account for this range, while also providing a well distributed set of indicator values across countries that range from 0 to 100 after rescaling, estimates of national mean fasting plasma glucose where rescaled using a minimum of 5.1 mmol/L (the best estimate of the population mean fasting plasma glucose that poses the minimum health risk to the population)^{35,36} and a maximum of 7.1 mmol/L (the observed maximum across national means). The rescaled indicator for mean fasting plasma glucose was equal to $(7.1 - x) / (7.1 - 5.1)$, for which x is mean fasting plasma glucose. Finally, in the service capacity and access category, hospital bed density and health worker density have a lower bound of 0 but do not have a clear optimal level or maximum. To place these indicators onto a 0–100 scale, a threshold value was selected for each indicator based on observed minimum values across high-income Organization for Economic Co-operation and Development (OECD) countries. Countries with values above the thresholds were held at 100, and those below were linearly rescaled between 0 and 100, per the formula: 100 or $(x / \text{threshold}) \times 100$,

	UHC service coverage index	Recent primary data availability	Family planning demand satisfied (%)	Antenatal care four or more visits (%)†	Child immunisation (DTP3) (%)	Care-seeking behaviour for child pneumonia (%)†	Tuberculosis effective treatment (%)‡	HIV antiretroviral treatment (%)	Insecticide-treated bednets (%)	At least basic sanitation (%)	Prevalence of non-raised blood pressure (%)	Mean fasting plasma glucose (mmol/L)§	Tobacco non-use (%)	Hospital beds per 10000 population†	Physicians per 1000 population†	Psychiatrists per 10000 population†	Surgeons per 10000 population†	International Health Regulations compliance (%)†
Australia	≥80	85	84	95	93	90	69	79	..	100	80	5.51	85	37.9	3.5	13.7	20.3	100
Austria	≥80	62	84	97	93	92	64	72	..	100	79	5.24	69	76.5	5.2	19.7	91.2	87
Belgium	≥80	62	90	97	99	91	71	72	..	100	83	5.39	71	62.3	3.0	20.3	50.3	82
Brunei	≥80	62	83	100	99	86	56	72	..	96	81	5.33	84	27.4	1.5	4.3	22.5	91
Canada	≥80	46	89	99	91	90	74	72	..	99	87	5.54	85	27.0	2.5	13.4	21.1	100
Denmark	≥80	62	83	97	93	92	49	72	..	100	79	5.34	80	25.3	3.7	17.4	58.7	91
France	≥80	69	93	99	98	91	67	75	..	99	78	5.31	67	64.8	3.2	14.1	29.4	89
Iceland	≥80	62	83	97	92	94	77	72	..	99	80	5.47	85	31.7	3.8	25.5	51.0	84
Israel	≥80	54	71	97	95	91	77	72	..	100	83	5.58	74	30.9	3.6	6.7	40.4	71
Italy	≥80	69	67	87	93	92	79	76	..	99	79	5.37	76	34.2	3.9	10.8	20.4	78
Japan	≥80	62	65	97	96	89	46	72	..	100	83	5.31	77	134.0	2.3	8.4	16.8	100
Luxembourg	≥80	62	83	97	99	94	68	72	..	98	78	5.43	76	48.2	2.9	22.5	51.6	89
The Netherlands	≥80	69	87	97	95	91	74	77	..	98	81	5.11	74	46.6	3.4	20.1	29.7	94
New Zealand	≥80	62	85	97	92	86	71	72	..	100	84	5.57	84	28.0	3.0	18.0	18.3	98
Norway	≥80	54	87	97	95	92	73	72	..	98	80	5.52	79	38.6	4.4	29.7	74.7	98
Portugal	≥80	54	83	97	98	91	63	72	..	99	76	5.28	77	34.0	4.4	4.5	47.8	95
Singapore	≥80	62	77	97	96	86	68	53	..	100	85	5.30	83	24.0	3.4	13.7	102.3	99
South Korea	≥80	77	83	98	98	80	76	72	..	100	88	5.40	76	115.3	2.2	7.0	62.0	100
Sweden	≥80	69	81	97	98	90	77	63	..	99	81	5.36	81	25.9	4.1	18.3	26.1	92
Switzerland	≥80	62	87	97	97	92	68	72	..	100	82	5.39	74	46.8	4.1	41.4	50.4	91
UK	≥80	54	93	97	96	89	72	72	..	99	85	5.38	77	27.6	2.8	14.6	34.1	89
USA	≥80	77	86	97	95	89	74	72	..	100	87	5.71	78	29.0	2.6	12.4	36.7	97
Barbados	79	85	76	98	97	87	87	44	..	97	76	5.90	92	58.0	1.8	2.5	12.3	90
Finland	79	69	88	98	97	92	39	72	..	99	81	5.50	79	43.5	3.2	23.6	56.4	96
Germany	79	69	82	97	95	91	55	72	..	99	80	5.45	69	82.8	4.1	7.5	55.2	99
Malta	79	54	72	97	97	90	66	75	..	100	81	5.64	74	46.7	3.9	3.2	43.7	76
Uruguay	79	77	88	96	95	91	65	52	..	96	79	5.51	82	28.0	3.9	16.9	11.7	83
Cuba	78	92	88	99	99	93	71	69	..	91	81	5.67	64	52.0	7.5	10.3	70.6	99
Ireland	78	69	79	97	95	91	49	70	..	92	80	5.38	75	27.6	2.8	6.1	14.5	78
Peru	78	85	64	95	90	60	67	53	..	77	86	4.93	87	16.0	1.1	0.8	28.4	89
Slovenia	78	69	79	97	95	92	67	72	..	99	70	5.42	77	45.5	2.8	10.2	36.3	75
Brazil	77	85	88	90	96	50	62	57	..	86	77	5.52	86	22.0	1.9	3.5	34.4	97
El Salvador	77	85	80	90	91	80	84	45	..	91	81	5.61	89	13.0	1.9	0.5	20.3	94
Kuwait	77	69	67	71	99	82	84	71	..	100	77	6.06	80	20.4	1.9	3.3	106.0	86
Qatar	77	85	62	85	99	87	74	85	..	100	79	5.70	86	12.0	2.0	3.0	3.5	97
Spain	77	69	81	97	97	92	42	79	..	100	81	5.63	70	29.7	3.8	8.1	23.1	90
Algeria	76	85	76	67	95	66	70	65	..	88	75	5.42	85	19.0	1.2	3.2	20.6	72
Argentina	76	85	85	90	94	94	45	63	..	95	77	5.55	77	50.0	3.8	13.7	18.3	83
China	76	62	95	74	99	79	82	41	..	75	81	5.46	75	42.0	1.5	1.7	21.6	99
Colombia	76	77	83	89	91	64	61	53	..	84	81	5.00	90	15.0	1.6	2.5	5.8	85
Estonia	76	69	77	97	93	89	73	72	..	100	72	5.25	68	49.6	3.3	18.5	82.3	72
Mexico	76	92	83	94	87	73	65	55	..	89	80	5.89	85	15.2	2.4	1.0	16.0	96
Slovakia	76	69	76	97	96	83	77	56	..	99	71	5.45	70	57.5	3.4	11.5	18.5	96
Antigua and Barbuda	75	54	80	100	99	88	58	46	..	88	77	5.65	87	38.0	1.2	1.1	5.5	87
Costa Rica	75	92	90	90	92	77	71	45	..	97	81	5.52	88	11.6	2.5	5.2	7.1	83
Ecuador	75	77	82	80	78	72	46	50	..	86	82	5.39	93	15.0	1.7	1.1	34.3	89
Panama	75	92	74	88	73	82	63	48	..	77	80	5.59	94	23.0	1.6	3.8	17.6	68

Figure 2 continues on next page

	UHC service coverage index	Recent primary data availability (%)	Family planning demand satisfied (%)	Antenatal care, four or more visits (%)†	Child immunisation (DTP3) (%)	Care-seeking behaviour for child pneumonia (%)†	Tuberculosis effective treatment (%)‡	HIV antiretroviral treatment (%)	Insecticide-treated bednets (%)	At least basic sanitation (%)	Prevalence of non-raised blood pressure (%)	Mean fasting plasma glucose (mmol/L)§	Tobacco non-use (%)	Hospital beds per 10000 population†	Physicians per 1000 population†	Psychiatrists per 10000 population†	Surgeons per 10000 population†	International Health Regulations compliance (%)†
Poland	75	62	66	97	98	88	51	72	..	98	71	5.15	71	65.0	2.3	5.1	15.4	74
Thailand	75	77	91	93	99	83	42	61	..	95	78	5.15	79	21.0	0.4	0.9	6.3	98
Trinidad and Tobago	75	54	66	100	96	74	56	63	..	92	74	5.74	87	30.0	1.2	3.1	18.2	70
Belarus	74	85	74	100	99	93	63	42	..	94	73	5.48	71	110.5	4.1	7.7	93.6	90
Dominican Republic	74	77	84	93	85	73	59	46	..	83	79	5.24	86	16.0	1.5	1.1	9.0	70
Cyprus	73	46	83	97	97	91	51	72	..	99	80	5.45	64	34.2	2.5	2.7	12.8	62
Czech Republic	73	62	83	97	97	88	71	46	..	99	72	5.51	66	64.9	3.7	14.1	73.6	88
Venezuela	73	62	82	87	87	72	64	55	..	95	81	5.55	87	8.0	1.9	1.1	11.1	90
Vietnam	73	92	77	74	97	81	72	43	..	78	77	4.70	76	25.6	1.2	0.9	3.3	99
Bahamas	72	62	83	85	95	77	73	29	..	92	79	5.82	88	29.0	2.7	1.1	21.0	59
Bahrain	72	62	59	100	98	90	38	42	..	100	79	5.79	79	20.3	0.9	4.8	15.1	96
Grenada	72	54	79	89	92	82	87	46	..	78	76	5.67	87	37.0	0.7	1.9	2.8	66
Oman	72	69	35	71	99	56	84	43	..	99	76	5.71	92	15.8	1.5	2.3	14.2	94
Romania	72	62	71	76	89	70	74	67	..	82	70	5.39	70	62.7	2.7	6.0	40.8	79
Uzbekistan	72	54	84	88	99	68	60	28	..	100	75	5.71	87	39.9	2.5	1.9	26.0	83
Kazakhstan	71	85	75	95	98	81	80	26	..	98	73	5.65	74	67.2	3.3	6.3	44.1	78
Turkey	71	77	60	89	97	85	76	28	..	96	80	5.49	72	26.6	1.7	1.5	8.3	78
Chile	70	69	82	97	96	87	51	49	..	100	79	5.50	61	22.0	1.0	4.7	41.0	75
Greece	70	46	59	97	99	89	71	72	..	99	81	5.51	56	42.5	6.3	21.9	134.9	76
Hungary	70	54	85	88	99	87	69	28	..	98	70	5.40	69	70.4	3.3	4.4	31.9	86
Jordan	70	69	62	95	99	77	70	50	..	97	79	6.25	73	14.0	2.7	1.3	10.8	97
Malaysia	70	85	53	80	99	87	68	26	..	100	77	5.66	78	18.6	1.3	0.8	6.9	99
Nicaragua	70	62	89	88	98	58	68	38	..	76	79	5.33	87	9.0	0.9	0.9	8.7	76
Macedonia	70	69	28	94	91	93	87	41	..	91	72	5.41	69	44.3	2.8	10.0	36.9	89
Croatia	69	77	59	93	94	90	62	65	..	98	68	5.37	63	55.6	3.1	15.5	68.2	71
Paraguay	69	69	81	77	93	74	62	30	..	91	76	5.52	86	13.0	1.3	2.0	5.4	82
Saint Lucia	69	69	76	90	99	82	86	46	..	91	73	5.58	87	13.0	0.1	1.1	10.9	58
North Korea	68	46	85	94	96	80	73	41	..	77	82	5.13	75	143.0	2.8	0.5	0.6	73
Egypt	68	92	80	83	93	68	50	21	..	93	75	5.10	75	15.6	0.8	0.9	26.8	93
Guyana	68	77	57	87	95	84	55	56	..	86	77	5.68	87	16.0	0.2	0.5	5.9	81
Lebanon	68	54	61	71	81	74	66	44	..	95	79	5.70	66	28.5	2.4	1.4	45.4	76
Saudi Arabia	68	69	45	71	98	82	54	54	..	100	77	6.59	87	26.5	2.6	2.1	61.6	99
Seychelles	68	62	39	56	97	83	60	39	..	100	77	5.83	79	36.0	1.0	2.1	22.9	82
Suriname	68	77	72	67	89	76	62	38	..	79	78	5.75	74	31.0	0.8	1.5	13.7	71
Armenia	67	85	40	96	94	57	69	29	..	92	75	5.64	73	41.8	2.8	5.1	63.3	96
Lithuania	67	62	70	88	93	87	71	20	..	94	70	5.50	70	72.8	4.3	16.7	61.2	83
South Africa	67	62	84	87	75	65	49	49	..	73	73	5.71	79	28.0	0.8	0.4	6.4	100
Turkmenistan	67	54	74	88	99	51	55	28	..	97	75	5.58	69	73.6	2.3	6.3	42.4	84
Fiji	66	77	67	94	99	72	70	31	..	96	78	5.98	77	23.0	0.4	0.7	1.8	98
Georgia	66	85	53	87	94	74	66	28	..	85	74	5.64	70	25.9	4.8	6.5	42.5	81
Kyrgyzstan	66	92	66	95	97	60	69	28	..	97	73	5.55	73	45.1	1.9	3.4	32.5	50
Iran	65	85	76	94	98	76	70	11	..	88	80	5.47	89	15.0	1.5	1.8	1.6	85
Morocco	65	69	78	55	99	70	71	41	..	84	74	5.58	77	11.0	0.6	0.5	7.8	95
Moldova	65	92	63	95	87	79	46	26	..	78	70	5.48	75	58.3	2.5	5.9	13.8	78
Saint Vincent and the Grenadines	65	46	81	100	98	81	36	46	..	87	77	5.67	87	26.0	0.6	0.9	3.7	35
Serbia	65	92	36	94	95	90	71	63	..	95	71	5.36	61	56.5	2.5	7.4	43.1	47

Figure 2 continues on next page

	UHC service coverage data index	Recent primary availability	Family planning demand satisfied (%)	Antenatal care, four or more visits (%)†	Child immunisation (DTP3) (%)	Care-seeking behaviour for child pneumonia (%)†	Tuberculosis effective treatment visits (%)†	HIV antiretroviral treatment (%)	Insecticide-treated bednets (%)	At least basic sanitation (%)	Prevalence of non-raised blood pressure (%)	Mean fasting plasma glucose (mmol/L)§	Tobacco non-use (%)	Hospital beds per 1000 population*	Physicians per 1000 population†	Psychiatrists per 100000 population†	Surgeons per 100000 population†	International Health Regulations compliance (%)†
Tajikistan	65	69	56	53	96	63	71	22	..	96	74	5.48	69	47.6	1.7	2.2	15.8	89
Tunisia	65	85	75	85	98	60	73	27	..	93	77	5.75	67	22.9	1.3	2.6	7.3	65
Azerbaijan	64	62	32	66	96	33	67	34	..	89	76	5.72	78	46.9	3.4	3.7	41.3	84
Bulgaria	64	62	59	88	91	76	83	24	..	86	72	5.41	62	68.2	4.0	7.9	64.1	69
Honduras	64	69	77	89	97	64	74	48	..	80	79	5.31	87	7.0	0.4	0.4	2.6	74
Latvia	64	62	77	88	95	87	72	14	..	93	70	5.42	62	58.0	3.2	12.1	53.0	90
Mauritius	64	54	49	56	97	78	41	39	..	93	75	5.60	78	34.0	1.1	0.8	6.9	68
Iraq	63	69	62	50	58	74	48	43	..	86	75	5.78	81	13.8	0.9	0.4	12.6	91
Libya	63	46	45	71	97	81	22	43	..	100	76	5.93	81	37.0	2.1	1.0	15.6	65
Mongolia	63	92	72	90	99	70	32	33	..	59	71	5.54	74	30.0	2.9	0.5	14.1	86
Russia	63	62	73	78	97	83	60	28	..	89	73	5.52	59	81.8	3.3	11.1	16.6	81
Ukraine	63	85	70	87	23	92	53	26	..	96	73	5.47	69	88.0	3.0	10.1	72.5	97
United Arab Emirates	63	46	60	71	99	88	35	43	..	100	80	6.04	81	11.5	1.6	0.1	11.0	91
Albania	62	46	25	67	99	70	67	28	..	98	71	5.41	71	28.9	1.3	1.3	5.5	81
Cabo Verde	62	54	77	72	93	70	34	50	..	65	71	6.05	91	21.0	0.3	1.4	11.5	58
Sri Lanka	62	62	74	93	99	58	58	23	..	94	78	5.38	86	35.1	0.7	0.4	0.6	71
Tonga	62	62	50	70	78	76	87	41	..	94	76	6.31	72	18.6	0.6	1.0	2.8	74
Belize	61	77	68	83	94	67	31	29	..	87	77	5.54	87	13.0	0.8	0.6	5.6	55
Bolivia	60	69	52	59	99	62	52	22	..	53	82	5.40	87	11.0	0.5	1.0	17.6	67
Botswana	60	69	78	73	95	37	48	77	..	60	71	5.32	80	18.0	0.4	0.3	1.6	56
Jamaica	60	69	83	86	91	82	14	32	..	85	78	5.69	83	17.0	0.4	1.1	3.6	81
Federated states of Micronesia	60	38	59	74	72	65	75	41	..	56	75	6.18	75	18.6	0.2	1.0	10.6	64
Myanmar	60	77	74	74	89	58	61	47	..	65	76	5.02	79	9.0	0.6	0.3	0.9	86
Syria	60	46	60	64	41	77	56	43	..	93	76	5.79	81	15.0	1.5	0.3	3.0	63
Bhutan	59	100	83	85	99	74	72	13	..	63	72	4.90	94	17.4	0.3	0.4	0.8	65
Namibia	59	85	77	63	92	68	70	63	..	34	72	5.35	78	27.0	0.4	0.3	0.8	66
Philippines	58	92	54	84	60	64	78	27	..	75	78	5.03	75	5.0	1.1	0.5	4.3	84
Swaziland	58	92	79	76	90	58	46	69	..	58	71	5.52	91	21.0	0.1	0.1	4.0	51
Bosnia and Herzegovina	57	85	27	84	82	87	59	28	..	95	69	5.57	61	35.0	1.9	4.0	7.2	55
Guatemala	57	77	67	86	74	50	68	36	..	67	79	5.82	87	6.0	0.9	0.3	1.3	86
Kenya	57	100	76	58	89	66	66	57	62	30	71	4.70	89	14.0	0.2	0.2	0.7	69
India	56	85	72	45	87	77	44	44	..	44	74	5.59	88	6.6	0.7	0.3	2.6	94
Samoa	56	77	37	73	66	78	68	41	..	97	76	6.63	72	18.6	0.5	0.5	2.6	75
Vanuatu	56	77	59	52	64	72	71	41	..	54	76	5.38	81	18.6	0.2	0.4	1.9	43
Zambia	56	86	65	56	90	70	49	64	64	31	73	5.16	86	20.0	0.2	0.1	0.7	92
Cambodia	55	100	59	76	89	69	55	76	..	49	74	4.73	82	8.3	0.2	0.3	0.8	51
Maldives	55	38	53	85	99	22	30	13	..	96	76	5.14	71	43.0	1.6	3.7	8.8	60
Zimbabwe	55	86	86	70	87	51	58	68	78	39	72	5.37	84	17.0	0.1	0.1	0.5	68
Montenegro	54	77	36	87	89	89	55	21	..	96	71	5.34	54	39.6	2.3	8.7	37.6	55
São Tomé and Príncipe	54	69	52	84	96	69	71	39	..	40	74	5.44	87	29.0	0.5	0.5	1.5	16
Rwanda	53	86	65	44	98	54	72	74	67	62	74	4.93	87	16.0	0.1	0.1	0.4	41
Gabon	52	64	37	78	80	68	41	56	11	41	75	5.39	87	13.0	0.3	0.3	16.4	48
Solomon Islands	50	54	56	65	98	73	73	41	..	31	78	6.26	75	14.0	0.2	0.2	0.9	57
Indonesia	49	92	81	84	78	75	27	10	..	68	76	5.09	61	12.1	0.2	0.3	6.9	96
Laos	48	92	67	37	89	54	32	35	..	73	75	5.10	70	15.0	0.2	0.0	1.0	74
Comoros	47	86	33	49	91	38	53	32	57	34	72	5.16	86	21.6	0.2	0.1	1.3	29

Figure 2 continues on next page

	UHC service index	Recent primary coverage data	Family planning demand satisfied (%)†	Antenatal care, four or more visits (%)†	Child immunisation (DTP3) (%)	Care-seeking behaviour for child pneumonia (%)†	Tuberculosis effective treatment (%)‡	HIV antiretroviral treatment (%)	Insecticide-treated bednets (%)	At least basic sanitation (%)	Prevalence of non-raised blood pressure (%)	Mean fasting plasma glucose (mmol/l)§	Tobacco non-use (%)	Hospital beds per 10000 population†	Physicians per 1000 population†	Psychiatrists per 100000 population†	Surgeons per 100000 population†	International Health Regulations compliance (%)†
Djibouti	47	64	43	23	84	94	65	22	30	51	73	5.40	87	14.0	0.2	0.1	1.5	46
Haiti	47	77	49	67	60	38	62	46	..	31	76	5.41	87	7.0	1.2	0.1	1.1	48
Timor-Leste	47	54	48	55	76	71	48	41	..	44	73	4.98	57	59.0	0.1	0.3	1.6	66
Bangladesh	46	85	74	31	97	42	53	13	..	47	75	5.45	77	7.7	0.4	0.1	1.7	85
Gambia	46	93	28	78	97	68	64	24	64	42	71	5.56	84	11.0	0.1	0.2	0.6	33
Nepal	46	92	65	60	91	50	69	36	..	46	70	5.44	76	3.0	0.2	0.2	0.9	72
Equatorial Guinea	45	57	25	67	16	54	50	32	26	75	72	5.28	87	21.0	0.3	0.1	32.7	27
Ghana	45	93	43	87	88	56	28	28	66	14	76	5.49	96	9.0	0.1	0.1	0.5	69
Lesotho	45	85	76	74	93	63	32	40	..	44	72	5.50	74	13.0	0.0	0.1	0.2	63
Cameroon	44	79	38	59	84	28	45	30	45	39	75	5.53	87	13.0	0.1	0.0	0.4	91
Côte d'Ivoire	44	64	34	44	83	38	49	34	73	30	73	5.39	87	4.0	0.1	0.1	1.5	87
Malawi	44	86	73	51	88	71	40	58	55	44	71	5.03	85	13.0	0.0	0.0	0.4	40
Uganda	44	86	46	48	78	79	40	60	66	19	73	5.22	90	5.0	0.1	0.0	0.6	73
Burundi	43	79	38	49	94	55	46	50	77	51	71	4.87	87	7.9	0.1	0.0	0.2	56
Sudan	43	71	31	51	93	48	44	8	42	35	70	5.24	87	8.2	3.1	0.1	0.8	71
Mozambique	42	79	39	51	80	50	34	44	66	24	71	5.21	83	7.0	0.1	0.1	0.7	67
Togo	42	93	33	57	88	49	61	39	74	14	71	5.32	92	7.0	0.1	0.0	0.3	69
Benin	41	93	24	59	82	23	54	51	69	14	72	5.07	93	5.0	0.1	0.1	0.8	44
Papua New Guinea	41	46	48	55	73	63	56	48	..	19	75	6.07	63	18.6	0.1	0.1	0.5	64
Senegal	41	79	43	47	89	48	55	44	68	48	70	5.46	91	3.0	0.1	0.2	0.3	30
DR Congo	40	71	18	48	81	42	43	32	59	20	72	5.06	87	8.0	0.1	0.1	0.1	75
Kiribati	40	46	43	71	78	81	70	41	..	40	79	6.78	51	18.6	0.2	1.8	3.6	60
Pakistan	40	92	49	37	72	64	59	5	..	58	70	5.84	80	6.0	0.8	0.3	1.3	43
Burkina Faso	39	86	43	34	91	56	49	55	62	23	68	5.31	87	4.0	0.0	0.1	0.2	50
Ethiopia	39	93	58	32	77	29	63	55	61	7	79	4.48	96	3.1	0.1	0.0	0.4	78
Guinea-Bissau	39	64	40	65	87	34	25	25	78	22	70	5.31	87	10.0	0.1	0.0	0.5	50
Nigeria	39	79	33	54	49	35	13	26	45	33	76	5.45	94	5.0	0.4	0.1	1.0	67
Tanzania	39	86	54	43	98	55	33	55	29	24	73	5.30	85	7.0	0.0	0.0	0.2	67
Yemen	39	85	48	25	69	34	52	15	..	60	69	5.59	81	7.1	0.3	0.2	0.4	46
Congo (Brazzaville)	38	79	37	79	80	28	39	29	36	15	74	5.20	76	16.0	0.1	0.1	0.2	28
Eritrea	38	79	27	57	95	45	56	57	19	11	71	5.12	94	7.0	0.1	0.0	0.4	71
Angola	36	57	25	56	64	39	22	23	40	39	70	5.25	87	8.0	0.1	0.0	5.1	18
Sierra Leone	36	79	36	76	86	72	51	21	72	14	70	5.41	74	4.0	0.0	0.0	0.1	64
Guinea	35	71	20	57	54	37	46	28	57	22	70	5.30	87	3.0	0.1	0.0	0.5	52
Afghanistan	34	85	43	18	65	62	51	5	..	39	69	5.36	87	5.0	0.3	0.1	0.9	43
Liberia	34	93	38	78	52	51	31	17	47	17	72	5.31	90	8.0	0.0	0.1	0.2	26
Central African Republic	33	64	37	38	47	30	39	22	49	25	69	5.13	87	10.0	0.0	0.0	0.2	24
Mauritania	33	64	30	48	73	34	38	21	8	45	68	5.24	87	4.0	0.1	0.1	1.6	28
Niger	33	79	41	39	65	59	44	26	39	13	66	5.20	92	2.8	0.0	0.0	0.2	73
Mali	32	33	38	64	23	44	32	59	59	31	68	5.36	88	1.0	0.1	0.0	0.7	55
Madagascar	30	59	51	69	41	43	4	68	68	10	72	5.12	87	2.0	0.1	0.1	0.4	29
South Sudan	30	14	17	31	48	38	9	58	58	10	72	5.30	87	8.7	0.1	0.0	1.2	50
Chad	29	18	31	46	26	37	54	70	70	10	67	5.30	87	4.0	0.0	0.0	0.1	41
Somalia	22	45	6	42	13	40	10	23	23	16	57	5.17	87	8.7	0.0	0.0	0.1	6

whichever was the lower, for which x is hospital bed or health cadre density. The empirical thresholds used were: 18 hospital beds per 10 000, 0.9 physicians per 1000, 1 psychiatrist per 100 000 and 14 surgeons per 100 000 population.

Equity

With complete data, the service coverage index could be computed and compared across different dimensions of inequality, for example across wealth and education gradients, different geographical regions within a country, and age and sex. This is currently not possible for all tracer indicators because of data limitations; however, a subset of indicators can be used to show variation in inequality between countries.³⁷ Here, we assessed inequalities in coverage by household wealth quintile, defined by a household wealth index that accounts for ownership of specific household items and access to specific services.³⁸ We focused on four tracer indicators measured through Demographic and Health Surveys (DHS) or Multiple Indicator Cluster Surveys (MICS), namely family planning coverage, antenatal care (four or more visits), diphtheria, tetanus, and pertussis vaccine coverage, and access to at least basic sanitation. We compared average national coverage of these indicators with average coverage of the same indicators in the poorest household wealth quintile, to be consistent with the SDG indicator's focus on national coverage and coverage in the most disadvantaged populations. Specifically, for each country we calculated the ratio of the average coverage level of the four indicators in the poorest quintile as compared with the average coverage level for the national population. We then multiplied this ratio against the UHC service coverage index, as computed for the national population, to give the expected value of the UHC service coverage index for the poorest wealth quintile.

Sensitivity analyses

Final index values for countries depend on various methodological decisions, including which indicators are

included in the index, how indicators are scaled, how missing values are handled, and how the indicators are combined into a summary measure. We tested the sensitivity of the index to these choices by re-computing the index using a variety of different approaches, including: deleting one indicator at a time, rescaling all indicators based on observed minima and maxima, ignoring missing data when computing the index (ie, no imputation), projecting the subset of indicators for which estimates were not available for a common year, and computing the index with arithmetic means or based on the individual ranks of tracer indicators. We also compared the index to other summary measures of health and development, like life expectancy and gross national income.

Country consultation

WHO did a country consultation with 131 countries that nominated focal points from February to April, 2017, to solicit feedback about the methods used to construct the index and to obtain new data inputs. Respondents were largely supportive of the methods of computation and the composition of the index. We received 303 datapoints from 52 countries, of which 128 (42%) were incorporated into the database after review. The remainder were excluded because of differences in definition, insufficient documentation, duplication, or requiring further analysis by WHO or UN estimation groups who were responsible for the particular indicator. Most country-submitted data were from new sources, such as recently completed household surveys or annual updates from national administrative data systems.

Role of the funding source

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

Results

Global databases for the selected tracer indicators varied in terms of the availability of comparable estimates between countries and the amount and timeliness of primary data on indicators that countries have obtained and made publicly available (table). The list of selected tracer indicators, the type of indicator, and specific notes on rationale for inclusion, limitations, and potential future refinements are summarised in the table. Two of the 16 tracer indicators did not have widespread data availability at the time of analysis, namely coverage of cervical cancer screening and access to essential medicines. Thus, these two indicators were excluded from the index calculations (figure 1). Of the remaining 14 indicators, on average countries had primary data sources (ie, ignoring estimates and modelling) between 2010 and 2015 for 72% of the indicators, with 85 (46%) of 183 countries

Figure 2: Values for the universal health coverage index of coverage of essential health services and values for each of the tracer indicators used to calculate the index, by country

Values were not transformed or rescaled. Country index values of 80 and over are reported as ≥ 80 for presentation purposes and to avoid comparisons that were not meaningful. For tracer indicators, data are displayed in bold font if primary data were available since 2010, otherwise faded font is used to denote absence of recent primary data. UHC=universal health coverage. DTP3=three doses of diphtheria, tetanus, and pertussis vaccine. *Primary data refers to empirical data collection; availability of comparable estimates was higher than availability of primary data. Primary data availability was calculated as the percentage of indicators for which primary data since 2010 were available. For the purpose of this calculation, the three health-worker density indicators were treated as one indicator. †Most recent year of data available was used. Year of data for each indicator reported from each country is available in the appendix. ‡Estimates for the percentage of cases treated are for 2014, whereas estimates of cases detected are for 2015. §Estimates are for 2008.

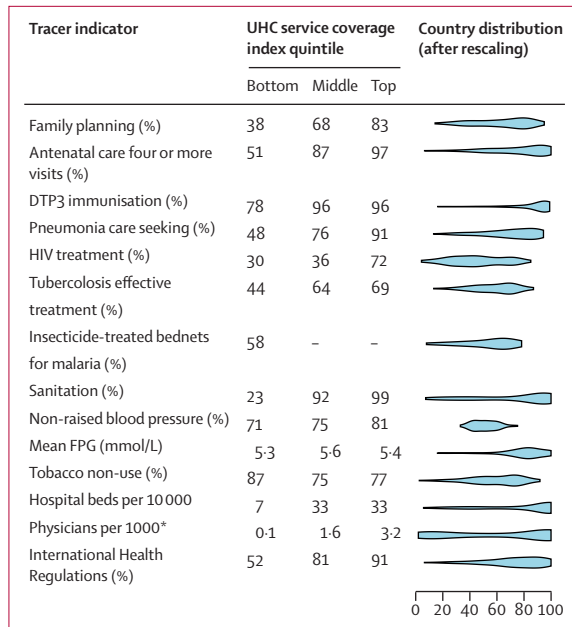


Figure 3: Median tracer indicator value across countries grouped by universal health coverage index quintile and country distribution of rescaled inputs to the index

The plot shows the distribution of values for the 183 countries included in the analysis. DTP3=three doses of diphtheria, tetanus, and pertussis vaccine. *Physicians per 1000 values are shown with rescaled health worker density score distribution, which combines physician, surgeon, and psychiatrist densities.

having more than 75% of indicators with data since 2010 (figure 2; appendix). The most data-rich indicators were those for child immunisation and health-worker densities. Data were more sparse for indicators of care seeking for suspected childhood pneumonia, although data availability was good in low-income and middle-income countries where monitoring is most essential, and for proxy indicators for the treatment of hypertension (prevalence of non-raised blood pressure) and diabetes (mean fasting plasma glucose).

Figure 3 presents summary statistics for the individual tracer indicators, and all country indicator values are shown in 2. When organised into quintiles according to the final UHC service coverage index, coverage of family planning ranged from 38% in the lowest index quintile to 83% in the highest quintile. There was also substantial variation in household access to at least basic sanitation, ranging from 23% in the lowest index quintile to 99% in the highest index quintile. The shape of the distribution of country values varied across indicators (figure 3). For example, most countries had high coverage levels of three doses of diphtheria, tetanus, and pertussis containing vaccines in infants, whereas antiretroviral therapy for HIV was below 50% in most countries. Under service capacity and access, more than half of countries were above the threshold of 18 beds per 10000 population; likewise, more than half of countries were above the threshold of 0.9 physicians per 1000 population.

Current values for the service coverage index ranged from 22 to 86 across 183 countries, with a median value of 65 (figure 2). Currently, the index does not adequately distinguish between countries with the highest level of service coverage provision. Therefore, country index values of 80 and over are reported as greater than or equal to 80 for presentation purposes to avoid comparisons that are not meaningful. The service coverage index is highly correlated with other measures of health and development, for example under-five year mortality rates ($\rho=0.86$), life expectancy ($\rho=0.88$), and the human development index ($\rho=0.91$), and modestly correlated with gross national income (GNI) per capita ($\rho=0.65$).^{33,37} The service coverage index is more predictive of life expectancy than GNI, and remains predictive of life expectancy after controlling for GNI and education levels. For example, a regression of national life expectancy on the service coverage index, the log of GNI per capita, and mean years of adult education indicates that going from 0 to 100 on the UHC index is associated with a 32-year (95% CI 25–39) increase in life expectancy, holding GNI per capita and mean years of adult education constant. Over the range of observed country values (22–86) this translates into a difference in 21 years of life expectancy.

It can also be informative to look at countries with service coverage index values that lie well above or below what might be expected given their level of economic development. Predicting the service coverage index with a regression on GNI per capita, and then focusing on countries with high data availability across tracer indicators, countries with index values that are ten or more units higher than expected are Barbados, Colombia, Ecuador, El Salvador, Kyrgyzstan, Myanmar, Peru, Vietnam, and Zimbabwe. In the other direction, Afghanistan, Congo (Brazzaville), Indonesia, Mali, Montenegro, Nigeria, Pakistan, Qatar, and Yemen had index values that were ten or more units lower than expected on the basis of their per capita national income. Many of the countries with lower than expected index values are affected by conflict.

The service coverage index is constructed from sub-indices representing four categories of RMNCH, infectious disease, non-communicable diseases, and service capacity and access and health security. Figure 4 depicts these sub-indices, along with the full service coverage index, across modified SDG regions weighted by population size (see appendix for regional definitions and country-level values). The service coverage index is highest in Europe and North America (plus Australia and New Zealand; 77) and eastern Asia (77), whereas sub-Saharan Africa (42), Oceania (minus Australia and New Zealand; 45), and southern Asia (53) had the lowest average values. The strongest gradient across regions was for the service capacity and access sub-index; the mean value for sub-Saharan Africa was only 27 compared with 99 in eastern Asia. The non-communicable disease sub-index, which currently uses prevalence-based proxy

See Online for appendix

indicators for treatment of hypertension and diabetes, along with non-use of tobacco, was fairly evenly distributed across regions, and less correlated with other categories.

In the absence of data on service coverage levels across key dimensions of inequality for all tracer indicators in the index, a subset of tracer indicators is used to indicate the degree of inequality in service coverage (figure 5). On the basis of geometric means of four well measured service coverage indicators in 52 countries with recent data, median service coverage was 27% lower in the poorest wealth quintile compared with the national population. However, there was considerable variation, with several countries having less than a 5% difference in average coverage between the poorest wealth quintile and the national average, whereas in others, the average coverage in the poorest quintile was less than half that of the national average. With few exceptions, wealth-related inequality was greater than inequality based on the subnational regions measured in DHS or MICS, as well as according to education quintiles and urban versus rural residence.

The index was relatively insensitive to calculation methods. Comparing the absolute difference in ranks of index values compared with alternative calculation methods shows a median (IQR) absolute change in country rank of five positions (2–8) when using arithmetic means, one position (0–2) when first rescaling all tracer indicators by their observed minimum and maximum values before inclusion in the index, and one position (0–3) when computing an overall geometric mean instead of computing means within and then across the four categories of service coverage. This finding does not mean that small differences in ranks between countries are meaningful, because many country values are similar and there is uncertainty around the measurement of the indicator values themselves. Comparing each country's ranking according to the final index to its average rank across each individual tracer indicator, the median absolute difference in ranks is eight positions (4–17).

We assessed sensitivity of the index to the choice of tracer indicators by dropping one indicator at a time and re-computing the index. Spearman rank correlation coefficients across all of these permutations were very high (lowest value was 0.95), and the median (IQR) absolute difference in ranks as compared to the full index was two positions (1–6; appendix). The largest differences came from dropping indicators on antiretroviral therapy and health-worker density. On the basis of current estimated coverage levels, the inclusion of insecticide-treated bednet coverage as an additional indicator for 40 countries with high malaria burden did not have a major impact on their final index values; its inclusion increased their final index value by an average of 0.9 units (out of 100). Projecting the five indicators for which comparable estimates were not available to a common year changed ranks by two positions (1–5). To assess the effect of imputing

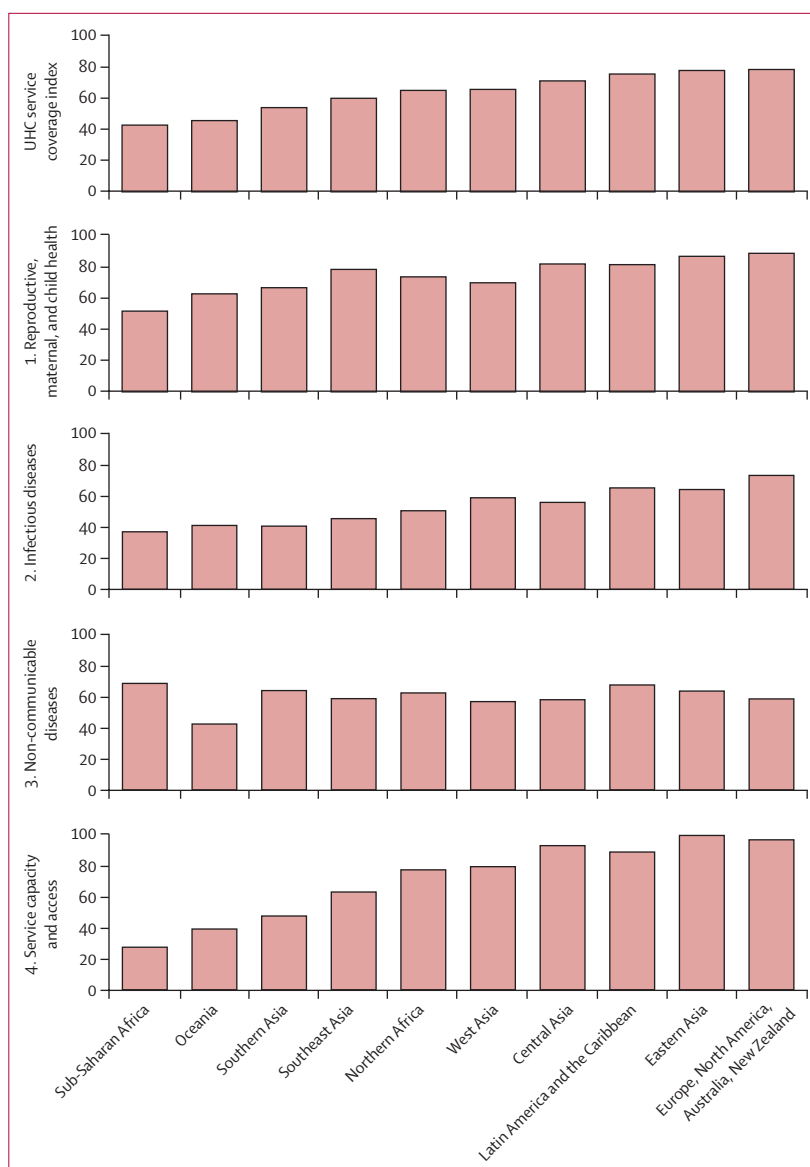


Figure 4: Regional (population-weighted) means for the UHC service coverage index and its four component sub-indices, by modified SDG region
UHC=universal health coverage. SDG=Sustainable Development Goal.

missing data more generally, we calculated the geometric mean of coverage indicators with available data for each country separately, and compared that with the geometric mean computed across the final dataset of all indicators. This showed that imputation leads to a median increase in the final index score of two units (1–3) out of 100. Simulation experiments showed the use of imputation reduced mean absolute error as compared to using no imputation.

Discussion

An index of essential health services has been adopted as an indicator for monitoring progress towards

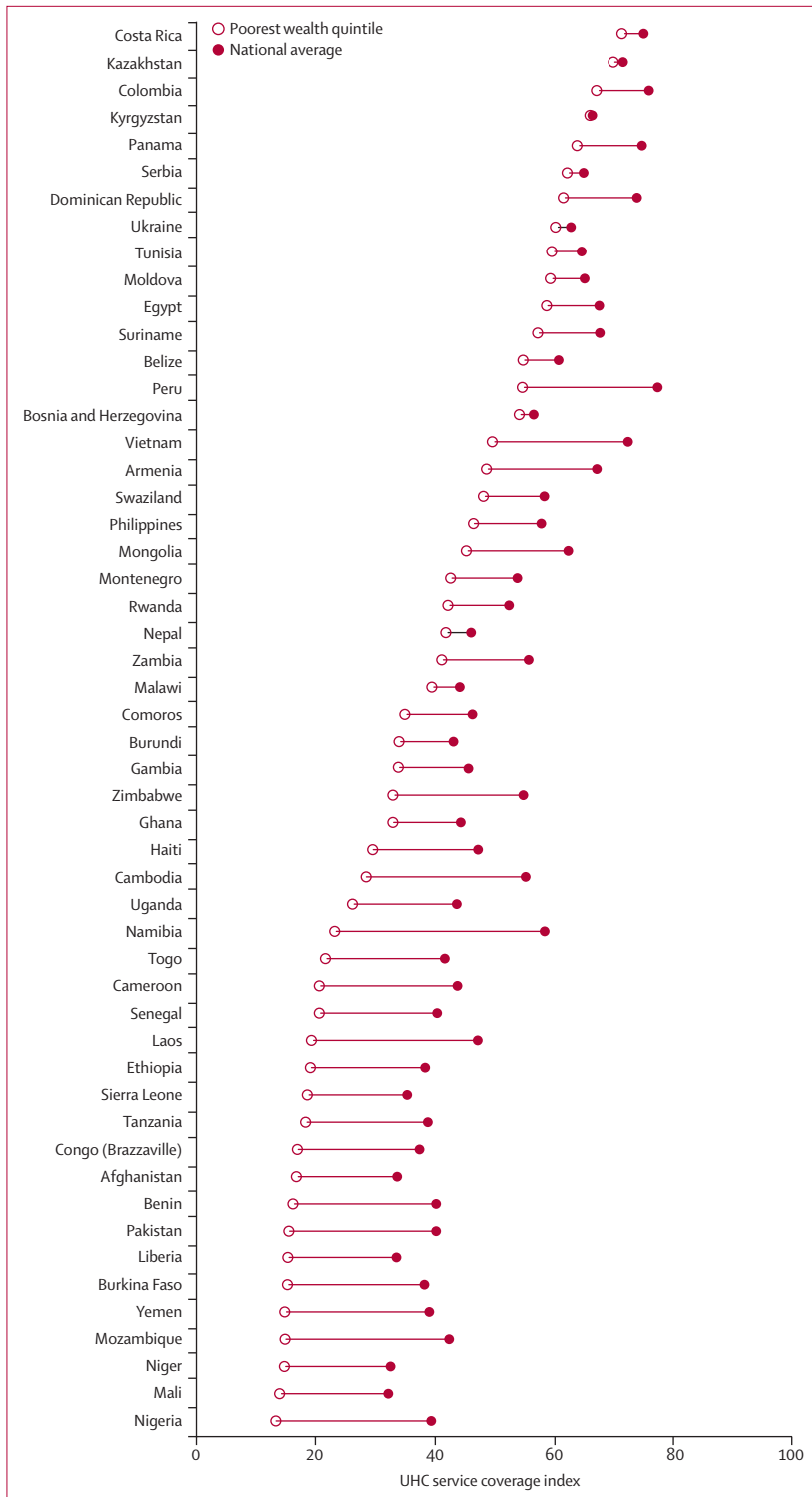


Figure 5: UHC service coverage index at a national level, and estimated for the poorest wealth quintile
 UHC= universal health coverage. Patterns of relative inequality for family planning; antenatal care; diphtheria, pertussis, and tetanus vaccine; and access to at least basic sanitation are represented. Countries with high data availability since 2010 are depicted.

SDG target 3.8 on UHC, and UHC serves as an organising principle through which all of the health-related SDG targets can be achieved. We selected a manageable set of widely monitored tracer indicators that focused on essential health-care services for the construction of a simple index. This index provided a broad summary of health service coverage within UHC and we believe it can serve as a point of reference for policy discussions and help highlight specific issues and patterns across and within countries. This monitoring framework is also flexible enough for regions and countries to use alternative indicators that they deem to be important, and add additional stratifying variables for monitoring equity in health service coverage.

Our findings show the wide range of the service coverage index from over 80 in high-income countries such as Australia, Belgium, Canada, and Japan to less than 35 in some conflict-affected and low-income countries, such as Afghanistan, Somalia, and South Sudan. The strong association of the service coverage index with life expectancy, after controlling for economic development and education levels, is striking, with a difference of 21 years in life expectancy over the range of observed values of the index. It should be noted that this is a crude cross-sectional analysis that suggests the service coverage index is a meaningful measure of effective health service provision; however, it is not a causal estimate of the effect of UHC on survival. The index also provides an entry point for examining service coverage, as it can be broken down by sub-indices for the four categories, at the level of individual tracer indicators, and should encourage review of other indicators of service coverage relevant to a particular country. Inequalities in essential service coverage within countries, as estimated from a subset of indicators with available data, are very large in many settings, particularly in lower-income countries, although there are also substantial differences in the degree of inequality in countries that have high national values for the service coverage index. Adapting our framework to construct indices by subnational geographical region, along with alternative indicators of national relevance, could be a useful extension of this analysis that would supply country decision makers with more actionable information than that in the cross-country comparisons presented in this Report.

There are many strengths of the service coverage index. The index is simple to compute and interpret, which was confirmed by the country consultation, and wherever possible it makes use of other SDG indicators of service coverage to reduce reporting burden. This feature increases the chances of country uptake, in similar or modified formats, to track UHC progress. The index is comprised of indicators that are relevant (ie, linked to disease burden), and feasible (data are widely available and comparable—ie, mean the same thing in different settings). The index performed well in various tests of sensitivity, and face validity of the results was high.

There are, however, several limitations and challenges that need to be addressed in future refinements of the index, both globally and within countries. The process of selecting tracer indicators highlighted the data gaps that currently exist for health service coverage indicators around the world. Although the aim was to select indicators of effective service coverage, most of the coverage indicators that are currently included in the index measure contact coverage as opposed to effective coverage. Additionally, no coverage indicators were selected as tracer indicators for some important health areas—for example, there are currently few data for robust indicators of coverage of interventions for non-communicable diseases, mental health, injuries, and emergencies for most countries. Proxy indicators that track service coverage, such as data on service capacity or health status, were used in place of coverage indicators in these areas. For the tracer indicators that were used in the index, empirical data were not available for every country, and analytical or statistical methods were used to fill in gaps in data. Care should also be taken in comparing countries with similar index values given the uncertainty around estimates of tracer indicators, missing data for some tracer indicators across countries, and choices about how to calculate the index. Based on sensitivity analyses, country rankings are generally stable, but in some cases might vary by 20 positions based on the choice of method. Data scarcity is even more problematic for ensuring no-one is left behind as more investments are made in health systems—currently, comparable data on coverage of essential services that can be disaggregated by key dimensions of inequality are most available for RMNCH indicators in countries that have done DHS or MICS surveys. Inequality patterns might be different for other indicators such as non-communicable diseases or HIV treatment coverage but comparable data are not yet available for most countries. The index is also less useful in distinguishing provision of quality health services in high-income countries, which have coverage levels approaching 100% for most of the RMNCH and service capacity indicators. Finally, a single index cannot fully characterise all of the necessary and crucial health-care services that are required to achieve UHC. Given this fact, the approach taken in this Report was to select tracer indicators to track overall coverage of essential health services for monitoring purposes. These tracer indicators should not be interpreted as a recommended set of services.

Service capacity indicators, such as hospital bed density and psychiatrist and surgeon density, for now serve as proxy indicators of effective coverage in the areas of mental health, injuries, and emergencies. Indicators of service use, such as the number of inpatient and outpatient visits, were considered as alternatives but are currently excluded from the index because limited availability of data or concerns about comparability across

countries. These health service capacity and use indicators share a common limitation, which is that the optimal level is unclear; at moderate to high levels, the key question becomes whether a given rate of service use or capacity results in high-quality health services provided to those in need.³ Given this interpretation challenge, we used empirical thresholds to rescale indicators to incorporate low rates of service capacity and access in the index on the basis of minima from OECD countries, which means these indicators do not distinguish service coverage in many upper-middle-income and high-income countries. Additionally, substantial work is needed to standardise data on health cadres, which is anticipated for reporting on SDG 3.c.1. Using proxy indicators for hypertension and diabetes treatment was also necessary because of data limitations; however, the prevalence-based proxies are comprehensive measures of successful prevention and effective treatment coverage. Future work will lead to the inclusion of treatment coverage indicators for hypertension and diabetes.

A key challenge with selecting a core set of tracer indicators for global monitoring is that countries face markedly different health challenges and, partly as a consequence, obtain different types and qualities of data on health and health service provision. Future work should support countries or regions to adapt the index by selecting different tracer indicators according to data availability and priority health areas. In particular, the service coverage index is not highly relevant for high-income countries, where only a subset of indicators, mainly from the non-communicable diseases category, can be used to distinguish levels of coverage with essential health services. Other methods, such as amenable mortality or an index based on service quality data from OECD's work on health statistics, are likely to be informative for high-income settings.^{39,40} Data for monitoring inequalities in health-care service coverage should also be a priority for high-income countries.

There are various methods that can be used for constructing health-related indices.^{5,7,8,34,39} Some studies^{6,8,34} on UHC and SDG monitoring have built on the Human Development Index experience, particularly favouring the use of geometric means to combine indicators. We also used this approach, because a geometric mean will favour equal coverage levels across services instead of higher coverage for some services at the expense of others. An additional methodological choice that must be made when computing an index is how much weight each input or component should receive. The service coverage index weights indicators equally within the four categories delineated by the definition of SDG indicator 3.8.1, and does not attempt to incorporate weights, such as to reflect disease burden or the availability of cost-effective interventions.

In selecting methods for constructing an index of service coverage, including choice of indicators, indicator rescaling, projection to a common year, imputation of

missing data, and weighting schemes, we favoured straightforward approaches over those that were more complex. Monitoring the health-related SDGs is intended to be a country-led process, and in a time of increasingly sophisticated model-based estimates of levels and trends in health indicators,^{6,41,42} more effort should be made to ensure methods are understandable, replicable, and adaptable for use by technical experts in countries.⁴³ More complex methods might be useful reference points for testing less complicated methods but some approaches, like amenable mortality,^{39,44} are less meaningful for countries without high-quality death registration data because they depend on measurement (not prediction) of cause-specific mortality rates.

UHC is about reaching all people. At this point, the UHC service coverage index cannot easily include a full equity dimension as disaggregated data are limited to common RMNCH indicators and water and sanitation. More investment in equity-oriented health information systems would allow for more standardised data collection on socioeconomic and other inequality dimensions in surveys (eg, non-communicable disease surveys), better disaggregation of health facility data, for example, for HIV and tuberculosis indicators, and the development of computation methods to incorporate diverse disaggregated data into the index.⁴⁵

Looking forward to 2030, more work is needed to develop methods for tracking progress on the coverage of health-care services over time. The asynchronous timing of data collection across indicators and countries makes time trends in an index challenging, and a minimum period of 5 years is likely to be needed to reliably measure national changes in the index. More efforts towards data collection, in particular national health examination surveys, like the UHC survey recently completed in Tunisia,³⁶ that measure service coverage across different domains of health, as well as household spending on health, will greatly improve countries' abilities to track progress towards UHC, and to complete subnational assessments of UHC, which are likely to be the most useful to national policy makers.

Contributors

TB conceived the study. DRH, GAS, ARH, and TB developed the methods. DRH analysed the data and wrote the first draft of the manuscript. All authors revised and approved the final manuscript. The authors alone are responsible for the views expressed in this Article and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

Declarations of interests

We declare no competing interests.

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