

# Service coverage within universal health coverage: how large is the gap?

## Technical note

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This document describes the data and methods used to estimate the number of people who are not fully covered with essential health services, presented in:

World Health Organization and World Bank Group. Tracking universal health coverage: 2017 global monitoring report. Geneva: World Health Organization.

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### Background

To communicate the magnitude of the task ahead with respect to increasing health service coverage to improve health outcomes and achieve the health-related SDGs, perhaps no single statistic is more in demand than the number of people with coverage of essential health services. Ideally, the method for calculating this number should have two features:

- 1) Reflects the number of people who receive all the essential services they would need (vs affiliation with a health service scheme).
- 2) Changes in this number must be measurable.

Fully answering this question is challenging: there is no dataset that contains information on all people's need for health services and whether they received those services.

In the 2015 UHC monitoring report, we calculated that over 400 million lacked access to at least 1 of 7 essential services representing MDG priority areas (family planning, antenatal care, births attended by a skilled health professional, DTP3 immunization, HIV treatment, TB treatment, and ITN use among children) (1). This calculation did not encompass the broad range of essential health services individuals should receive, and considering an expanded list of services would yield a larger number of people without coverage for at least one of them. Moreover, this number did not reflect whether or not any particular individual has full coverage of all the essential services they may need. An estimate of the number of people who are covered with broad and representative range of health services that people should be able to access in any country is needed.

To compute the number of people with (or without) full coverage of essential services, we need a different methodology than the one that was used for the 2015 UHC monitoring report. The main limitation to the previous methodology is that we cannot measure levels or trends in coverage of most services included in a comprehensive basket of essential services, let alone determining who are the "haves" and "have nots" across each service to avoid double counting. We instead develop a method that relies on tracer indicators, which track coverage of the full basket of essential health interventions that should be provided in every country.

## Methods

### Overview

Consistent with the approach to measuring SDG indicator 3.8.1 on coverage of essential services, the method relies on a small set of tracer indicators, which measure coverage of essential services over an inclusive range of disease areas and service delivery platforms. The focus is on coverage of services among those in need (i.e., the percentage of people who need a service that receive the service), vs. access to services (i.e. affiliation with a health coverage scheme, or vs. effective coverage with services (i.e. the percentage of those in need who receive services of sufficient quality to realize the potential health gains). These tracer indicators reflect coverage with, but do not define, the full set of essential health services that should be provided in every country. The calculation has the following steps:

1. Select a small set of tracer indicators of service coverage with good data availability, drawing from the tracer indicators in the SDG 3.8.1 index. Compute average coverage in every country using these indicators.
2. Convert this average coverage to the percentage of people with full coverage (defined as receiving most needed services) in each country. This is then multiplied by total population to get the number of people with full coverage of essential services.

All calculations were done for 183 member states for the year 2015 and summed to obtain global estimates.

#### *Step 1: Average coverage of tracer indicators*

The UHC service coverage index is comprised of sixteen tracer indicators, which track coverage with essential health services (2). A strict criterion for these tracer indicators was that data are regularly collected and published for a majority of countries; on the other hand, some tracer indicators are proxies vs. direct measures of coverage. For the present analysis, an initial focus on a global estimates means that estimates need not be available for every country. On the other hand, all tracer indicators must be direct measures of service coverage on a 0 to 100% scale. These slightly different selection criteria required a number of indicator substitutions, outlined below. The final set of 12 tracer indicators is presented in Table 1.

**Table 1.** Tracer indicators included in the computation of average coverage of essential services.

<b>Community &amp; cross-sectoral</b>	<b>RMNCH</b> Family planning	<b>Infectious</b> At least basic sanitation Malaria prevention	<b>NCD</b> Tobacco control measures
<b>First level care</b>	Skilled birth attendance Measles vaccine 2 <sup>nd</sup> dose Child pneumonia care	HIV treatment TB effective treatment	Hypertension treatment Diabetes treatment
<b>Specialized</b>	Amenable mortality (maternal, appendicitis, selected treatable cancers): measured directly for countries with high quality CRVS, otherwise approximated based on inpatient admission rates.		

Pregnancy and delivery care: The UHC service coverage index currently has antenatal care, four or more visits (ANC4) as a tracer indicator for pregnancy and delivery care. This was selected over

percentage of births attended by skilled health personnel (SAB) due to concerns about lack of definitional standardization of which cadres are considered skilled, which could impede cross-country comparability. Work to standardize the SAB indicators is ongoing, and it is anticipated that SAB will replace ANC4 as soon as a comparable dataset is available (3). Here, we have used the initial data series published by the UN for SDG monitoring, which still require some standardization before country values are fully comparable (4).

Child immunization: The UHC service coverage index currently has at least three doses of a diphtheria-tetanus-pertussis vaccine (DTP3) as a tracer indicator for childhood vaccination. It was anticipated that this would be replaced with SDG indicator 3.b.1, once it was defined. In late October 2017, the Strategic Advisory Group of Experts (SAGE) on Immunization recommended that 2<sup>nd</sup> dose of a measles vaccine be used as a tracer indicator for monitoring SDG indicator 3.8.1. This update has been made here.

Tobacco control measures: The UHC service coverage index has as a tracer indicator the percentage of adults aged 15 years and over not currently smoking tobacco. Although this indicator reflects effective implementation of a suite of anti-tobacco measures, it is not a direct measure of coverage. To reflect coverage with anti-tobacco measures, average coverage of six WHO 'best buy' and other tobacco control interventions with cost-effectiveness data was used. The six interventions are: increase taxes and prices, implement plain packaging/graphic warnings, ban tobacco advertising, promotion and sponsorship, eliminate second-hand exposure, implement anti-tobacco mass media campaigns, and provide tobacco cessation support (5). For each intervention, one point is given if the intervention is implemented at a low level (as rated in reference (6)), two points if it is implemented at an intermediate level, and three points if implemented at the highest level; each country's total score is divided by 18 to give an average percentage coverage across all interventions ranging from 0% to 100%.

Hypertension treatment coverage: The UHC service coverage index has as a tracer indicator the percentage of adults aged 18 years and over with normal blood pressure. It is anticipated that the index will use hypertension treatment coverage once a global database becomes available (work is underway (3)). As prevalence of normal blood pressure is not a direct measure of coverage with health services, hypertension treatment coverage is approximated for the present calculation.

Estimated levels of hypertension treatment coverage are sensitive to the inclusion of undiagnosed stage I hypertension in the denominator, that is, measured systolic blood pressure greater than or equal to 140/90 but less than 160/100. Individuals with blood pressure measured in this range are typically re-assessed to ensure that treatment is indicated, given that individuals experience large day-to-day variability in blood pressure. Of those whose blood pressure measurement is again greater than or equal to 140/90 but less than 160/100, some individuals with low total cardiovascular risk would not require antihypertensive medication. Estimated treatment coverage is substantially higher if undiagnosed stage I hypertension is excluded from the denominator, and final estimates of number of people covered with essential health services are sensitive to this decision.

Estimates of hypertension coverage in world regions were made on the basis of the PURE study (7). Two estimates were made:

- a) the percentage of people with any hypertension (defined as  $\geq 140$  systolic blood pressure or  $\geq 90$  systolic blood pressure) currently taking medication.
- b) the percentage of people with stage II hypertension (defined as  $\geq 140$  systolic blood pressure or  $\geq 100$  systolic blood pressure) currently taking medication.

For both calculations, all individuals taking medication for hypertension, regardless of blood pressure measurement at diagnosis, are included in the numerator and denominator. Untreated individuals are included in the denominator only if their measured blood pressure exceeds the threshold noted above. Here, we consider stage II hypertension coverage to be our best estimate, but consider total hypertension coverage as a sensitivity analysis.

Diabetes treatment coverage: The UHC service coverage index has as a tracer indicator mean fasting plasma glucose (FPG). It is anticipated that the index will use diabetes treatment coverage once a global database becomes available (work is underway (3)). As mean FPG is not measured on a 0-100% scale, diabetes treatment coverage is approximated for the present calculation. Diabetes treatment coverage was estimated for world regions on the basis of data from population-representative household surveys which included measurement of fasting plasma glucose (1, 8).

Specialized services: It is extremely challenging to measure coverage with specialized (hospital) services, as diagnosis of need (the denominator) is typically complex and cannot be done in a household survey (see Box 1.1 in the Report (3)). In the UHC service coverage index, these are captured with proxy variables of hospital beds and surgeons per capita. However, for this exercise an indicator of service coverage measured on a scale of 0 to 100% is required. The chosen indicator is based on the concept of amenable mortality (9): deaths from certain causes should not occur if appropriate care is given. Multiple compilations of causes of death that are considered amenable have been published; here we use a small set of causes of death for which incidence of the condition which potentially leads to death has moderate epidemiological variability, and for which death rates should be virtually zero, provided appropriate specialized care is provided. The causes of death included are: maternal mortality, treatable cancers (cervix cancer and Hodgkin's lymphoma in ages 0-74, and leukaemia in ages 0-19), and appendicitis in ages 0-74. Age-standardized mortality rates for each of the three causes of death (maternal, cancers, and appendicitis) were calculated using WHO estimates (10). For each of the three causes of death, coverage was calculated as one less the ratio of age-standardized mortality in each country to the estimated 95<sup>th</sup> percentile of age-standardized mortality rate (high-HIV countries were excluded for the cancer calculation due to the substantially different epidemiology of cervical cancer in these countries). Conceptually, this denominator (assumed to be constant across all settings) represents the estimated mortality rate in the absence of quality specialized services. The coverage thus gives the percentage of deaths that were prevented by the provision of quality specialized services.

High quality data on mortality by cause are available for a subset of middle-income and virtually all high-income countries (11). For remaining countries, data on mortality by cause of death are insufficient for monitoring progress, since changes over time are driven by the covariates used to predict cause of death patterns in the absence of high quality data. To approximate amenable

mortality with country data in a way that can be tracked over time, we fit a regression equation<sup>1</sup> which converts hospital utilization rates (as collated from regional WHO data observatories and OECD) to amenable mortality among low and middle income countries (as estimated by WHO).

*Step 2: Conversion of average coverage to full coverage*

Globally, our best estimate of average coverage of the set of 12 tracer indicators of service coverage in Table 1 is 66% (Table 3). This *does not* mean that approximately 66% of the world's population is covered with needed services. Any given individual may be covered for some, but not others, and they are all essential. Thus, we develop a set of equations to convert "average service coverage" to "proportion of people with full coverage."

We first fit a regression to generate a base equation to make this conversion. To do this, we use an analysis of household survey data, focusing on seven basic maternal and child health interventions (see pp 16-18 of the Report (3)). We look at the "co-coverage" of these interventions in mother-child pairs, which means we compute, at the individual level, what fraction of the interventions each mother-child pair receive. A regression equation fitted to these data is used to convert average coverage of essential services in each country to the proportion of people that are expected to have full coverage with essential services (empirical survey data are shown in Figure 1, left panel). To set a realistic goal for full coverage, this is operationalized as the percentage of mother-child pairs who receive at least six out of seven basic services. This allows for some measurement error in the empirical co-coverage survey data. The regression equation is as follows ( $y$  is co-coverage of 6 of 7 interventions, while  $x$  is average coverage of the 7 interventions):

$$\ln\{E(y)\} = \beta x \quad y \sim \text{Binomial}$$

A series of sensitivity analyses, following the same general procedure and using the same dataset, were run to develop alternative conversion equations. For the purposes of these sensitivity analyses, an 8<sup>th</sup> health intervention, early initiation of breastfeeding, was included from the same dataset. First, regressions were fit to predict full coverage defined as 5 out of 6 services from their corresponding average coverage, for all seven possible sets of six services (excluding early initiation of breastfeeding), to determine if exclusion of any particular service affected the fitted regression curve. Second, regression equations were fit to predict coverage with 6 out of 7 services from their corresponding average service coverage, for all eight possible sets of seven services (including early initiation of breastfeeding). This resulted in a total of 15 regression curves characterizing the relationship between the average coverage of services and the proportion of the population with 'full' coverage (Figure 1, right panel).

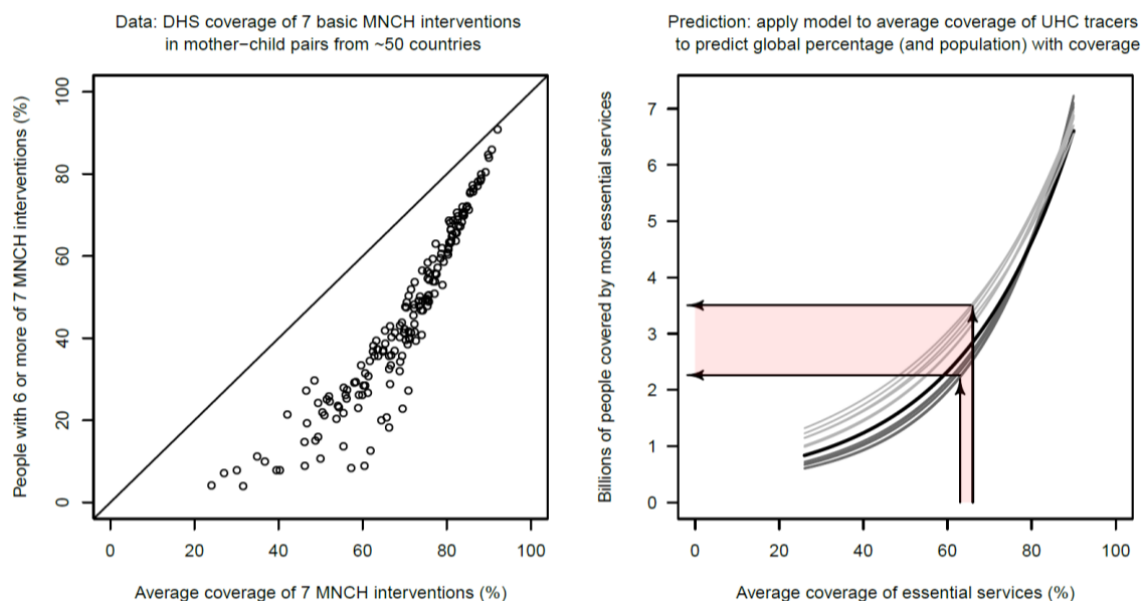
Finally, we calculate the proportion of people with full coverage with essential services in each country using the country's average coverage with essential services (calculated in step 1) and each of the 15 regression curves. This proportion can be converted to number of people by multiplying it by population size (Figure 1, right panel). This is then repeated with average service coverage

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<sup>1</sup> The regression equation predicts the final scaled amenable mortality variable as described in the preceding paragraph as a function of the log of the inpatient admission rate and the log of the inpatient admission rate squared, using a binomial generalized linear model. For the subset of countries without recent data on inpatient admission rates, the inpatient admission rate was first imputed from hospital bed density, with which it is highly correlated ( $\rho=0.84$ ).

calculated using total hypertension treatment coverage as a final sensitivity analysis. The range of estimates of the number of people with full coverage with essential services across these 30 different sensitivity analyses is summarized in Table 2.

**Figure 1.** Conversion of average coverage of essential services to full coverage of essential services. In the left-hand panel, data for the base regression from 180 DHS surveys in 63 countries are shown. In the right-hand panel, fitted regression curves are shown. Light grey curves are for the conversion of average coverage to full coverage defined as 5 of 6 (83%) interventions; dark grey curves are for the conversion of average coverage to full coverage defined as 6 of 7 (86%) interventions; and the base case regression is shown in black.



## Results

Based on a set of sensitivity analyses, the range of people with coverage of essential services is 2.3-3.5 billion (Table 2). This suggests at least half of the world's population lack full coverage of essential health services. This analysis was generally not sensitive to changes in tracer indicators, with the exception of total vs. stage II hypertension coverage.

**Table 2.** Estimated percentage and number of people who have full coverage of essential health services globally, by sensitivity analysis, 2015.

Average coverage		Hypertension coverage definition	
		Stage II hypertension	Total hypertension
Average coverage		66%	63%
Full coverage	Five out of six	%	43%-47%
		# (billions)	3.1-3.5
	Six out of seven	%	36%-39%
		# (billions)	2.6-2.8

## Limitations of approach

Given data limitations, the approach outlined in this technical note has the following limitations:

- The approach assumes the relationship between average coverage and co-coverage as observed in the DHS for MNCH indicators is (1) representative of what that relationship is for a wider set of indicators (e.g., including infectious and NCD) and (2) that this relationship is stable over time and across countries. If the correlation among intervention coverage is actually lower, then the number of people with full coverage of essential services will be lower than estimated here.
- The relationship between average coverage and co-coverage depends on the way that full coverage is defined (e.g., 5 of 6 or 6 of 7 basic services).
- The average coverage of services is computed based on a small subset of tracer indicators, based mainly on data availability. It also focuses on contact coverage, as opposed to effective coverage.
- The measure of coverage with specialized services is not on a natural coverage scale and must be rescaled.
- The average coverage of the tracer indicators is sensitive to the definition of hypertension treatment coverage. Estimates could change once country-level estimates of hypertension and diabetes treatment coverage are completed.

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