13th General Programme of Work (GPW13)

Methods for Impact Measurement

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Foreword



[DRAFT] In August 2017, WHO ushered in a new era of transformation based on three grounding principles: to promote health, keep the world safe, and serve the vulnerable. Reflective of these values, it is the goal of the Thirteenth General Programme of Work (GPW 13) to make a measurable impact on the health of billions of people over the next five years.

The Triple Billion targets – one billion more people benefiting from universal health coverage, one billion more people better protected from health emergencies, and one billion more people enjoying better health and well-being – epitomize this ambition.

The Impact Measurement framework will guide and inform the efforts of the Secretariat, Member States, and external partners to measure our progress during GPW 13 and substantially improve global progress towards achievement of the Sustainable Development Goals (SDGs).

Grounded in transparency, equity, and impact, the framework uses methods that are accessible to all Member States and aims to analyse and address inequalities within and between countries and regions. It is aligned with the SDGs to unite countries across global targets while still adapting to each Member State's national priorities for improving the health of their people.

This framework lays the foundation for a delivery approach generating a relentless focus on setting targets, tracking progress, and problem-solving when issues arise. Measured results will not only monitor change in health outcomes, but also provide key insights into the current state of our data and health information systems. It will be a roadmap for the Secretariat and Member States in designing and implementing technical support strategies to strengthen national and global data systems, and promote stronger collaborations with new partners to elevate the quality of health data worldwide.

Consultation with internal and external experts, including the WHO Expert Reference Group Task Force on GPW13, have driven development of the methods for measuring impact. Without these coordinated efforts, a robust measurement system like this would not be possible.

Member States have worked with WHO staff to refine and hone the methods described in this report, as well as testing the feasibility of the methods with available data. These initiatives are helping us design a comprehensive programme towards strengthening data and health information systems in countries. We envision working with Member States to implement the measurement methods and achieve our collective ambition to make a significant impact on the health and well-being of billions of people by 2023.

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Warning

This document is in the process of being edited and laid out in preparation for release in time for the WHA in May 2020. It is offered as it is, on a best-effort basis, in order that details of the GPW13 methods are available to all as soon as possible. The main text and the methods details are now finalised. Updates to examples, tables and diagrams are in progress. Sections expected to be updated or reviewed are marked. The document has yet to be fully proofread.

The document is downloadable from https://www.who.int/about/what-we-do/thirteenth-general-programme-of-work-2019-2023.

It will be updated with the final version in May 2020.

Acknowledgements

[IN PROGRESS]

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Abbreviations

ASC	average service coverage
APC	alcohol per capita
CRVS	civil registration and vital statistics
EIS	event information site
EOC	emergency operation centre
EMS	event management system
GATHER	Guidelines for Accurate and Transparent Health Estimates Reporting
GBD	Global Burden of Disease
GHE	Global Health Estimates
GPW	General Programme of Work
HALE	health life expectancy
HEP	health emergencies protection
HEPI	Health Emergencies Protection Index
HIS	health information system
HPOP	healthier populations
IHR	International Health Regulations
ITN	insecticide-treated net
JEE	joint external evaluation
JRF	Joint Reporting Form (WHO/UNICEF)
MCV1	measles-containing vaccine first-dose
MS	Member State
NFP	national focal point
RDT	rapid diagnostic test
SDG	Sustainable Development Goal
SPAR	State Parties Self-assessment Annual Reporting
TFA	trans fatty acids
UHC	universal health coverage
WHS	World Health Survey
WHS+	World Health Survey Plus

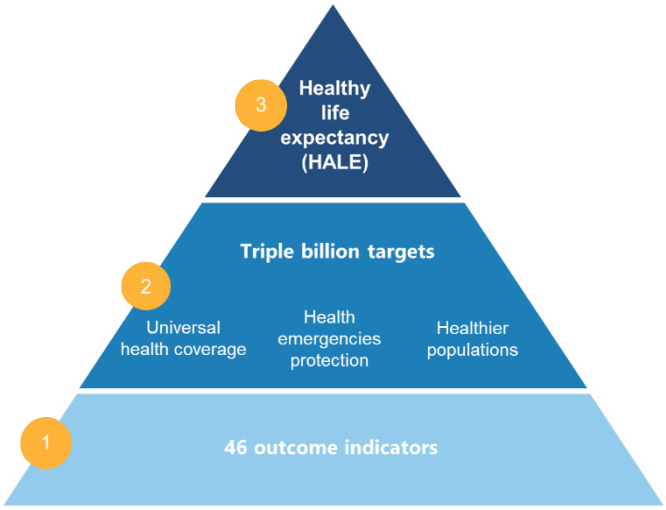
Executive summary

The purpose of this document is to describe the methods to be used to measure the impact of the World Health Organization's Thirteenth General Programme of Work, 2019–2023 (GPW13).

The ambition of the GPW13 is to improve the health of billions of people in the next five years. The WHO Impact Measurement Framework is part of GPW13. It measures progress at three levels:

1. 46 outcome indicators and their global targets for 2023, covering a range of health issues
2. The Triple Billion targets, to be achieved by 2023:
    - 1 billion more people benefiting from universal health coverage
    - 1 billion more people better protected from health emergencies
    - 1 billion more people enjoying better health and well-being.
3. Healthy life expectancy (HALE), quantifying expected years of life in good health as a measure of the overall health of populations.

Fig. 0.1 WHO Impact Measurement Framework



The Impact Measurement Framework commits to monitoring inequality and improving equity in health at all levels of the framework.

Outcome indicators

The 46 outcome indicators cover a range of key health issues and underpin the GPW13 programme. They were approved at the World Health Assembly in May 2019 (WHA72) after extensive internal and external consultation. They include 39 Sustainable Development Goal (SDG) indicators, together with seven non-SDG indicators that address priorities identified by member states, including antimicrobial resistance, polio, three additional indicators for noncommunicable diseases (hypertension, obesity, trans fats policy), and two emergencies-related indicators. The 46 outcome indicators are each associated with 2023 global targets. Indicators will be disaggregated by relevant inequality measures (such as sex, age and location).

The outcome indicator approach is flexible, allowing countries to prioritize indicators based on their national health strategy. Countries will track progress towards the 2023 target for their chosen indicators. Not every country will therefore necessarily track every indicator.

WHO will work with countries to address significant gaps in data collection. For around one-third of countries there is no recent primary or underlying data for over half of the SDG health-related indicators

(WHO, 2019g). Addressing these data gaps and supporting countries to make progress in data collection is a priority for WHO (though beyond the scope of this report).

The Triple Billions

The Triple Billion methods are the tools WHO has devised in order to package together the health-related SDGs (and additional GPW13 indicators). They provide a measurement strategy for WHO, focused on the execution and delivery of ambitious improvements in the health of the world's populations. The approach has been approved by the Member States and represents a new departure, making WHO more accountable to the people it serves.

Key reasons for counting the billions include:

- Advocating for ambitious improvement in world health
- Triggering action for impact
- Highlighting data gaps that must be addressed
- Measuring the change that results
- Making a start on increasing accountability via measurement.

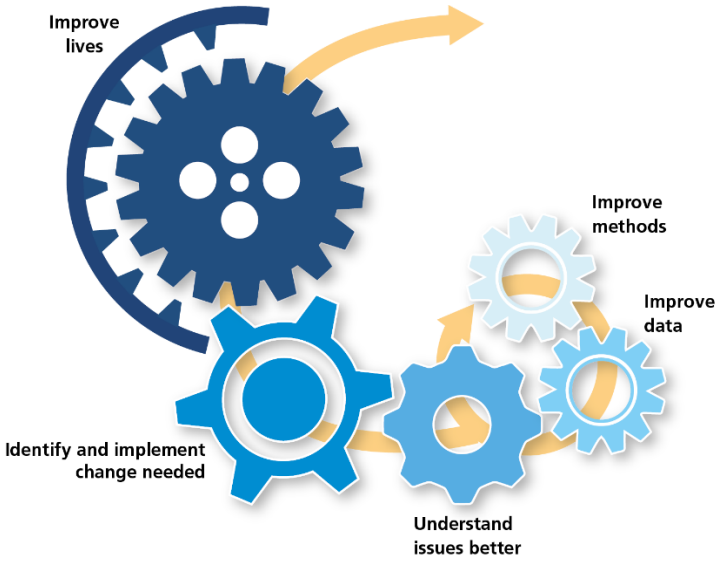
The Triple Billions are designed to attract the attention of the world in a headline-catching way that motivates change. In order to monitor country progress towards these targets, a counting scheme is required.

The choice of methods for monitoring progress towards the billions follows extensive debate and consultation with experts, regions and countries. WHO has opted to choose relatively straightforward methods for GPW13 that allow a well-defined and consistent approach to calculating each billion. This is not an exact science, and compromises are made between what is optimal and what is feasible. The GPW13 approach represents a choice, recognizing:

- the options possible in interpretation of the Triple Billions
- the focus on SDG indicators to mitigate countries' data-reporting burden
- the availability and quality of data at the country level
- the need for the method to be simple and clear in order to ensure Member State engagement and ownership
- the different country and regional contexts
- the time-frame of the GPW13 programme and the need to progress rapidly into implementation.

The focus of the Triple Billion methods has been to begin with a practical way forward; the scope to improve and refine the methods for the Triple Billions is eclipsed by the priority of taking action for impact now. The Triple Billion methods can be expected to evolve beyond GPW13, in keeping with advances in data and understanding (Fig 0.2).

Fig. 0.2 The cycle of change and impact driven by the Triple Billion targets



Each of the billions is measured using several component indicators. Understanding change at indicator level is a key component of implementation and delivery of the Triple Billions. It will be necessary to dig down into the contributing indicators to determine actions needed.

Inevitably, big countries that improve population health have the capacity to impact large numbers of people, thereby making a sizable contribution to the Triple Billion targets. However, changes in countries with small populations are just as important to secure. In line with the GPW13, which is concerned with all populations and all sizes of countries, the life of each individual person is weighted equally. Contributions to the billions will be reported as the percentage of population benefiting (independent of country size), in addition to being reported as a number.

WHO intends to support countries to to calculate their own contribution to the billions and will therefore provide simple online tools to allow countries to run calculations.

The Universal Health Coverage Billion

The Universal Health Coverage (UHC) Billion aims to ensure that an additional 1 billion people receive the quality health services they need without financial hardship. This cacluation will be based on the two components of the Sustainable Development Goal for UHC (Target 3.8):

- **Average service coverage:** using 14 tracer indicators, incorporating reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. The 14 indicators derive from SDG 3.8.1 but with an update to the health work force indicator. A nested arithmetic averaging approach is used (differing slightly from SDG 3.8.1).
- **Financial hardship:** measured using the proportion of the population that spends more than 10% of household expenditure or income on health (catastrophic spending; SDG 3.8.2).

The two elements are combined into a single measure to estimate the number of additional people with access to essential services without suffering financial hardship.

Considerable acceleration will be needed if the target of 1 billion people receiving needed health services without financial hardship is to be achieved. If current trends in average service coverage and financial hardship continue at a steady rate, around 300 million more people may benefit from access to UHC by 2023. A further 700 million people must be reached to achieve the UHC Billion.

The Health Emergencies Protection Billion

The Health Emergencies Protection (HEP) billion goal is for 1 billion more people to be better protected from health emergencies. It will be measured using an index built from three simple indicators:

- emergency prepare indicator (measuring IHR capacities)
- emergency prevent indicator (measuring routine and emergency vaccination coverage)
- emergency detect & respond indicator (measuring timeliness of emergency systems).

The emergency **prepare i**ndicator measures country preparedness for emergencies. It encapsulates the level to which a country is ready to identify and respond to a range of emergency situations. It is based on the average attainment of 13 International Health Regulation (IHR) capacities for surveillance and response, as reported using the IHR State Party Self-Assessment Annual Reporting (SPAR).

The emergency **prevent** indicator measures efforts to prevent health emergencies via vaccination coverage. Reaching high vaccination coverage in at-risk groups for vaccine-preventable infectious pathogens is a key element to tackling preventable epidemic diseases and pandemics and to the control and elimination of high-threat infectious hazards. The indicator is a weighted average of routine and campaign vaccinations for diseases linked with epidemics and pandemics. It includes:

- three priority infectious hazards: yellow fever, meningococcal meningitis and cholera – when relevant to a country
- measles, polio – to emphasize the importance of routine coverage.

The indicator can be adapted to include other mass-vaccination campaigns that are needed (e.g. pandemic influenza, Ebola virus disease, COVID-19).

The emergency **detect & respond** indicator measures whether public health emergencies are detected, notified and responded to in a timely fashion. The indicator focuses on three elements:

- time to detection
- time to notification
- time to response.

This is a new indicator of key importance for improving emergency response. Data has been gathered retrospectively from events reported to WHO under IHR regulations. Data for additional serious health emergencies will be needed for this timeliness indicator.

As with the other billions, acceleration will be needed to achieve the Health Emergencies Protection Billion. A conservative estimate based on the existing data suggests that at current rates 500 million more people will benefit by 2023. Progress needs to be doubled for this billion to be met.

The Healthier Populations Billion

The Healthier Populations Billion aims to support the world's populations to live healthier lives. The key to achieving this will be via government policies and actions that promote healthier environments and encourage healthier life choices. The index is built on the assumption that the target will primarily be met through multisectoral interventions, driven by the health sector and influenced by policy, advocacy and regulation.

The Healthier Populations Billion is constructed from 16 indicators from the GPW13 outcome indicators, covering environmental, behavioural and social/health risk factors. The indicators include clean air, safe water, sanitation and roads, tobacco and alcohol use, obesity, domestic violence (intimate partner; child), child nutrition and child development, trans fats, and mental health (suicides). All but two are SDG indicators.

Progress on each indicator is combined into the billion using a simple unweighted counting scheme, to estimate the number of additional people living healthier lives.

As with the other Triple Billion targets, considerable acceleration and improvements will be required if the Healthier Populations (HPOP) Billion is to be achieved, particularly for indicators where decreases in healthiness are anticipated. If current progress is maintained, the number of additional people leading healthier lives could be around 600 million, i.e. 400 million short of a billion. The HPOP Billion is expected to include a mix of positive contributions, whereby healthiness is improved (e.g. increased sanitation, cleaner household fuels) and negative contributions for indicators that are currently getting worse, and for which the first goal will be to halt the deterioration (e.g. in obesity, air pollution, alcohol intake).

Healthy life expectancy

Healthy life expectancy (HALE) is an indicator that provides a summary measure of average levels of population health. It quantifies the expected years of life spent in good health. HALE will be used for GPW13 baseline reporting and for monitoring progress for each Member State. HALE will facilitate cross-country comparisons, and comparisons within countries over time.

Equity

Equity in health is a cross-cutting theme of the GPW13 methods: advances in global and Member State health must not leave behind those in the greatest need. Measures of inequality will be made at all three levels of the GPW13 framework: the outcome indicators, the Triple Billion targets and HALE. Specific targets for disadvantaged groups will be used to ensure that priority subgroups benefit proportionally more from the Triple Billion targets. The key to tracking equity will be disaggregation of the 46 outcome indicators, whenever applicable, to measure within-country inequality and address the Sustainable Development Goals, leaving no one behind.

1 Introduction

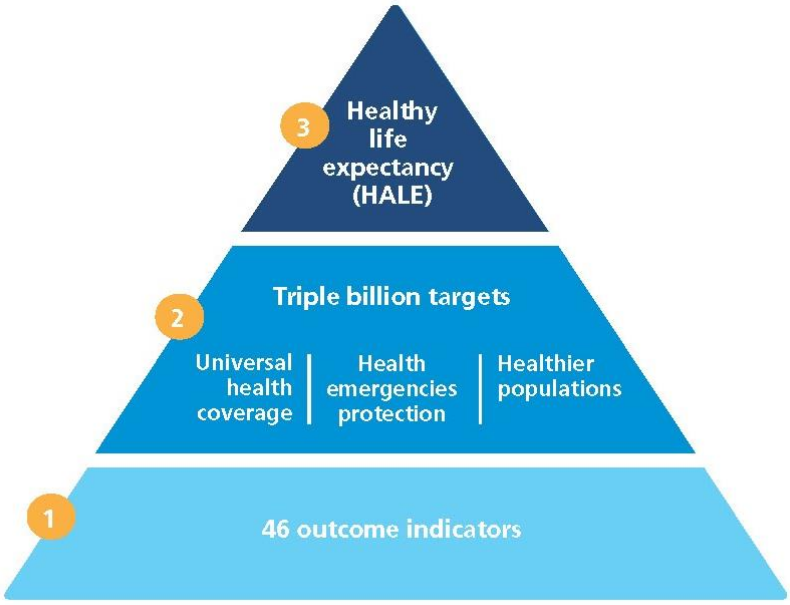
In May 2018, the World Health Assembly approved WHO's 13th General Programme of Work (GPW13) (WHO, 2018a), **which focuses on measurable health impacts for people at the country level.**

To support this, WHO has created the WHO Impact Measurement Framework, a measurement system that allows health impact to be measured accountably.

The aims of the Impact Measurement Framework are to:

- make a measurable impact on people's health at country level
- increase the likelihood that the Triple Billion targets will be met
- accelerate progress towards the Sustainable Development Goals (SDGs)
- transform how WHO works by anchoring commitments in measurable results
- provide a means of tracking the joint efforts of the Secretariat, Member States and partners
- strengthen country data and information systems for health.

Fig. 1.1 The WHO Impact Measurement Framework

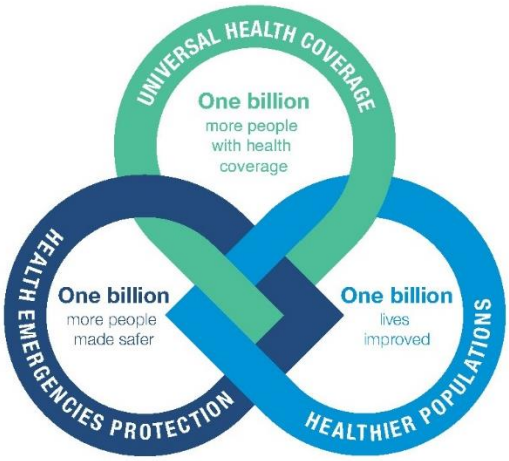


The Impact Measurement Framework measures progress on three levels:

1. **46 outcome indicators and targets** cover a range of health issues and provide a set of measurement indicators that will be used to measure the outcomes in the programme budget (39 of which are identical to SDGs).
2. The Triple Billion targets:
    - 1 billion more people benefiting from universal health coverage
    - 1 billion more people better protected from health emergencies
    - 1 billion more people enjoying better health and well-being.

The goal will be to achieve the Triple Billion targets by 2023. Each of these targets will be measured using composite indices. The Triple Billions may overlap; some people may benefit from more than one of the measures (Fig. 1.2) and may therefore be counted more than once.

Fig. 1.2 The overlapping Triple Billion goals



3. **Healthy life expectancy** (HALE) quantifies expected years of life in good health at a particular age, and can be considered a summary measure of the overall health of populations. It is used within GPW13 as an overarching and comparable measure of the impact of the Triple Billion targets.

The Impact Measurement Framework includes a cross-cutting commitment to improving equity in health. Health equity is defined as the absence of unfair and avoidable differences in health. Monitoring health inequalities, i.e. observable differences in health, is essential for achieving health equity. It allows the identification of vulnerable groups that are being left behind and provides evidence for equity-oriented decision-making to close existing gaps.

Inequalities may exist between countries and between population subgroups within a country. The GPW13 is committed to reducing inequalities both between and within countries. Inequalities will be monitored at all three levels of the framework: the 46 outcome indicators and targets, the Triple Billion targets and HALE. Importantly, within-country inequality monitoring depends on the availability of real disaggregated data.

1.1 Delivering the Triple Billions

WHO Director-General Dr Tedros Adhanom Ghebreyesus reminded WHO in 2019 that the Triple Billion targets are "about changing the DNA of the organization to deliver a measurable impact in the lives of the people we serve". The GPW13 and the Triple Billions approach will only be of value if they are tied to interventions that drive impact within countries over the next several years. The methods described here provide a roadmap to measure the Triple Billions, but the actual work of the delivery that will drive change will come from the collective expertise of WHO, partners, regions and Member States, and the global health community.

To successfully deliver tangible impact on people's lives under the GPW13, WHO will not only measure progress against the Triple Billion targets, but will also work with countries to deliver change. It will help countries shape critical decisions that enhance implementation and achieve impact. A delivery approach prioritises relentless focus on impact, setting targets and tracking progress, and problem-solving each indicator when issues arise.

1.2 Scope of this report [to be reviewed]

This document describes the current state of the methods for use in the GPW13 Impact Measurement Framework. It discusses each of the three levels of the Framework, focusing particularly on the methodology for each of the Triple Billions and how indices and component indices will be calculated. It provides example calculations and considers both the global and country level. Whilst the report details how the billions are to be calculated, there remain related aspects that are not yet defined. For example, details of

how uncertainty will be estimated and how data gaps will be infilled. Updates to this report will be issued as methods become finalised.

1.3 The consultation process [to be reviewed]

The methods for calculating the GPW13 billions have undergone extensive input and consultations within and external to WHO and at country, regional and WHO programme level.

This has included:

- creation of an advisory expert reference group and task force to advise on methods
- creation of healthier populations secretariat working group and subgroups (May 2019)
- internal consultation with WHO technical programmes (Sept 2019)
- informal review and discussions with key experts (Sept 2019)
- consultation with WHO technical programmes and regional offices on inequality monitoring (Dec 2018–Nov 2019).
- regional consultations/committees (Sep – Nov 2019)
- global technical consultation (regions, technical experts, country experts, ERG) (Oct 2019)
- creation of UHC Billion technical working group (Nov 2019)
- informal Member State consultations (Nov 2019)
- SEARO GPW13 methods meeting (Delhi, Nov 2019).

Comments have been received from programmes, regions, countries and health experts, and many of these have led to alterations to the methods and text. At the time of production of this report, the methods are being piloted in selected countries.

2 Outcome indicators

Forty-six outcome indicators and targets, covering a range of health issues, form the basis of the GPW13 calculation of the Triple Billions and will be used to measure outcomes, track targets and address inequity.

2.1 Outcome indicators

The outcome indicators cover a range of health issues and will measure the outcomes of the programme budget. They will help track and thus accelerate progress towards the SDGs. Each of the indicators will have a global target to be achieved by the end of GPW13. The outcome indicators are designed to provide a flexible approach, enabling Member States to select their own priorities. Countries will therefore be able to target their efforts according to their specific local health needs.

The outcome indicators have been developed by WHO technical programmes. They were approved by WHA27 in 2019 after extensive consultation with Member States and review by partners (WHO, 2019f). Progress on the underlying issues will provide the basis for improving global health and achieving the Triple Billions (Asma *et al.*, 2019).

Table 2.1 lists the 46 outcome indicators. The indicators have largely been selected from existing SDG indicators, with a few additional emerging health topics:

- 39 of the 46 indicators are taken from the Sustainable Development Goals (SDGs) (26 derive from SDG 3; 13 from other SDG categories)
- seven non-SDG indicators address priorities identified by Member States: antimicrobial resistance; polio; additional indicators for noncommunicable diseases (hypertension, obesity, trans fats policy); and two emergencies-related indicators (vaccine coverage for epidemics/pandemics and proportion of vulnerable people in fragile settings provided with essential health services).

Indicators will be disaggregated by key inequality dimensions (such as sex, age and location). Disaggregation dimensions and priority subgroups (e.g. vulnerable populations) will be identified globally for global-level monitoring and by member states for national-level monitoring.

2.2 Use of indicators in the Triple Billions

The outcome indicators contribute indirectly or directly to the Triple Billion targets (Table 2.1, Fig. 2.1).

The UHC Billion is based on the outcome indicators SDG 3.8.1 UHC service coverage index and SDG 3.8.2 UHC financial hardship. SDG 3.8.1 has 14 tracer indicators and six of these are either outcome indicators or are closely associated with outcome indicators. For example, tuberculosis treatment is used as an SDG 3.8.1 tracer indicator, and tuberculosis incidence rate is one of the outcome indicators.

For the Health Emergencies Protection (HEP) Billion, two of the four health emergencies outcome indicators are used in the calculation of the billion. The remaining two indicators monitor equity of emergency protection.

For the Healthier Population (HPOP) Billion, 16 component indicators are selected from the outcome indicators.

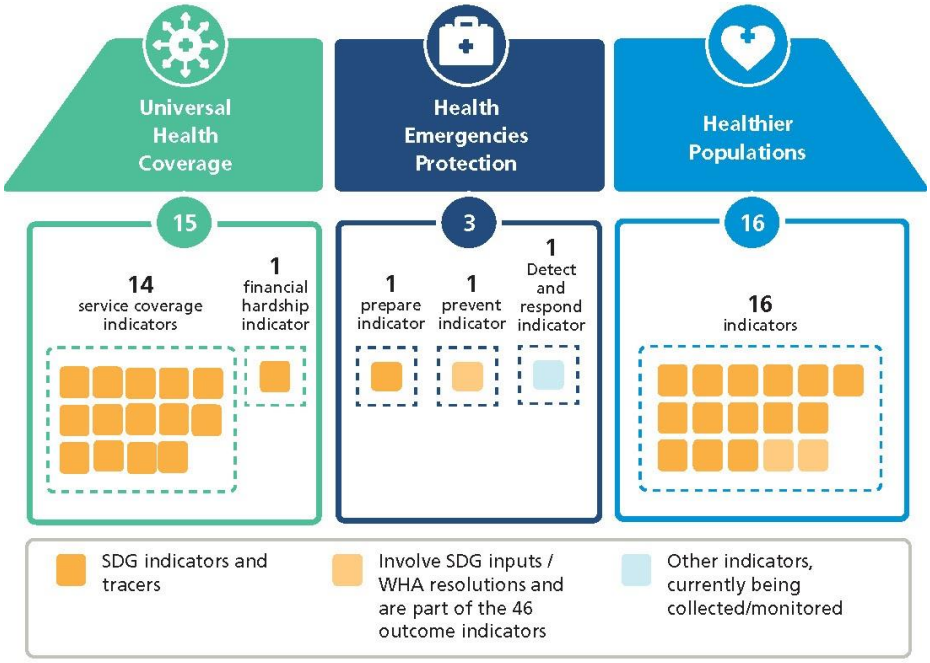
Table 2.1 Outcome indicators grouped by UHC, Health Emergencies Protection and Healthier Populations [review]

SDG//WHA indicator no.	Used in Billion measure?	Indicator
UHC INDICATOR		
SDG 1.a.2		Proportion of total government spending on essential services (education, health, and social protection)
SDG 3.1.1		Maternal mortality ratio
SDG 3.1.2		Proportion of births attended by skilled health personnel
SDG 3.2.1		Under-5 mortality rate
SDG 3.2.2		Neonatal mortality rate
SDG 3.3.1		Number of new HIV infections per 1 000 uninfected population, by sex, age, and key populations
SDG 3.3.2		Tuberculosis incidence per 100 000 population
SDG 3.3.3		Malaria incidence per 1 000 population at risk
SDG 3.3.4		Hepatitis B incidence per 100 000 population
SDG 3.3.5		Number of people requiring interventions against neglected tropical diseases
SDG 3.4.1		Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease
SDG 3.7.1		Proportion of women of reproductive age (15–49 years) who have their need for family planning satisfied with modern methods
SDG 3.8.1	UHC	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)
SDG 3.8.2	UHC	Proportion of population with large household expenditures on health as a share of total household expenditures or income for (a) >=10%* and (b) >= 25% of expenditure.
SDG 3.9.2		Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe water, sanitation and hygiene for all (WASH) services)
SDG 3.b.1		Proportion of the target population covered by all vaccines included in their national programme
SDG 3.b.3		Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis
SDG 3.c.1	UHC	Health worker density and distribution
SDG 3.d.2		Percentage of bloodstream infections due to antimicrobial resistant organisms
WHA68.7		Patterns of antibiotic consumption at national level
WHA66.10		Age-standardized prevalence of raised blood pressure among persons aged 18+ years (defined as systolic blood pressure of >140 mmHg and/or diastolic blood pressure >90 mmHg) and mean systolic blood pressure
HEALTH EMERGENCIES PROTECTION INDICATOR		
SDG 1.5.1		Number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population
SDG 3.d.1	HEP / UHC	International Health Regulations (IHR) capacity and health emergency preparedness

SDG//WHA indicator no.	Used in Billion measure?	Indicator
Health Emergencies	HEP	Vaccine coverage of at-risk groups for epidemic or pandemic prone diseases
Health Emergencies		Proportion of vulnerable people in fragile settings provided with essential health services
WHA68.3		Number of cases of poliomyelitis caused by wild poliovirus (WPV)
HEALTHIER POPULATIONS INDICATOR		
SDG 2.2.1	HPOP	Prevalence of stunting (height for age <–2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age
SDG 2.2.2	HPOP	Prevalence of malnutrition (weight for height >+2 or <–2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (wasting)
SDG 2.2.2	HPOP	Prevalence of malnutrition (weight for height >+2 or <–2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (overweight)
SDG 3.4.2	HPOP	Suicide mortality rate
SDG 3.5.1		Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance-use disorders
SDG 3.5.2	HPOP	Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol
SDG 3.6.1	HPOP	Death rate due to road traffic injuries
SDG 3.9.1		Mortality rate attributed to household and ambient air pollution
SDG 3.9.3		Mortality rate attributed to unintentional poisoning
SDG 3.a.1	HPOP / UHC	Age-standardized prevalence of current tobacco use among persons aged 15 years and older†
SDG 4.2.1	HPOP	Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex
SDG 5.2.1	HPOP	Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age
SDG 5.6.1		Proportion of women aged 15–49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care
SDG 6.1.1	HPOP	Proportion of population using safely managed drinking water services
SDG 6.2.1	HPOP	Proportion of population using (a) safely managed sanitation services* and (b) a hand-washing facility with soap and water
SDG 7.1.2	HPOP	Proportion of population with primary reliance on clean fuels and technology
SDG 11.6.2	HPOP	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)
SDG 16.2.1	HPOP	Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month
WHA66.10	HPOP	Protection of the population of a country by effective policy/regulation on industrially produced trans-fatty acids (TFA)
WHA66.10	HPOP	Prevalence of obesity for (a) ages 5–19*, (b) ages 18+*

*Note: Not all indicators are used in the billion calculations. *Used in the billion calculation. † For the HPOP billion non-age-standardized data are used. See also bit.ly/gpw13.*

Fig. 2.1 Indicators in the Triple Billion indices



2.3 Indicator availability and methods

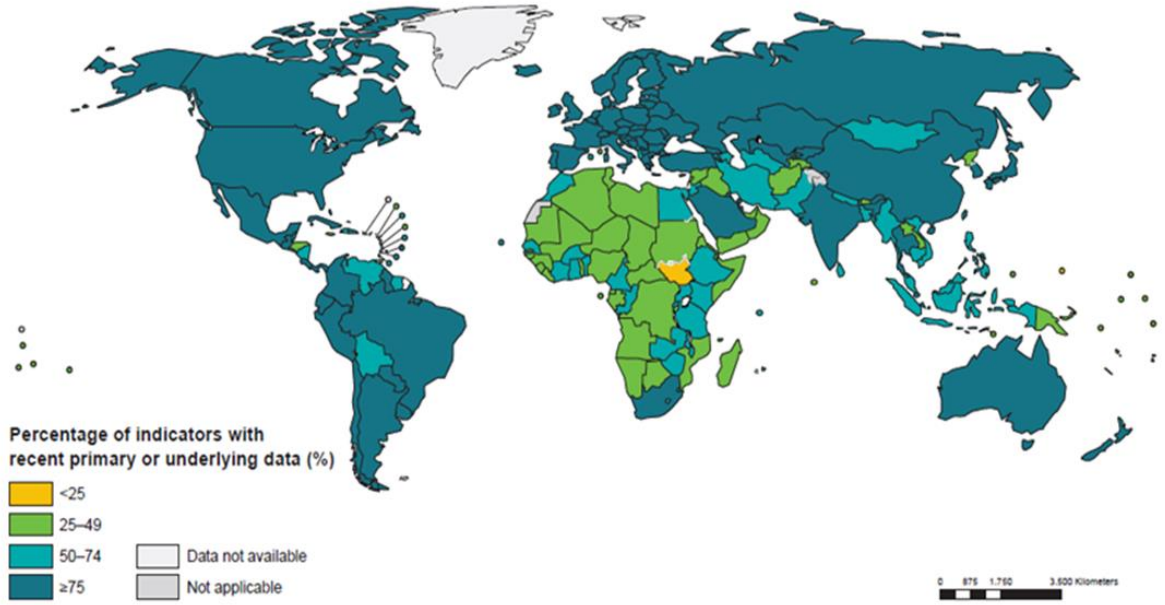
The availability of data values or estimates for the 46 outcome indicators can be found in Appendix A.2. The data are compiled from two key sources of data, for the year 2000 onwards. Data for health-related SDGs/GPW13 indicators were primarily extracted from WHO's Global Health Observatory (WHO, 2019b). In cases where data were not available from this source or where data are outside of SDG 3, data were taken from the UN Global SDG Indicators Database (UN Statistics Division, 2019). This database contains country-reported data or official estimates agreed with countries.

Three aspects of indicator availability are presented in Appendix A.2:

1. Number of countries with no data for each of the indicators, 2000–2018
2. Number of countries with at least one data point available from 2015 or later
3. Number of countries with trend data available: at least two data points, with the latest data from 2015 or later.

A key issue is that while estimates for indicators may be available, they are not always derived from recent primary data. The World Health Statistics 2019 reported that for about one-third of countries, over half of the indicators had no recent primary or underlying data (this included data on sex disaggregation; Fig. 2.2; (WHO, 2019g). One in seven indicator country values included had no underlying data since 2000. Low-income and lower-middle-income countries in particular lacked primary or underlying data. For many indicators, no recent sex-disaggregated data are available. Even though 10% of health-related SDG indicators depend directly on reliable cause-of-death data, only half of all deaths around the world are reported with a cause of death, and 30 million deaths are unreported each year, mainly in low- and middle-income countries (WHO, 2017).

Fig. 2.2 Availability of primary or underlying data for health-related SDG indicators.



Note: For about one-third of countries, there is no recent primary or underlying data for over half of the SDG indicators. Source: World Health Statistics 2019

Many of the outcome indicators and the methods for each of the Triple Billions depend on the availability of accurate cause-of-death data, household surveys, and diseases registries. The methods, data sources, frequency of data collection and other relevant information on each of the 46 outcome indicators are provided in the metadata file (WHO, 2019a). An example of the information provided for each of the indicators can be seen in Appendix A.1.

2.4 Supporting and strengthening country measurement capacity [draft]

This report focuses on the GPW13 methods – these rely on country data and country measurement systems. The measurement of the billions exposes the enormous data gaps in the existing SDG data availability seen in many parts of the world. Reliable, timely, affordable, country-owned and accessible data is needed. This includes collection of raw data and providing disaggregation to enable equity and gender analysis.

As part of the support to countries within GPW13, WHO will be working with countries to improve their data. WHO is committed to ensuring that countries with the greatest needs are supported to allow them to gather key data sets as a priority. Data gaps are to be addressed as a matter of high priority.

WHO is investing effort and working with a diverse set of partners in supporting countries to strengthen their data collection, analysis, interpretation, and to use functions without which robust measurement of the GPW13 will not be possible. A long-lasting benefit of this measurement approach will be to identify and fill gaps in measurement systems at the country level and to support countries in applying these to the monitoring and improvement of public health impact. This will also strengthen the evidence base for policy and implementation decisions.

Support for improved collaboration

WHO is working to foster better collaboration across ministries, including Ministries of Health (MoH), and National Statistics Offices (NSOs). Using data to take action is much more likely when country governments, academia, and civil society fully understand and own every step of the measurement process, including data processing and data synthesis. It will be necessary to address process gaps, e.g. where data exists but

is not accessible or has very delayed availability. Regular scrutiny of SDG data gaps can help countries identify where more consistent collaboration is needed.

An area of key concern is to be able to obtain more timely information on financial hardship. For this it is critical for MoH to collaborate more closely with NSOs in the design, analysis and scheduling of household surveys. WHO will continue to work to use and improve use of existing surveys (e.g. DHS, LSMS, Budget consumption surveys etc) and to extend collaboration with other institutions conducting surveys including the EU, World Bank and other household survey measuring agencies.

Support for improved survey data

Household surveys are an indispensable part of a comprehensive health data and surveillance systems. They are particularly suited for measurement of multiple indicators and for providing key information to understand interrelationships between indicators. Whilst in many countries the civic registration data systems and administrative data systems are fragmented and inadequate to report meaningful health data, surveys can be implemented rapidly to collect representative data related to important health, social and economic topics.

WHO is committed to supporting countries in primary data collection through a new survey programme, the World Health Survey Plus (WHS+). Working with partners, the WHS+ is envisaged as a multi-topic, mult-iplatform, multi-mode exercise to generate data from community-dwelling populations where they are lacking. It will also fill critical data gaps in key areas of public health importance to track progress on the GPW13 and SDGs. It will improve equity analyses and ensure we "leave no one behind".

The World Health Survey+ will also be used to collect jointly measure data on financial hardship and service coverage, which will help to better understand the joint distribution of the indicators. A recent household survey in Tunisia provided joint data on service coverage and financial hardship at household level (Statistiques Tunisie, 2018). WHO plans to implement similar surveys, extending this to several more countries. These will help provide an accurate picture of the reality of UHC.

Support for improved country ownership

Real country ownership will happen when national data systems are strengthened for data generation, analysis, and use, as well as when clear standards for each step of GRSDG monitoring are established. WHO intends to provide precise guidance on the processing of data that covers all key sources of bias. WHO and other partners can support countries to develop their analytical skills and infrastructure.

Support for review and assessment of existing data sources

WHO carried out an extensive review of strengths and weaknesses and identified gaps in health information systems in countries using the SCORE technical package (WHO, 2019d). Setting up routines in which SDG data and gaps are reviewed and scrutinised helps solidify the importance of the data for countries so they can make results-based decisions.

Support for country data systems [incomplete]

Strengthening of data systems for health in countries is a core requirement for progress. This includes establishing and improving health information systems (HIS) and working to gather and improve the quality of civil registration and vital statistics (CRVS) data.

2.5 Equity for outcome indicators

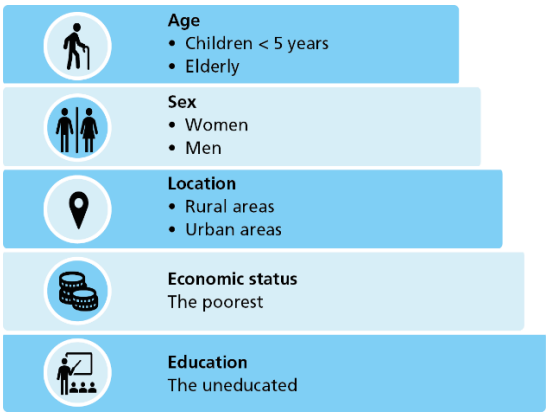
A key objective of the 46 outcome indicators and targets is to proportionally benefit priority population subgroups and reduce within-country inequalities, i.e. differences in health that exist between population subgroups within a country.

To monitor within-country inequalities:

- Each outcome indicator will be disaggregated by at least one key dimension of inequality (Fig. 2.3).
- For each outcome indicator and inequality dimension, at least one priority subgroup will be identified.

The situation in the priority subgroup(s) will be monitored alongside the national average to show how the priority subgroups are performing compared to the population overall. Equity milestones may be identified for the priority subgroups to ensure accelerated gains in health for these subgroups and an overall reduction of inequalities.

Fig. 2.3 Example of dimensions of inequality and priority subgroups



Within-country inequalities will be monitored at global, regional, national and subnational levels. Appendix G describes the methods employed for global-level monitoring. Similar methods may be used for monitoring at regional, national and subnational level, with consideration given to the specific context and priorities within different WHO regions and Member States. Fig. 2.4 illustrates the process of implementing inequality monitoring for outcome indicators at regional, national and subnational levels.

Fig. 2.4 Implementation of inequality monitoring at regional, national and subnational levels



When selecting inequality dimensions and priority subgroups, the following should be taken into consideration.

Health indicators

Disaggregation may not be possible for all indicators. Some indicators may only be monitored at the national level. For example, indicator SDG 1.a.2 "Proportion of total government spending on essential services (education, health and social protection)" is a national-level indicator that cannot be disaggregated.

Disaggregation may already be an inherent part of some indicators. For example, by definition indicator SDG 3.3.1 "Number of new HIV infections per 1000 uninfected population, by sex, age and key populations" should be disaggregated by sex, age and key populations. In this case, indicators should be disaggregated by the pre-defined dimensions and for each pre-defined dimension a priority subgroup should be identified. Additional inequality dimensions and priority subgroups can be selected.

Inequality dimensions

Different indicators may be disaggregated by different dimensions of inequality, depending on which dimension is the most relevant to the selected indicator. For example, for indicator SDG 3.6.1 "Death rate due to road traffic injuries", place of residence (urban/rural) may be the most important inequality dimension, while for indicator SDG 3.7.1 "Proportion of women of reproductive age (aged 15–49 years) who have their need for family planning satisfied with modern methods" disaggregation by age may be most relevant.

For the same indicator, different regions/countries/subnational regions may select different inequality dimensions, depending on their context and priorities. For example, for the same indicator, disaggregation by ethnicity/race may be most relevant in countries from the WHO Region of the Americas, while disaggregation by migration status may be most important in countries from the WHO European Region.

Double disaggregation may be considered for some indicators in order to assess intersections between two different inequality dimensions. For example, for indicator SDG 3.3.2 "Tuberculosis incidence per 100 000 population" it may be important to disaggregate simultaneously by age and sex.

Indicators should be disaggregated by sex, wherever relevant and possible.

Priority subgroups

For each indicator and inequality dimension, at least one priority subgroup should be identified. The priority subgroup is typically the most disadvantaged or most vulnerable subgroup, or the subgroup with the highest burden. For example, for most indicators disaggregated by economic status, the poorest quintile is the priority subgroup.

For the same inequality dimension, the priority subgroup may be different for different indicators. For example, while for most indicators disaggregated by economic status, the poorest quintile is the priority subgroup, the richest quintile may be the priority subgroup for some indicators, such as indicator SDG 2.2.2 Prevalence of malnutrition (weight for height >+2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (overweight).

Where more than one priority subgroup can be identified, a top-priority group should be identified for the purpose of monitoring. For example, for indicator WHA67.25/WHA68.7 Percentage of bloodstream infections due to antimicrobial resistant organisms, disaggregated by age, both children <5 years and elderly people ≥65 years may be priority subgroups, but for the purpose of monitoring, children <5 years may be selected as the top-priority subgroup.

3 Triple Billions concept

The ambition of the GPW13 is to improve the health of billions of people in the next five years. Within this, the Triple Billions approach provides a measurement strategy for WHO, with a focus on the execution and delivery of ambitious improvements in the health of the world's populations.

The Triple Billions approach has been approved by the Member States and represents a new departure for WHO, making WHO more accountable to its people. The Triple Billions described in this report are tied specifically to the GPW13 programme and its indicators. They are primarily based on SDG data, respecting the wishes of countries to minimize the burden of any additional data collection.

This chapter introduces general concepts that are common to each of the Triple Billions. Details of the specific methods for each billion are provided in the subsequent chapters.

3.1 Why count the Triple Billions?

The Triple Billion methods are the tools that WHO has chosen to measure health-related change resulting from interventions and improvements. The Triple Billions provide easily graspable concepts and goals that are designed to attract the attention of the world in a simplified headline-catching way that motivates change. The Triple Billions package together the health-related SDGs (and additional GPW13 indicators) in a way that aims to encourage acceleration of country-level implementation strategies to achieve maximum impact. At the same time, they uncover gaps in data availability, frequency and quality that must be addressed.

Key reasons for counting the billions include:

- Advocating for ambitious improvement in world health
- Triggering action for impact
- Highlighting data gaps that must be addressed
- Measuring the change that results
- Making a start on increasing accountability via measurement.

3.2 How to count the Triple Billions?

The choice of the methods used to count each billion follows extensive debate and consultation (Section 1.3; Appendix C.7). It incorporates suggestions of experts and the comments and requirements of countries.

There are many ways in which the Triple Billions could be estimated and achieved – this is not an exact science. There must be a compromise between optimal and feasible, based on the current framework and the available data resources. The key is for the methods to drive impact in the right direction, giving prominence to each element.

WHO has opted for relatively straightforward methods for GPW13 that allow a well-defined and consistent approach to counting each billion, recognizing:

- the options possible in interpretation of the Triple Billions
- the focus on SDG indicators to mitigate countries' data-reporting burden
- the availability and quality of data at the country level
- the need for the method to be simple and clear in order to ensure Member State engagement and ownership

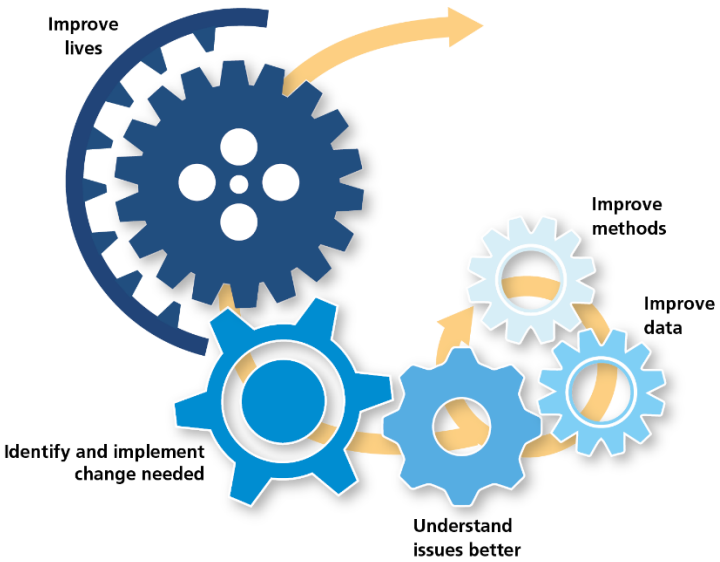
- the different country and regional contexts
- the time-frame of the GPW13 programme and the need to progress rapidly into implementation.

This is in alignment with the SDG philosophy. The focus has been to begin with a practical way forward, avoiding complexities where possible, that enables action for accelerated impact.

3.3 The Triple Billions drive a cycle of change

Measurement of each of the Triple Billions is intertwined with the tasks of improving data and improving understanding. The process of measurement exposes gaps in data, encourages the gathering of better data and promotes better understanding; this, in turn, feeds future possibilities for measurement. Thus, measurement sets up a cycle of change with the potential to drive progress. Progress in measurement allows clearer choices to be made, more precise actions to be undertaken and more lives to be improved (Fig. 3.1). Countries will continue to work to understand issues and to identify ways forward to increase impact and improve people's lives in tangible ways. Counting the Triple Billions will encourage a series of positive changes through which we can hope to see accelerated improvements to the health of the world's people.

Fig. 3.1 The cycle of change and impact driven by the Triple Billions



Triple Billion methods can be expected to evolve beyond GPW13, in keeping with advances in data and understanding.

Note that the billions are each built from several indicators. Understanding change at indicator level is a key component of implementation and delivery of the Triple Billions. It will be necessary to dig down into the contributing indicators to determine actions needed.

3.4 Big and small countries are equally important

GPW13 is concerned with all populations and all sizes of countries. Inevitably, big countries that improve population health have the capacity to contribute large numbers of people to the Triple Billion targets. However, changes in countries with small populations are just as important to secure. Contributions to the Triple Billions will be reported at country level both as percentage of population and as the total number of people. The contribution to the billion expressed as % of population is independent of country size: the life of each individual person is weighted equally.

3.5 Interpreting the Triple Billions as populations

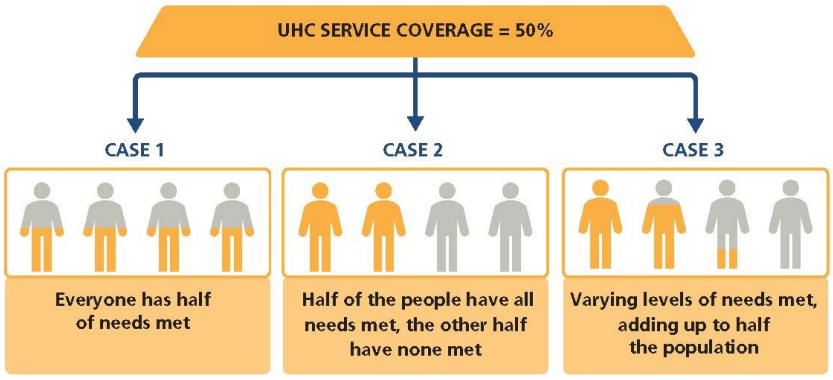
The Triple Billions are counted at a population level and not at an individual level.

In a number of instances, it is necessary to count an equivalent population. Consider, for example, the service coverage component of the UHC billion. If UHC service coverage is 50%, this means that 50% of UHC services were delivered at the population level. However, the service coverage value does not distinguish between the following cases (Fig. 3.2):

1. All people have half (50%) of the services they need.
2. 50% of people have all services they need; the rest have no coverage.
3. A mix of service coverage levels that average to 50% at the population level.

In reality, UHC will be distributed unevenly across the population (case 3) and yet the goal is for this to be equitable (case 1). However, for the purposes of counting the Triple Billions, case 2 is the most useful. A UHC service coverage of 50% can be considered **equivalent** to 50% of people having 100% of services (Fig. 3.2). The contributions to the UHC Billion will count change in the **equivalent population**. This means that a 10% change in UHC service coverage, even if equitably distributed, would be counted as being **equivalent** to 10% of people being 100% better off in terms of service coverage (for the UHC Billion, financial hardship will also be factored into the final count).

Fig. 3.2 Understanding equivalent population, as illustrated by UHC service coverage



A similar perspective is required for components of the other billions (e.g., to convert changes in preparedness into a population for the Health Emergencies Protection Billion and changes in air quality for the Healthier Populations Billion). Equity remains a key goal and although equity is not directly monitored in the measurement of the Triple Billions, it will be tracked though the individual indicators.

3.6 Handling population growth

The Triple Billions must count lives that benefit from interventions, and not just additional lives due to population growth. To avoid complexities linked to population growth, the final country population (2023; UN population estimate) will be used in the Triple Billion calculations. Typically, the number of people benefiting will be estimated by multiplying the final 2023 population by the estimated 5-year change in the indices or indicators. For example, if use of tobacco has declined by 2% over 5 years in a country, then this would be interpreted as 2% of the 2023 population being additionally free from tobacco use.

The approach provides a robust method of calculation and avoids complexity. Alternative and more general forms of handling population growth were considered but are not recommended for use in the Triple Billions (see also Appendix B.1).

3.7 Identifying country shares of the Triple Billions

For GPW13, countries select their own priorities and targets within the overall global goal of achieving the Triple Billion targets by 2023. During consultations, some countries posed the following question to WHO: What is my "expected" contribution to each of the Triple Billions?", i.e. what would my contribution be if the global effort was shared out "fairly"?

For each billion, all countries are encouraged to make progress, irrespective of population size, baseline performance or economic status. It is also important to work to reduce inequalities by closing the gap between countries. Progress will ideally be shared out evenly, in proportion to (a) the population of each country and (b) the gap between current and ideal status within a country. So, for example, the benchmark could be for all countries to reduce their gap by a guideline percentage, which would encourage faster progress for less advantaged countries. This supports increased equity in the world and respects the situation that there may be less scope for improvement for some high-income countries (e.g. if access to health services is already high).

In line with these principles, guideline country contributions to each billion can be produced. These are not binding, but instead offer countries a benchmark to help guide plans. Country contribution benchmarks will additionally help countries and the global community understand if we are collectively on track to reach the Triple Billion targets by 2023, will help countries prioritize interventions, and will make change in all countries equally important, regardless of their size.

WHO will produce and share the calculations of country contributions to the Triple Billions. It will additionally provide simple online tools or software that can be used by countries wishing to carry out their own calculations. This will allow countries to rerun calculations with their own values and priorities, and to answer, "what if?" type questions (e.g. how would halving tobacco use change my contribution to the billion?). WHO is creating billion dashboards that will support planning and implementation. For global reports, the Triple Billions will be calculated by WHO to ensure a standardized approach.

3.8 Planned refinements to the Triple Billion methods

This report details the calculation methods that will be used to estimate each of the Triple Billions. However, there are important components of the calculations that will need to be refined. These include methods for projection or extrapolation of data (since there is typically a significant time lag for data to become available and this will make calculation of change by 2023 a challenge). It is intended that estimates of uncertainty will be calculated for each of the billions (in keeping with adherence to GATHER guidelines; (Stevens *et al.*, 2016). The approach to handling uncertainty is not yet determined.

3.9 Equity for the Triple Billion targets

Equity for the Triple Billion targets will be assessed by examining inequalities between countries, by comparing the situation in low-income countries with the global average, for example. Ideally, the situation should be improving faster in low-income countries, which will close existing gaps and reduce between-country health inequities.

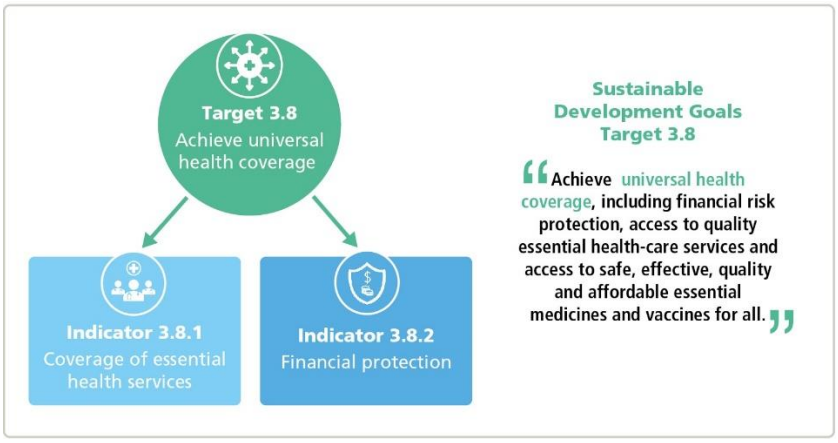
4 Universal Health Coverage Billion

The Universal Health Coverage (UHC) Billion aims to ensure that an additional 1 billion people receive the quality health services they need without financial hardship.

Universal health coverage (UHC) is a part of the Sustainable Development Goals (Target 3.8) and the UHC Billion will be based on SDG 3.8. and its two pillars (Fig. 4.1). It will use two components:

- **Average service coverage:** using 14 tracer indicators, incorporating reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. The 14 indicators derive from SDG 3.8.1 but with an update to the health worker force indicator. A nested arithmetic averaging approach is used (differing slightly from SDG 3.8.1).
- **Financial hardship:** measured using the proportion of the population that spends more than 10% of household expenditure or income on health (catastrophic spending; SDG 3.8.2).

Fig. 4.1 Universal health coverage within the Sustainable Development Goals



Each of these components is vital in their own right for monitoring and informing purposeful action. The two dimensions respond to different policy levers. They will be tracked separately and will individually inform choices made to drive progress and help reach the UHC Billion goal.

Measuring UHC is not an easy task and remains a challenge for global health metrics, particularly the issue of understanding the relationships between service coverage, financial hardship and population. For the UHC Billion, the aim is to make the best use of existing SDG methods and data to count the billion.

Movement toward UHC requires people to get the services they need without suffering financial hardship. To calculate the UHC Billion, the two elements are combined into a single measure to estimate the number of additional people with access to essential services without suffering financial hardship. The approach has some serious limitations that are important to understand (Section 4.4; Appendix C.5).

4.1 UHC average service coverage for the UHC Billion

The average service coverage (ASC) component of the UHC Billion estimates the average proportion of essential services that are provided to a population. The average service coverage is adapted from the SDG 3.8.1 UHC service coverage index.

4.1.1 Background to SDG 3.8.1 Service Coverage Index

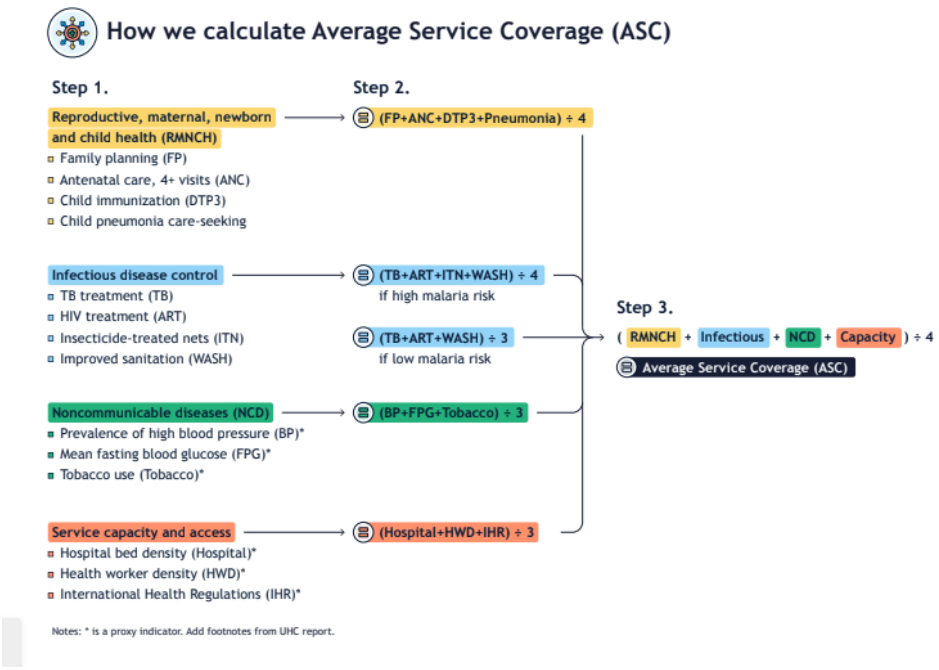
The SDG 3.8.1 UHC service coverage index provides an index of coverage of essential health services (WHO & World Bank, 2017; Hogan *et al.*, 2018; WHO, 2019c). It measures the coverage of tracer indicators in four essential health service areas: reproductive, maternal, newborn, and child health; infectious diseases; noncommunicable diseases; and service capacity and access. It is constructed from geometric means of the 14 tracer indicators – first within each of the four areas, and then across the four category-specific means to obtain the final summary index. The 14 indicators are not meant as a complete or exhaustive list of health services and interventions covered in a given country's UHC programmes, nor do they measure the health impact of these services. However, they provide a strong signal of the coverage of health services needed by most populations across sociodemographic settings. The 14 indicators include eight direct measures of service coverage and six measures that are proxies for service coverage (some of which are rescaled; Appendix C.1). The resulting index is a performance metric (scaled from 0 to 100).

4.1.2 Average service coverage calculation

The average service coverage (ASC) component of the UHC Billion uses the indicators and method of SDG 3.8.1 as its basis, with some important alterations.

ASC is estimated as the nested arithmetic average over 14 tracer indicators (Fig. 4.2; Appendix C.1). Indicators are averaged within each of four categories, and then across these categories.

Fig. 4.2 Calculating Average Service Coverage for the UHC Billion [update]



**Indicator rescaling is slightly adjusted (relative to SDG 3.8.); ⁺Indicator has been adjusted from SDG 3.8.1 – was Physicians, Psychiatrists and Surgeons. 'Countries with high risk of malaria refers to countries with moderate to high transmission in Sub-Saharan Africa where LLIN is the core vector control intervention and where all populations at risk are provided with the intervention. See also Appendix C.1.*

The key adaptation in using ASC is the use of arithmetic averaging in place of geometric averaging. Arithmetic averaging makes conversion to a population more plausible (see Appendix C.2). It is needed because the geometric averaging used in the SDG 3.8.1 index means that, by design, it is not a directly scalable measure of service coverage (e.g. if it were to increase by 20% this would not mean that services had increased by 20%). Arithmetic averaging also avoids issues of the geometric mean that occur when one or two indicators have values that are very different from the rest.

Nested averaging is maintained, following the SDG 3.8.1/UHC report methods. It provides an even weighting between the four categories of coverage. It means that different indicators have different weightings in the average, but that the balance between the categories does not change (e.g. when comparing countries with and without relevant data on use of insecticide-treated nets (ITN) for the malaria indicator).

Two further refinements to the use of the SDG 3.8.1 tracer indicators are included for GPW13 (Table 4.1, Appendix C.1). These are an adjusted rescaling of the tobacco indicator to ensure that improvements in all countries can be recognized, and an improvement to the health work force indicator to measure doctors, nurses and midwives, which allows better use of recent SDG datasets on health work forces (see Appendix C.1 for details).

Note that the adjustments made here are intended for use in the GPW13 calculations only. The UHC SDG 3.8.1 index and its tracers remain unchanged.

Table 4.1Adapting SDG 3.8.1 for use in GPW13 Billion

	SDG 3.8.1	GPW13	Reason
Averaging	Nested geometric	Nested arithmetic	Allows conversion to population
			Avoids issues that occur with zero values or when one indicator value is very different to the rest (Appendix C.2)
Indicators	14 tracer indicators	14 tracer indicators:	Uses improved SDG data for HWF
		Tobacco use and health work force are adjusted relative to SDG 3.8.1	Ensures progress in tobacco is included for all countries

4.2 UHC financial hardship

For the UHC Billion, financial hardship will be measured using SDG 3.8.2. In the following paragraphs, the term financial hardship will indicate financial hardship as measured by the SDG 3.8.2 measure of catastrophic spending with a 10% threshold, i.e. the proportion of the population with out-of-pocket health spending exceeding 10% of household total consumption expenditure or income.

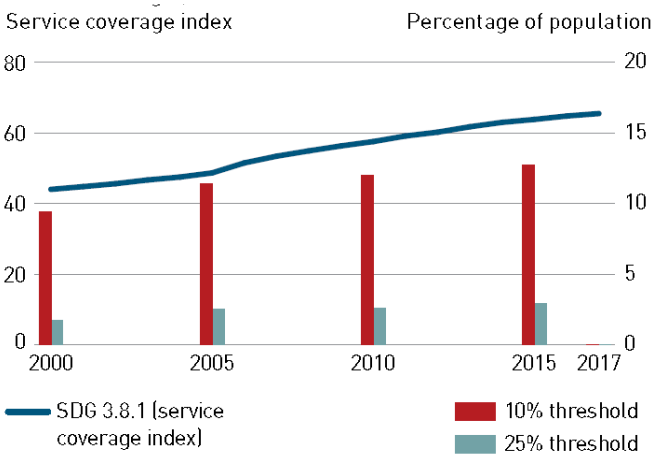
A final objective of well-performing health systems is to protect people from the negative consequences out-of-pocket health payments can have on people's living standard and ability to spend on other needs. Financial hardship in paying for health services out-of-pocket refers to those negative consequences, and its avoidance is a fundamental part of UHC. It is important to include such objectives in the UHC billion measurement. Financial hardship due to spending on health occurs in two settings: when households spend a large share of their ability to pay on health services out-of-pocket (catastrophic payments) or when payment for health services pushes the household below or further below the poverty line (impoverishing payments). The SDG 3.8.2 indicator has two thresholds for catastrophic spending: 10% and 25%; the 25% benchmark represents a very high bar, particularly for those who are poorest.

Alternative definitions of catastrophic health spending exist which account for the poor having a lower capacity to pay for the services they need and are better suited to tracking socio-economic inequalities in catastrophic health spending. Hence, many WHO regions use several indicators to track catastrophic health spending (WHO, 2019c). These other indicators are more appropriate for use in the future. All indicators of catastrophic health spending rely on the same data source.

Over 900 million people are estimated to incur catastrophic health spending as tracked by SDG indicator 3.8.2 at the 10% threshold; over time the incidence of global catastrophic spending is getting worse

(Fig. 4.3) (WHO, 2019c). An important WHO goal is to stop the rise in the percentage of people suffering financial hardship in accessing health services. This will be tracked over time, within and across countries.

Fig. 4.3 Globally catastrophic spending is getting worse whilst SDG 3.8.1 service coverage has improved [redraw]



Source: (WHO, 2019c)

There is currently a lack of recent survey data to monitor financial hardship. Without such data it may not be possible to calculate the impact of financial hardship in country contributions to the UHC Billion, or it may be necessary to assume unchanged financial hardship (Appendix C.3). For example, for catastrophic spending as tracked by SDG 3.8.2 indicator, there is no data value from 2012 onwards for around 45% of the world's populations (WHO, 2019c). This lack of timely information results from:

- the varied frequency of data collection by relevant surveys (from annual in many high-income countries to once in a decade in some low-income countries, with an average of 2.5 years between surveys)
- lack of timely access to surveys conducted outside the health information system
- difference in access to the surveys at global, regional and country levels
- failure to institutionalize production of health-related indicators as part of the routine information system when there is limited involvement of Ministries of Health in the design, development and collection of relevant surveys.

Supporting countries to better engage with National Statistical Offices, and to plan, produce and disseminate data on financial hardship using various definitions will be an important part of improving and measuring UHC during GPW13.

4.3 Calculating the UHC Billion

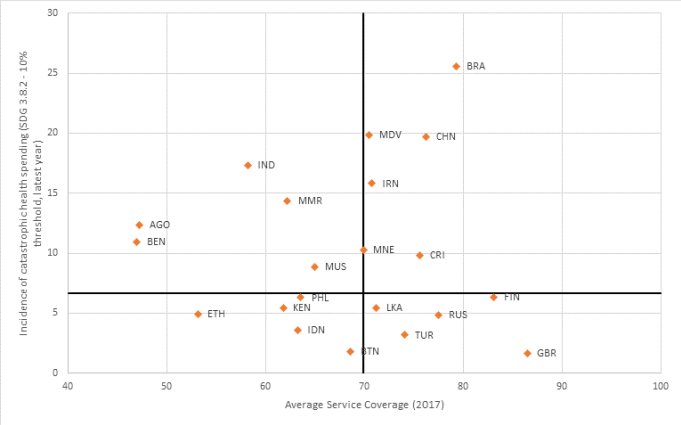
The UHC Billion estimates improvements at the population level, combining service coverage and financial hardship to estimate the change in the proportion of needed services that are provided without suffering hardship. The change is then counted into the UHC Billion using a population equivalence (see Section 3.5).

4.3.1 UHC requires service coverage without financial hardship

UHC requires people to get the services they need without suffering financial hardship. To have maximum impact and achieve the Billion, countries will need to focus on both UHC components and track their evolution over time.

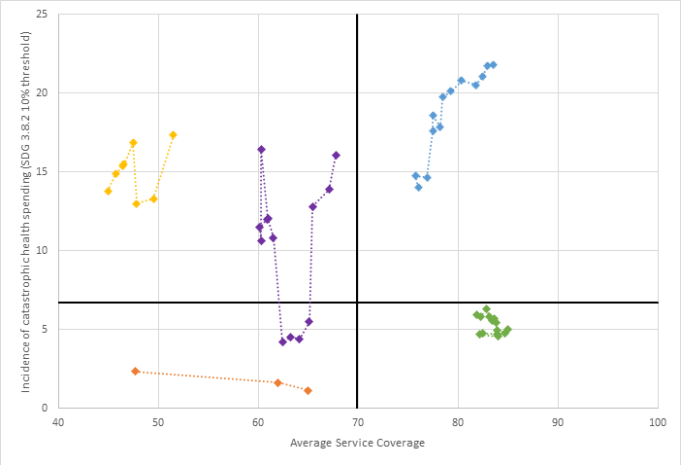
Globally, service coverage is generally improving, but financial hardship (SDG 3.8.2) has worsened (Fig. 4.3). At present countries are at different stages in terms of service coverage and financial hardship, and these can evolve in very different ways over time (Fig. 4.4; Fig. 4.5) (WHO, 2019c).

Fig. 4.4 Illustration for selected countries showing they are at different stages of service coverage and financial hardship [redraw]



Note: Quadrants are divided by the median value of each indicator at the global level (based on a sample of 146 countries). Financial hardship axis shows the catastrophic spending at 10% level for the latest available year.
Source: UN SD January 2019 and provisional ASC data.

Fig. 4.5 Example of evolution of service coverage and financial hardship at country level [redraw]



Note: Financial hardship axis shows incidence of catastrophic spending at the 10% level. In some locations service coverage has improved, but financial hardship has worsened. In others, low levels of service coverage have improved without increased financial hardship. Countries were chosen to show evolution across quadrants or within quadrant to demonstrate all countries can make some progress. Quadrants are divided by the global median values for ASC in 2017 and latest available year for financial hardship.
Source: WHO–World Bank as of January 2019 and provisional data on ASC.

4.3.2 Combining service coverage and financial hardship for the UHC Billion

To count the UHC Billion, the two components of UHC are combined into a single measure. The single measure is a first step towards estimating UHC on both metrics (see also Sections 4.4, 4.5 and Appendix C.5).

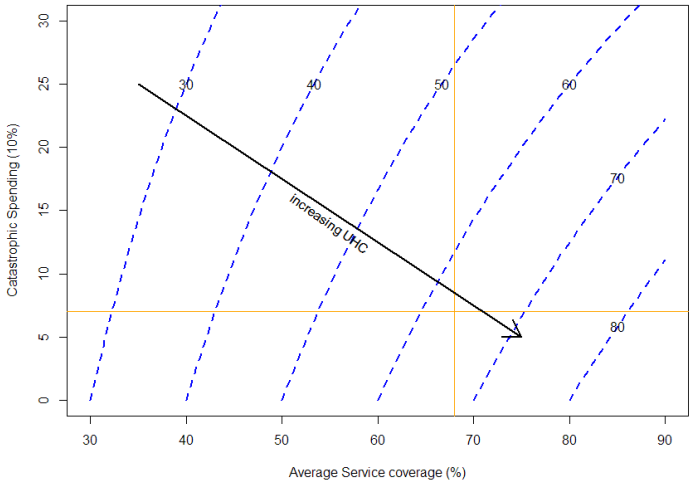
The UHC single measure (UHC_{sm}) estimates the proportion of services received without incurring financial hardship (catastrophic health spending):

$$UHC\ single\ measure\ (UHC_{sm}) = UHC\ essential\ service\ coverage\ without\ financial\ hardship$$
$$= ASC * (1 - financial\ hardship)$$

Here, average service coverage (*ASC*) is the nested arithmetic average service coverage derived from SDG 3.8.1, and financial hardship is measured by the proportion of population with catastrophic spending on health at the 10% level (SDG 3.8.2; Section 4.2).

The UHC single measure links service coverage and financial hardship as shown in Fig. 4.6. UHC will improve if either service coverage increases (with no change in financial hardship) or financial hardship reduces (with no change in service coverage) or if both these changes take place together. However, if service coverage increases but financial hardship worsens, then the two measures are acting in opposing directions: the contribution to the UHC Billion will be reduced and may even be negative. The single measure thus considers both aspects of UHC together and emphasizes the importance of progress in both dimensions.

Fig. 4.6 Combining average service coverage and financial hardship into a single measure [redraw]



Note: Blue contours show the single measure used to count the billion. The higher the value the better the UHC.

In the UHC single measure, the basis for combining service coverage and financial hardship into the UHC Billion is a proportional approach. The proportional approach estimates the proportion of services that are received without financial hardship (Fig. 4.7). For the UHC single measure to equal 100%, a population must receive all the health services they need and experience no financial hardship. If service coverage is 60% and there is no financial hardship, then UHC_{sm} will also be 60%. The greater the proportion of the population with catastrophic health spending then the lower the percentage of the population counted into the UHC Billion. For example, if service coverage is 60% and catastrophic health spending is 12% then:

$$UHC_{sm} = 60 * (1 - 0.12) = 53\%$$

In other words, under the assumption of independence, it is assumed 12% of the services received at population level were a source of financial hardship (and are not counted towards the UHC Billion).

Fig. 4.7 Understanding how service coverage and financial hardship are combined into the UHC single measure used in the billion [redraw]



The approach recognizes that people can incur financial hardship due to health spending even if they receive only some of the services and products they need. It relies on a simplifying assumption that catastrophic health spending is independent of (i.e. not correlated with) service coverage (see Section 4.4). This assumption is unlikely to be completely correct but provides a first step given the current lack of data.

Calculating contributions to the UHC Billion

The change in UHC over the GPW13 period will be estimated as

$$Change\ in\ UHC_{sm} = \quad (UHC_{sm-2023} - UHC_{sm-2018})$$

To convert this into a number of people for contributions to the UHC Billion, the change in the UHC single measure is multiplied by the final population.

$$Contribution\ to\ UHC\ billion = Change\ in\ UHC_{sm}\ x\ population_{2023} \quad /100$$

This approach handles population growth as described in Section 3.6 and makes the UHC Billion robust to its effects.

4.3.3 Example country calculation for UHC Billion

This section presents a hypothetical country calculation of how change in UHC service coverage and financial hardship contribute to the UHC Billion. The estimation of the contribution to the UHC Billion proceeds by:

Step 1: calculating average service coverage (ASC) from the SDG 3.8.1 tracer indicators
Step 2: combining this with financial hardship to determine the change in the UHC single measure
Step 3: combining this with population as a contribution to the UHC Billion.

Step 1: Calculating arithmetic average service coverage (ASC)

Table 4.2 shows an example of the calculation of average service coverage for the start and end of a 5-year period, calculated as the nested arithmetic average across each category and its indicators in each year. In this example, it increases from 0.48 to 0.53 over 5 years.

Step 2: Calculating UHC for the billion

The proportion of services provided to the population without financial hardship is calculated by combining the ASC and financial hardship (Table 4.2).

Table 4.2 Example country calculation for the UHC Billion

Indicator	2018	Average	2023	Average
Family planning	0.54		0.61	
Antenatal care (4+ visits)	0.32		0.32	
3 of diphtheria-tetanus-pertussis	0.62		0.73	
Child pneumonia care-seeking	0.28	0.44	0.31	0.49
TB treatment	0.45		0.64	
HIV treatment (ART)	0.6		0.61	
Bed nets (ITNs)	0.38		0.45	
Improved sanitation	0.06	0.37	0.07	0.44
***Prevalence normal blood pressure**	0.41		0.58	
***Mean fasting blood glucose**	1.0		1.0	
***Tobacco use**	0.92	0.78	0.93	0.84
***Hospital bed density**	0.15		0.18	
***Health worker density**	0.04		0.05	
***International Health Regulations**	0.77	0.32	0.79	0.34
Average service coverage		**0.48**		**0.53**
Financial hardship (catastrophic >10%)		**0.08**		**0.05**
UHC single measure	0.48 * (1-0.08) =	**0.44**	0.53 * (1-0.05) =	**0.50**
Change in UHC single measure		–		**0.06**

**Proxy indicators. Figures are rounded to two decimal places.*

Step 3: Contribution to the UHC Billion

The calculation of the contribution to the UHC Billion combines the change in UHC with the final population. For the historical 5-year period 2012 to 2017, this works as follows:

Improvement in service coverage	0.05
Improvement in catastrophic health spending	0.03
Change in UHC	0.06
Population 2017 (millions)	106

Additional population (equivalent) with improved service coverage (millions)	106 x 0.05 = 5.3 million
Additional population without catastrophic health spending (millions)	106 x 0.03 = 3.2 million
Contribution to UHC Billion (millions)	106 x 0.06 = 6.4 million

Note that the contribution to the billion is not the direct sum of the separate changes due to service coverage or improved financial hardship.

4.3.4 Identifying country shares of the UHC Billion

The UHC Billion will be achieved as the result of action across the globe. As with each of the other Triple Billions, all countries are encouraged to make progress – there is always room for improvement. At the same time, in the quest for better equality in the world, it is right that those countries with lowest UHC are given the support and encouragement needed to work towards closing the existing global gap.

The benchmark contributions of each country to the UHC Billion will be to share out the billion target in proportion to the population and to the gap in UHC. Countries will be encouraged to reduce their own gap by a suggested guideline percentage (see also Section 3.7). However, it will be at the discretion of the country to identify its target for UHC and how to extend this to its population. Ideally, a country will work jointly on both the service coverage and financial hardship components.

4.4 Limitations of the UHC Billion calculations

The accuracy of the UHC Billion calculation is limited by the SDG data and methods on which it is based. Limitations include:

- extent to which service coverage indicators are representative
- limitations of indicators for financial hardship/protection
- data availability: lack of a common data source for service coverage and financial hardship, data that is collected in different years, use of proxies
- assuming a lack of correlation between service coverage and financial hardship
- uncertainties arising from data availability/quality
- double counting due to overlaps with the two other Triple Billions
- use of population equivalence in counting the billion.

Further details are provided in Appendix C.5.

Note that the method used to combine service coverage and financial hardship is intended only for use in calculation of the UHC Billion. It has been constructed solely for this purpose. It does not replace or amend any part of the existing SDG 3.8 method and its tracer indicators. It should be anticipated that the approach will be refined or replaced once there is sufficient data for this to be practical.

4.5 UHC for the future [draft]

The UHC billion can expect to evolve, particularly as new data becomes available to test and improve on the approach. For example, a key requirement for progress on UHC will be to collect Household Survey data that links service coverage to household out-of-pocket expenditure so that the interrelationships between those benefiting from service coverage and/or avoiding financial hardship can be better understood (see also Section 2.4).

Approaches to obtaining globally comparable UHC indices will evolve as methods and understanding improve and data measurements and health treatments change (Appendix C.7). It is important that WHO continues to work with member states to try and improve data availability and quality and understand better how to measure true UHC (Section 2.4).

SDG 3.8 evolution

The tracer indicators used in SDG 3.8.1 are expected to evolve as data and medical care advance. When the index was created it was intended to replace proxy indicators over time with measurements of treatment coverage when data became available e.g. for diabetes and hypertension, and to improve service covereage indicators as this became possible. It was also planned to add coverage for cervical cancer vaccines and essential medicines in the future. The aim for the future should be to include the most measurable indicators, with the highest impact, that will drive the most important change.

Quality/effectiveness of service [Draft]

SDG 3.8.1 aims to measure service coverage but does not allow for the quality or effectiveness of treatments, or for accessibility of care. Nor does it include any weighting that could account for differences in health gains that accrue from different health interventions. In the future, UHC measurement is expected to benefit from improved indicators and methods (Fullman et al., 2017, 2018; Hogan et al., 2018; Lee, Wu and Liu, 2018).

There is ongoing work to develop an approach to UHC that measures **effective coverage** (Appendix C.7). Details of this revised effective-coverage approach are still being defined, but its aims are to:

- focus on quality of treatment coverage, in keeping with the definition of UHC

- adjust for the varying epidemiological burden in countries
- weight treatments by health gain.

The method will probably involve use of tracer indicators categorized by type of care (promotion, prevention, treatment, rehabilitation and palliation) and by life course, using proxies to measure the effectiveness of health services. Tracers will be combined into a UHC index by weighting by potential health gain. Challenges are to minimize the additional data burden, to use country data and to allow countries to carry out their own calculations.

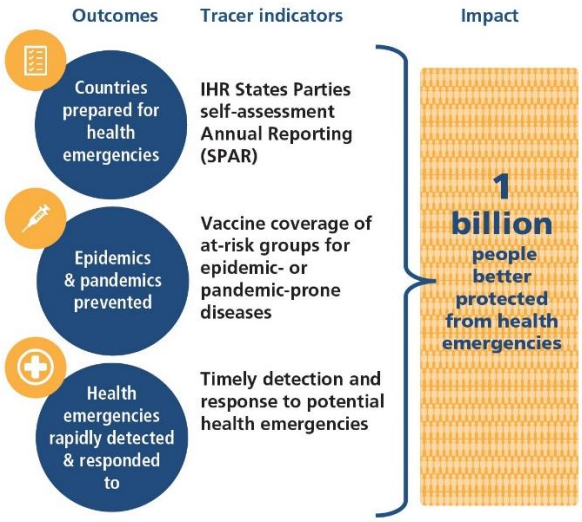
5 Health Emergencies Protection Billion

The aim of the Health Emergencies Protection Billion target is for 1 billion more people to be better protected from health emergencies.

It will be measured using the Health Emergencies Protection Index (HEPI), built from three simple indicators that capture the scope of WHO's health emergency activities (Fig. 5.1).

- emergency prepare indicator (IHR capacities)
- emergency prevent indicator (routine and emergency vaccination coverage)
- emergency detect & respond indicator (timeliness).

Fig. 5.1 The three tracer indicators that constitute the Health Emergencies Protection Index (HEPI)



The Health Emergencies Protection (HEP) Billion target is consistent with SDGs 3.d and 3.d.1 and with the Review Committee on the Role of the International Health Regulations (2005) in the Ebola Outbreak and Response (IHR, 2015). The emergency prepare indicator

The **emergency prepare** indicator measures a country's preparedness for emergencies. It encapsulates the level to which a country is ready to identify and respond to a range of emergency situations.

The indicator is based on attainment of International Health Regulations (IHR) capacities for surveillance and response (WHO, 2016a). States that are party to the International Health Regulations (IHR) (2005) are required to develop and maintain minimum core public health capacities for surveillance and response, and to report on the implementation of 13 core capacities. Each of the 13 IHR (2005) capacities is calculated as the average of its indicator scores (1–3 indicators per capacity, 24 indicators in total), with each indicator scored from 0–5 (5 steps). The assessment of these capacities provides the most comprehensive, internationally agreed and consistently measured dataset for determining the country capacity for preparedness for health emergencies.

The 13 IHR capacities are reported using the IHR State Parties Self-assessment Annual Reporting (SPAR), which became available in June 2018 (WHO, 2018c).

The emergency prepare indicator is the average of the scores for the 13 International Health Regulations (IHR) (2005) capacities (Table 5.1), as measured using SPAR:

Prepare indicator = Average of 13 IHR capacities (SPAR)

Table 5.1 IHR capacity score categories and example calculation of the prepare index

IHR Reporting capacities	Example of capacity score (%)
C1. Legislation and financing	60
C2. IHR coordination and national IHR focal-point functions	80
C3. Zoonotic events and the human–animal interface	80
C4. Food safety	40
C5. Laboratory	73
C6. Surveillance	80
C7. Human resources	40
C8. National health emergency framework	47
C9. Health service provision	60
C10. Risk communication	60
C11. Points of entry	60
C12. Chemical events	40
C13. Radiation emergencies	40
Prepare index (average of 13 core capacities)	**58**

Over the past eight years, all 196 WHO states party to the IHR have reported on the implementation of these 13 core capacities at least once. Of these, as of 7 August 2019, data from 182 were available for the most recent reporting year (WHO, 2018c).

The emergency prepare indicator allows countries to be stratified into five levels of preparedness (Table 5.2; Fig. 5.2), enabling prioritization of where preparedness effots are most needed. Progress will be measured by the cumulative population moving from one level of preparedness to a higher level – thus encouraging improvements to be made for all Member States.

Table 5.2 Emergency prepare indicator categories for 2018

Level	Number of Member States	Cumulative population (millions)
Level 5 (≥90)	19	2231
Level 4 (70 – <90)	46	2549
Level 3 (50 – <70)	51	1715
Level 2 (30 – <50)	56	627
Level 1 (<30)	10	114
Data pending	14	316
Total	**196**	**7552**

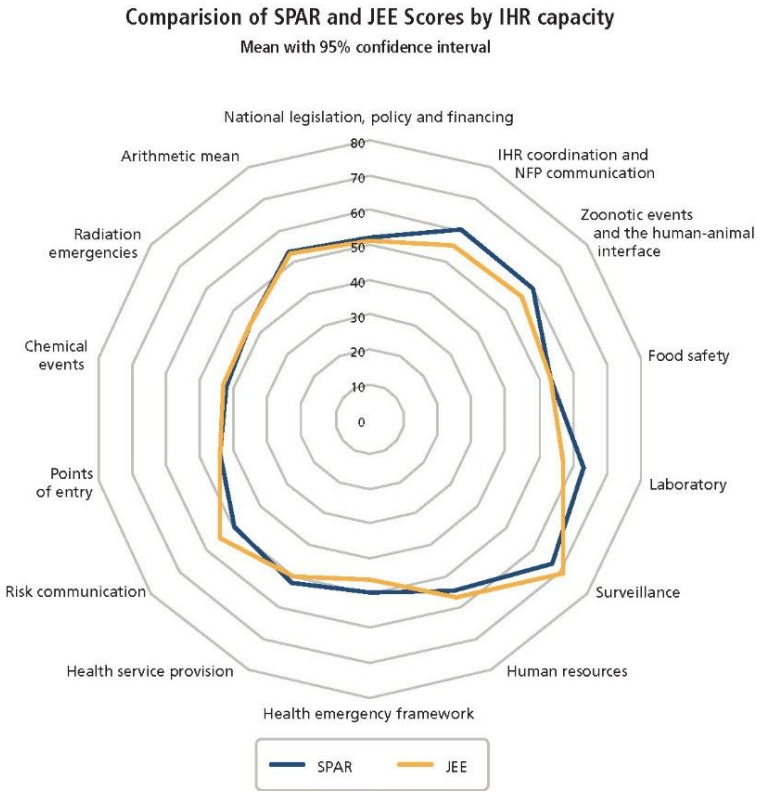
Note: The total number of states party to the IHR is 196.

Fig. 5.2 Preparedness index based on 2018 SPAR data [to do]

[Map to be provided]

Self-reported measures can often suffer from bias. In the case of IHR, voluntary external evaluations such as joint external evaluation (JEE) are used to assess this bias. Initial results from the new SPAR tool show a much closer alignment with the JEE tool than the previous annual reporting tool, with a correlation coefficient of 0.87 (Jan 2019, 63 countries) and no significant differences between the average scores for each of the technical areas (Kandel *et al.*, 2019). For the emergency prepare indicator, unadjusted SPAR values will be used. Bias will, however, continue to be assessed by comparing with JEE results.

Fig. 5.3 Comparison of SPAR and JEE IHR scores [redraw]



Source: Kandel, 2019

5.1.1 Example country calculation

For the example shown in Table 5.1, the country has scored an average of 58% for its 13 IHR core capacities, based on their IHR annual reporting Based on this average, it falls into the Level 3 category (50 to 70%).

5.2 The emergency prevent indicator

The **emergency prevent** indicator measures efforts to prevent health emergencies via vaccination coverage. Reaching high vaccination coverage in at-risk groups for vaccine-preventable infectious pathogens is key to tackling preventable epidemic diseases and pandemics, leading to the control and elimination of high-threat infectious hazards.

The emergency prevent indicator incorporates both routine and campaign vaccination for epidemic- and pandemic-prone diseases (The index will be the average coverage of relevant vaccines i.e. measles, polio and any of the listed three diseases for which a Member State is at risk:

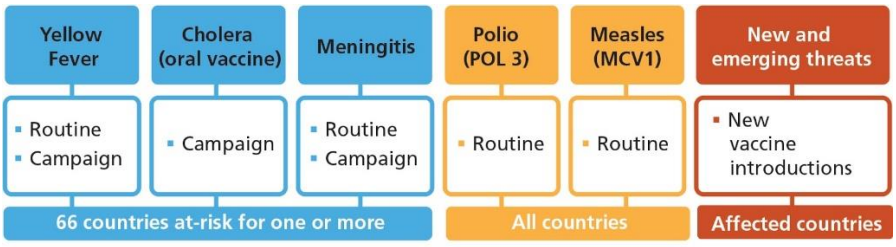
- measles: all Member States
- polio: all Member States
- cholera: affected Member States
- yellow fever: Member States at risk
- meningitis: Member States at high epidemic risk.

Fig. 5.4). It focuses on three priority infectious hazards: yellow fever, meningitis and cholera, all three being priority diseases calling for elimination or reduction through the implementation of global strategies in the Health Emergencies Programme. Because not all Member States are at risk of these diseases, routine vaccination of measles and polio is also included to develop estimates for all Member States and to highlight the importance of a functioning immunization programme for disease prevention. New and emerging threats, including pandemic influenza and infectious hazards with newly available vaccines and requiring mass-vaccination campaigns will also be incorporated into the index for affected countries. In these contingency scenarios, Member States either considered affected by or at risk of the event, or for whom WHO recommends a mass-vaccination programme, will have the relevant antigen added to the immunization coverage sub-index for that year.

The index will be the average coverage of relevant vaccines i.e. measles, polio and any of the listed three diseases for which a Member State is at risk:

- measles: all Member States
- polio: all Member States
- cholera: affected Member States
- yellow fever: Member States at risk
- meningitis: Member States at high epidemic risk.

Fig. 5.4 Routine and campaign vaccinations included in the prevent indicator



5.2.1 Calculation method

The prevent indicator is calculated as the population-weighted average of routine and campaign vaccine coverages for the applicable diseases: i.e. measles and polio for all Member States, and yellow fever and/or cholera and/or meningitis where there is a risk.

$$\text{Emergency prevent indicator} = \frac{\sum_v \text{Coverage}_v \times \text{relevant population}_v}{\sum_v \text{relevant population}_v}$$

where *v* represents the relevant vaccines for the country and year of estimation (see Table 5.3). The coverage estimates are each weighted by the relevant population. For routine vaccination, this is the total population of surviving infants. For campaigns, this is the target population. The rolling/cumulative vaccinated population is used during emergencies or any supplementary campaigns.

Table 5.3 Member States at risk for yellow fever, cholera, meningitis in 2019 [review]

	Number of Member States
Yellow fever (high-risk Member States)	39
Cholera (affected Member States)	47
Meningitis (Member States at high epidemic risk)	26
At risk for yellow fever, cholera, or meningitis	**66**

The indicator is an absolute estimate, meaning that countries can demonstrate progress by incremental improvement independently of other countries' performance. Ultimately, all countries should have coverage estimates of >90%. The calculation of the average vaccine coverage places a high weight on routine vaccination, emphasizing the value of routine coverage for many diseases. A potential limitation of this approach is that small targeted campaigns will have only a small impact on the indicator. Other weighting schemes were also considered (e.g. equal weighting for all antigens – in which small campaigns, such as for cholera, had an oversized effect on the mean).

5.2.2 Data sources and availability

The main sources of vaccination coverage data are:

- coverage estimates for routine vaccination (yellow fever, measles, polio) from WHO/UNICEF estimates of national immunization coverage (WUENIC); measles (MCV1) data available for all Member States
- routine immunization administrative coverage (meningitis A) from the WHO/UNICEF Joint Reporting Form (JRF)
- coverage estimates for emergency requests made to the International Coordinating Group (ICG) on Vaccine Provision where available (yellow fever, cholera and meningococcal meningitis) (WHO, 2018b)
- additional meningitis and yellow fever immunization campaign coverage estimates from the WHO/UNICEF JRF
- mass preventive oral cholera vaccination campaign coverages from the Global Task Force on Cholera Control (GTFCC).

There are 66 Member States currently considered at risk by the WHO Health Emergencies Programme for at least one of yellow fever, cholera and meningitis. Because not all Member States that are at high risk for, or affected by, yellow fever, cholera and meningitis made or had requests approved by the ICG or conducted other vaccination campaigns, the mean campaign coverage estimate was calculated using the antigen data available (i.e., non-missing). The estimate for cholera was the average of campaign coverage (when available), weighted by the relative sizes of the target population for the specific campaign(s). There is no cholera vaccination currently recommended as part of the routine vaccination schedule.

Where target population data are not available for a specific campaign, the number of doses shipped by the ICG or GTFCC will be used as a proxy for target population size.

5.2.3 Limitations

Robust and reliable data on campaigns is challenging to obtain. Vaccine campaigns are largely reactive and occur in response to disease outbreaks. Countries may experience multiple outbreaks of the same disease, resulting in several campaigns and thus the possibility that the same individuals receive a repeated (unneeded) vaccine. Additionally, some campaign data does not allow separation of pathogen type. For example, routine data for meningitis is focused on meningitis A, whereas the campaign data is cumulative for four types of Meningitis (i.e., A, C, E, W).

It can be difficult to evaluate whether sufficient vaccine doses for immunity have occurred. For measles, routine data is only for MCV1, however global recommendations advise that both MCV1 and MCV2 are needed for effectiveness. For cholera, the data does not specify if the vaccinated populations received one or two doses of OCV.

5.2.4 Example country calculation

A sample calculation of the prevent indicator is provided for a country at risk for yellow fever, cholera and meningitis A. Routine coverage is therefore evaluated for measles, yellow fever, meningitis A and polio, with the relevant population being the population of surviving infants. Emergency campaigns were also undertaken for yellow fever, meningitis A and cholera. The numerator for the emergency prevent indicator is the sum of vaccinated populations in each category, including rolling/cumulative vaccinated populations since 2015. The denominator is the total of the relevant populations. The 2018 ratio for this is 0.74.

Table 5.4 Example country calculation of the emergency prevent indicator

Country category: At risk for yellow fever, cholera and meningitis **Surviving infants (UNDP 2018): 6.98 million**				
Vaccine	**Type**	**Coverage (%)**	**Relevant population (millions)**	**Vaccinated (millions)**
Measles	routine	65	6.98	4.54
Yellow fever	routine	65	6.98	4.54
Meningitis A	routine	0*	6.98	0
Polio	routine	57	6.98	3.98
Yellow fever	2018 campaign	94	33.63	31.61
	2017 campaign	87	3.29	2,.87
Meningitis A	2017 campaign	86	2.34	2.01
	2016 campaign	87	0.20	0.17
	2015 campaign	66	0.52	0.34
Cholera	2017 campaign	104	1.71	1.78
Total			**69.6**	**51.8**
Indicator				**0.74**

**Introduction of meningitis A vaccination scheduled for 2019*

5.2.5 Initial global results

The 2018 emergency prevent indicator was estimated in October 2019 for 194 Member States and was based on incomplete data (Fig. 5.5, Table 5.5).

The 2018 preliminary results show an average global coverage of 86%, with 4.2 billion persons in 114 Member States having the highest level of prevention (≥90%). This means 3.4 billion people reside in 80 Member States where routine and emergency vaccination could be strengthened. Forty-nine of the 66 at-risk Member States have mean coverage <90%, with 2.9 billion people living in Member States with a level of prevention <90% and 26 Member States falling into the lowest three categories of vaccination coverage.

Fig. 5.5 Mean coverage of emergency prevent indicator

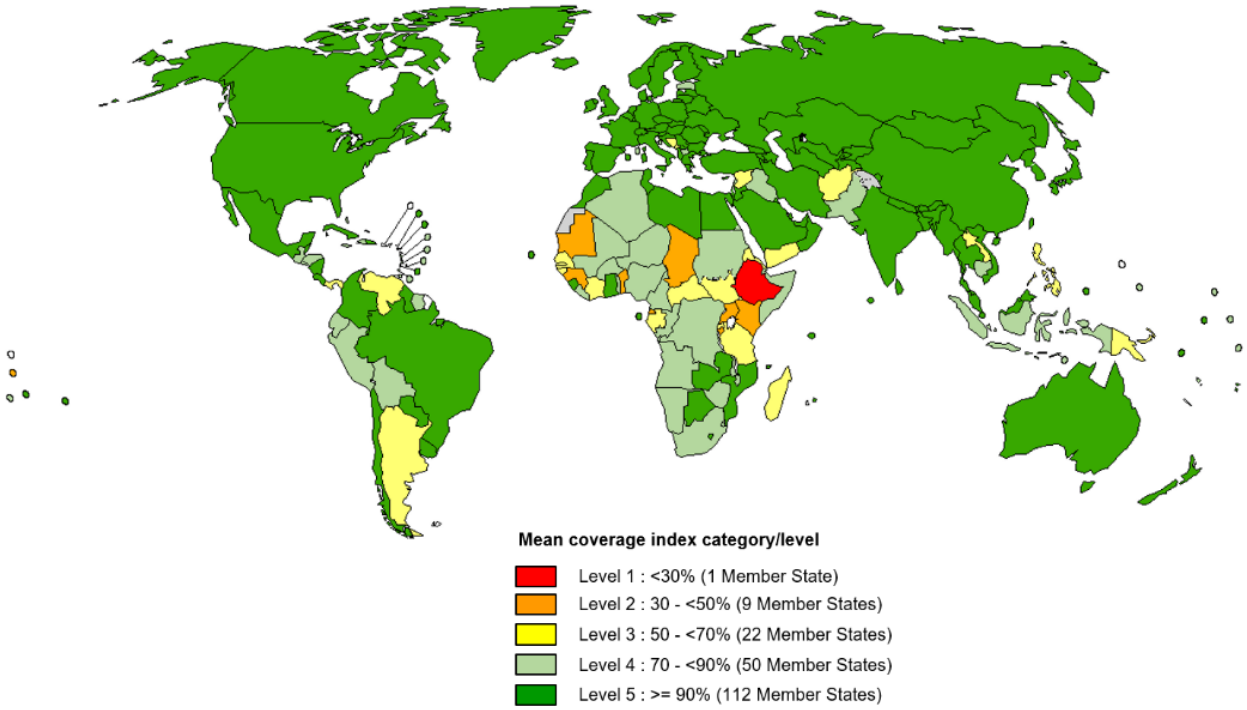


Table 5.5 Emergency prevent indicator levels for all Member States and at-risk Member States (n = 66; 2019). [review]

Category	Number of Member States	Total population (millions)	Number of at-risk Member States	Total at-risk states population (millions)
Level 5: ≥90	114	4,181	17	778
Level 4: 70 – <90	49	2,659	23	2,194
Level 3: 50 – <70	24	515	20	420
Level 2: 30 – <50	6	231	5	231
Level 1: <30	1	1	1	1
Total	**194**	**7,587**	**66**	**3,624**

5.3 The emergency detect & respond indicator

For the **emergency detect & respond** indicator, countries will be assessed on timeliness of detection, notification and response to public health emergencies. Timeliness is a critical aspect of improving public health impact in order to protect lives, measuring the speed with which Member States are able to react to public health events. This indicator is a new measure that will help establish data systems and milestones to measure the impact of surveillance and response efforts. The goal will be to encourage Member States to respond quickly to major public health emergencies.

5.3.1 Concept

The **emergency detect & respond indicator** will monitor the timeliness of detection, notification and response to events with serious public health impacts. Events will include:

- IHR-notifiable events: These are events, notifiable to the WHO, that have already been determined by Member States to be serious, unusual or unexpected, or that pose a risk of international spread, or risk of restrictions to international travel or trade. These hazards may be biological (zoonotic, food safety and other infectious hazards), chemical, radiological or nuclear. These events generally meet at least two of the four criteria outlined in IHR (2005) Annex 2 (exceptionally they may meet only one).
- Events with serious public health impact not already notified under IHR. These are a broader category of events and are not notifiable to WHO. They can include infectious pathogens, natural disasters, incidents among vulnerable persons, or chemical or radiological emergencies. Serious public health events are defined in alignment with IHR (2005 Annex 2). This includes (Table 5.6) whether:
    - the number of cases and/or number of deaths for this type of event is large for the given place, time or population
    - the event has the potential to have a high public health impact (including treatment failure/antibiotic resistance, vulnerable population, concomitant other factors like natural disasters or armed conflict)
    - external assistance is needed to detect, investigate, respond and control the current event, or prevent new cases.

WHO will work with countries to develop systems for reporting these data to WHO.

The indicator will focus on three key aspects of timeliness:

- time to detection (t_0)
- time to notification (t_1)
- time to respond (t_2).

These will be averaged to give an overall measure of timeliness.

The three timeliness components will be measured based on four event milestones: start, detection, notification, and response (Table 5.7). Further details are shown in Table 5.8, which also lists key proxy measures that can be used to estimate the event milestones.

The varied types of possible event measures pose a challenge. For example, a single definition for the start of an event or of a response is not possible. In many cases, key dates are missing and proxy dates will be used as an approximation, where they are available. For example, if the date of symptom onset for the index case is not available, then the date of first recorded visit to a health care facility will be used as a proxy for the missing information (Table 5.8).

Time of notification is the time to notifaction of WHO. This should be reported for all IHR-notifiable events. For the remaining events the time to notification will not be applicable and the detect & respond indicator will be measured using the time to detection and the time taken to respond only.

Table 5.6 IHR specification of a serious health event

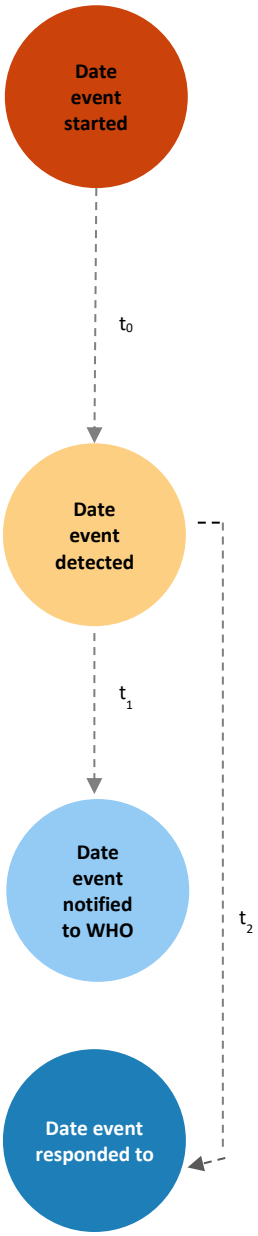
Is the public health impact of the event serious?	**I. Is the public health impact of the event serious?**
	1. *Is the number of cases and/or number of deaths for this type of event large for the given place, time or population?*
	2. *Has the event the potential to have a high public health impact?* THE FOLLOWING ARE EXAMPLES OF CIRCUMSTANCES THAT CONTRIBUTE TO HIGH PUBLIC HEALTH IMPACT: ✓ Event caused by a pathogen with high potential to cause epidemic (infectiousness of the agent, high case fatality, multiple transmission routes or healthy carrier). ✓ Indication of treatment failure (new or emerging antibiotic resistance, vaccine failure, antidote resistance or failure). ✓ Event represents a significant public health risk even if no or very few human cases have yet been identified. ✓ Cases reported among health staff. ✓ The population at risk is especially vulnerable (refugees, low level of immunization, children, elderly, low immunity, undernourished, etc.). ✓ Concomitant factors that may hinder or delay the public health response (natural catastrophes, armed conflicts, unfavourable weather conditions, multiple foci in the State Party). ✓ Event in an area with high population density. ✓ Spread of toxic, infectious or otherwise hazardous materials that may be occurring naturally or otherwise that has contaminated or has the potential to contaminate a population and/or a large geographical area.
	3. *Is external assistance needed to detect, investigate, respond and control the current event, or prevent new cases?* THE FOLLOWING ARE EXAMPLES OF WHEN ASSISTANCE MAY BE REQUIRED: ✓ Inadequate human, financial, material or technical resources – in particular: – insufficient laboratory or epidemiological capacity to investigate the event (equipment, personnel, financial resources); – insufficient antidotes, drugs and/or vaccine and/or protective equipment, decontamination equipment, or supportive equipment to cover estimated needs; – existing surveillance system is inadequate to detect new cases in a timely manner.
	IS THE PUBLIC HEALTH IMPACT OF THE EVENT SERIOUS? **Answer "yes" if you have answered "yes" to questions 1, 2 or 3 above.**

Source: IHR 2005 (WHO, 2016a)

Table 5.7 Definitions of event milestones used to measure timeliness

Event milestone	Definition
Event start	The true start of the event. If the true start date is not fully known, a proxy start date for an event will be used, e.g. the symptom onset date of the earliest reasonably identified case
Event detection	Date when the event was first detected. If detected by WHO and reported to the Member State (MS), the earliest detection date will be used.
Event notification	Date when the event was reported to WHO by the MS under IHR. If there is no reporting by the MS, this will be the date when the verification request was sent to the MS.
Event response	Date when event was first responded to, e.g. earliest date of any public health intervention. Definition not finalized.

Table 5.8 Key event milestones and their associated indicators

Date milestones	Ideal indicator	Examples of alternative proxy indicators
	Date of index case symptom onset	Symptom-onset date of first reported case (=initial case) First visit to health-care facility Suspected primary case Most likely exposure date (estimated) First exposure date (estimated) Latest exposure date (estimated) Outbreak start date Date of death of first reported case (=initial case) First report of the outbreak
	Date the local health authorities detect the event	First confirmatory laboratory test First sample collection date Ministry of Health (MoH) press release date Rapid diagnostic test (RDT) date First time diagnosed as suspected case Date other external party reported to MoH Date outbreak declared Date local health authority reported to MoH Preliminary laboratory test Communication from laboratory to MoH Date first communication between third party Member States happened Date local health authority detected signal through media
	Date event notified to WHO (under IHR)	Date national governmental agency, the International Health Regulation National Focal Point (IHR NFP)) reported to WHO.
	Earliest date of any public health intervention to control the event	Field investigation started Incident management system set up Vaccination campaign started Active surveillance initiated Rapid response team deployed Active surveillance initiated Risk communication started Date quarantine started Vector control campaign launched Food/product recall started National emergency operation centre (EOC) activated Expert group established

5.3.2 Calculating the detect & respond indicator

Each of the three components of timeliness are to be stratified into five levels (Table 5.8), with Level 5 being shortest delay and Level 2 the longest delay. Level 1 is used to indicate that no data were recorded for the

event and is aimed at encouraging collection of date data in order to measure timeliness. Threshold levels have been developed using quantiles of timeliness (in days) for each milestone observed for IHR notifiable events (where available) during 2014–2018.

$$Timeliness = \frac{\sum_{n=0}^{2} Level(t_n)}{3} \times 20$$

Table 5.9 Definition of levels for the three timeliness sub-indicators and the detect & respond indicator

Level	Timeliness sub-indicators range (detection, notification, and response) (days)	Detect & respond indicator range
Level 5	≤1	indicator ≥ 90
Level 4	1< t ≤7	70≤ indicator <90
Level 3	7 < t ≤14	50≤ indicator <70
Level 2	>14	30≤ indicator <50
Level 1	no date reported	Indicator <30

5.3.3 Example country calculation

Sample calculations are provided to illustrate the calculation of the detect & respond indicator. In the first example (Table 5.10), a single event has occurred, and data are available for each of the timeliness measures. The second example illustrates the case where data are missing for one of the measures and no proxy date could be identified (Table 5.11). The third example illustrates how multiple events are used, with each event being separately graded and then an average taken (Table 5.12). All data provided in the country example tables are subject to change.

Table 5.10 Example of country with one event with all dates reported

	Time	Median duration (days)	Sub-level
	Detection (t0)	31	2
	Notification (t1)	67	2
	Response (t2)	57	2
Timeliness level			2 (40%)

Table 5.11 Example of country with one event with no "event start date" reported

	Time	Median duration (days)	Sub-level
	Detection (t0)	N/A	1
	Notification (t1)	33	2
	Response (t2)	44	2
Timeliness level			2 (33%)

Table 5.12 Example of country with three events

	Time	Median duration (days)	Sub-level
Event 1	Detection (t0)	3	4
	Notification (t1)	1	5
	Response (t2)	50	2
timeliness level			4 (73%)
Event 2*	Detection (t0)	1	5
	Notification (t1)	N/A	
	Response (t2)	2	4
timeliness level			5 (90%)
Event 3	Detection (t0)	N/A	1
	Notification (t1)	N/A	1
	Response (t2)	N/A	1
timeliness level			1 (20%)
Detect & respond			3 (61%)

Note: In this example, events 1 and 3 are IHR-notifiable events – for event 3 no timeliness data are available. Event 2 is a serious public health event but not a notifiable event, so the time to notification is not applicable. Timeliness will be calculated for each event then the average will be used.

5.3.4 Data sources for timeliness data

There is a need to extend the sources of data used, in order to increase the number of events included in the detect & respond indicator and to improve the quality of event timeliness data. This is likely to include:

- Making full systematic use of the existing event information site (EIS): a web-based platform that allows secure communication between WHO and the IHR national focal points (NFPs), as defined in Article 11.1 of the IHR (2005). Reporting of IHR events by countries is mandatory and should include full timeliness information (WHO, 2016c).
- Developing the existing event management system (EMS): WHO's central internal electronic system for entering, accessing and managing information for all potential and substantiated events. The database includes event details, relevant communications and WHO assessments and decisions. The EMS system will require new capability to additionally record timeliness information for events with serious public health impact.

The collection of timeliness measures will likely need to be arrived at in a phased manner. Data-strengthening needs include encouraging countries to report significant public health events and to share this information with WHO. The goal will be twofold, to extend reporting and to make incremental progress on timeliness of detection, notification and response to events.

5.3.5 Limitations

Detect & respond timeliness is a new indicator that has not previously been gathered in a systematic manner. The definition and measurement of timeliness is challenging. Key event milestones may be unknown and even proxies can be difficult to define (Table 5.8). The proposed indicator is expected to evolve.

The number and nature of events varies enormously between Member States, depending on their burden of diseases, their access to health care, safe water and sanitation, and their gross domestic product. IHR and national health emergency events are by definition highly variable and unpredictable. Over the 5-year period 2014–2019, 121 out of 194 WHO Member States (62%) experienced an IHR event that was notified through EIS. During 2020, almost all member states will experience an IHR event due to the COVID-19 virus. The very variable nature of events makes this indicator sensitive to a single event. The inclusion of serious public health events in addition to IHR-notifiable events will increase the number of events used and help mitigate this.

WHO will need to work with countries to help define how data for events with serious public health impact can be systematically collected, stored and reported using existing channels. For example, it will be important to prioritize work on the EMS system to allow timeliness information to be recorded.

5.3.6 Initial contributions to the Health Emergencies Billion for the detect & respond indicator

Historical values of the detect & respond indicator, based solely on IHR events, have been collated for the period 2014–2018. In general, there are insufficient events for a meaningful set of baseline values to be calculated. In the majority of Member States, there are few or no IHR events and, in addition, timeliness values are very variable and dependent on the nature of the event.

For the other emergency indicators (prepare and prevent), the contribution to the Health Emergencies Protection (HEP) Billion will depend on the percentage change in the indicator from the baseline value (2018). However, for detect & respond, baseline values are not yet available, and an alternative approach is needed as change in timeliness cannot be measured sufficiently well. Instead, the goal of GPW13, for this indicator, will be to establish baseline values. A one-off contribution to the HEP billion will be made at the end of the period (2023) that will recognize (a) the average timeliness level of events recorded during 2019–2023 and (b) that systematic reporting of event timeliness information represents an advance towards handling emergencies (Table 5.13).

Table 5.13 Initial contribution to the HEP Billion for the new detect & respond indicator

Average detect & respond level (over events in 2019 to 2023)	Contribution to billion (% population)
Level 5	5
Level 4	4
Level 3	3
Level 2	2
Level 1	0

By creating a one-off initial contribution to the HEP Billion, the detect & respond indicator is intended to:

- raise awareness of the importance of timeliness and improve systems for timely detection, notification, and response
- encourage all countries to report timeliness measures for IHR and national emergency events

- advance new protocols and systems that support countries to record timeliness data for a wider range of health events (see 0 above).

In the future, when this indicator becomes more established and with more events included, it is planned to use the change in this indicator to measure contributions to the HEP Billion. It is expected that this will use a rolling average (over 3 to 5 years) of timeliness values.

5.4 Combined emergency index

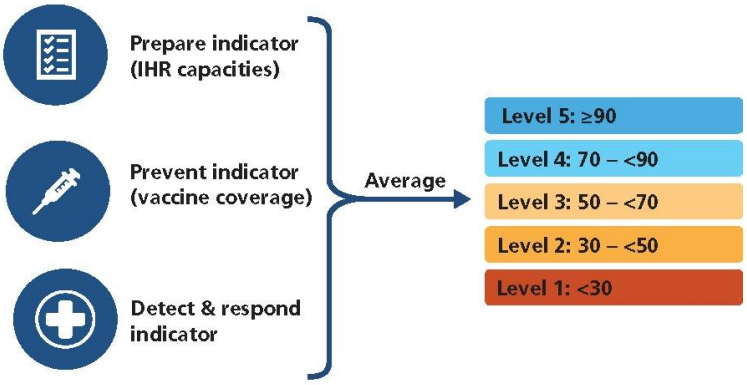
The Health Emergencies Protection Index (HEPI) is calculated as the arithmetic mean of the three tracer indicators: the emergency prepare, emergency prevent, and emergency detect & respond indicators:

$$Health\ Emergencies\ Protection\ Index = \frac{(Prepare + Prevent + Detect\ \&\ Respond)}{3}$$

HEPI is on the scale 0 to 100 and summarizes a country's overall level of protection from health emergencies. Countries will be categorized into five levels of HEPI (Fig. 5.6), with the objective that countries work towards moving up a level.

The newness of the detect & respond indicator means that baseline values of HEPI will not be available for most countries. By 2023 it is hoped to have improved data and that an HEPI value can be determined.

Fig. 5.6 Calculation of the Health Emergencies Protection Index



5.4.1 Calculating contributions to the Health Emergencies Protection Billion

The Health Emergencies Protection (HEP) Billion will be counted by adding up the changes linked to each in the three component indicators, expressed as a proportion of population.

For the prepare and prevent indicators, the contribution to the billion will be measured by the percentage change in the indicator value over the period 2018 to 2023 multiplied by the population, e.g.:

$$Prevent\ indicator\ contribution\ to\ HEP\ billion = \frac{Change\ in\ Prevent}{100} * Population\ (2023)$$

For example, if the prevent indicator had increased by 7% this would contribute 7% of a country's population to the HEP Billion.

In principle, the total contribution over the three indicators will be the sum of the individual contributions. This can also be determined using the HEP Index (HEPI):

$$Contribution\ to\ HEP\ billion = \frac{(Increase\ in\ HEPI\ * 3)}{100} * Population\ (2023)$$

For example, a country that has increased its HEPI by 5% would contribute 15% of its population. Final country calculations for contributions to the billion will use UNDP population estimates for the final year (2023) (see also Section 3.6).

Given the current deficit of timeliness data, baseline detect & respond and HEPI values will not be available. For GPW13, the billion will be calculated slightly differently using the initial contribution for detect & respond (Table 5.13). This approach will be used for all countries (even for those for whom a baseline value is possible):

$$Country\ contribution\ to\ HEP\ Billion = \left(\frac{Change\ in\ Prepare}{100} + \frac{Change\ in\ Prevent}{100} + \frac{Detect\ \&\ Respond\ Initial\ contributon}{100}\right) * Population\ (2023)$$

Note, in the unlikely case of this exceeding 100%, the contribution to the billion will be capped at 100%.

The overall HEP Billion goal is for the equivalent of 1 billion people to be better protected out of a population of around 8 billion (projected for 2023). This equates to around 1 in 8 people being better protected, i.e. 12.5% of the global population and a 4.17% average increase in each of the three tracer indicators. Note, however, that health emergencies protection is based on the strength of national (and sub-national) preparedness, prevention, and detection and response systems, which cannot be translated to the individual level. Thus, a 10% increase in HEPI is more likely to mean that most of the population is 10% better protected rather than that 10% of the population move from no protection to perfect protection.

All countries can contribute to the "1 billion better protected against health emergencies", provided they progress. However, a key goal of the billions is to address inequity. With this in mind, it is hoped to assist member states with low values of HEPI (levels 2 and 3) to make the greatest advances and to move towards closing the "gap".

5.4.2 Example country calculation for Health Emergencies Protection Billion

An example country calculation is illustrated in Table 5.14. In this case, the change in the prepare and prevent indicators contributed 5% and 2% of the population for the billion. For detect & respond, the hypothetical average value over the GPW13 period is 64%. This is level 3 and so will contribute 3% of population to the billion (Table 5.9, Table 5.13)

Table 5.14 Hypothetical country example contribution to Health Emergencies Protection Billion

Indicator	Baseline value 2018	End value 2023	Change	Contribution to HEP Billion (millions)
Prepare	51%	56%	5%	33.4*.05 =1.67
Prevent	74%	76%	2%	33.4*.02 = 0.67
Detect & respond	-	**Average 2019–2023** 64%	**Initial score** 3%	33.4*.03 =1.00
HEPI	-	**Average of indicators** 65%		
Total contribution			**10%**	**33.4 *(.05 +.02+.03) = 3.34**

Note: Country has a population of 33.4 million in 2023.

Identifying country shares of the HEP Billion

The HEP Billion will be achieved as the result of action across the globe. All countries are encouraged to make progress and to increment their level of protection – there is always room for improvement. e.g. consider preparedness for the COVID-19 pandemic. At the same time, in the quest for better equality in the world, it is right that those countries with poorer protection against emergencies are given the support and encouragement needed to work towards closing the existing differences.

The HEP Billion is a based on new indicators, and for the detect & respond indicator there is very limited data thus far. This means that the overall HEP index is not yet known for countries. In view of this, the proposed guideline contributions of each country to the HEP Billion will be to share out the billion target in proportion to population. Countries will be encouraged to contribute a fixed percentage to the billion equating to 12.5% of the population (or 1 in 8 people; see also Section 3.7). However, it will be at the discretion of the country to identify its own target.

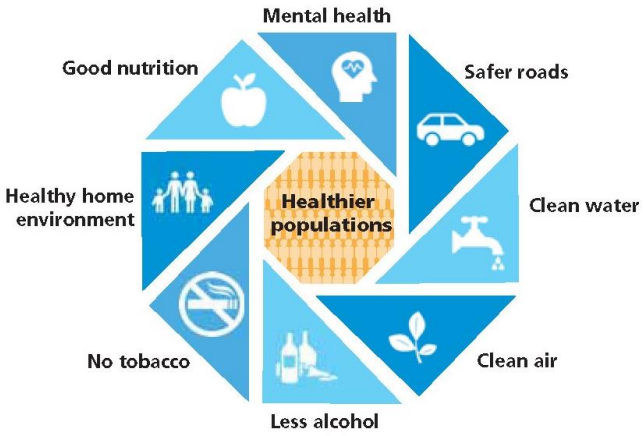
6 Healthier Populations Billion

The Healthier Populations Billion goal is for 1 billion more people to enjoy better health and well-being. It aims to enable and encourage people to lead healthier lives.

The Healthier Populations (HPOP) Billion includes aspects central to health that are determined by social, environmental and economic factors. It promotes healthier environments (e.g. clean air, water and urban infrastructure) and encourages healthier life choices and behaviours (e.g. reduced use of alcohol and tobacco, better nutrition and healthier body weight; Fig. 6.1). Interventions to enable people to enjoy better health and well-being are complex and often involve actions and the leadership of sectors outside health. The key to achieving the HPOP Billion will be via multisectoral interventions driven by the health sector and influenced by policy, advocacy and regulation.

The HPOP Billion measurement counts the number of people who have benefitted in one or more ways from changes related to environmental, behavioural and social/health risk factors (Fig. 6.1). The measurement is based on 16 of the GPW13 indicators, which cover clean air, safe water, sanitation, roads, tobacco and alcohol use, obesity, domestic violence (intimate partner; child), child nutrition and child development, trans fats, and mental health (suicides). All but two are SDG indicators. The HPOP Billion will measure the overall global impact of interventions by Member States, WHO and other interested parties, as measured by these indicators.

Fig. 6.1 The Healthier Populations Billion concept – improving people's health and well-being by addressing social, economic, environmental and behavioural risks to health



The method used to count the Healthier Populations Billion is called the Healthier Lives approach. It is the first time WHO has created a single measure of change in the domain of the behavioural, environmental and socially determined healthiness of global populations. The method is purposely kept straightforward, in keeping with the use of SDGs within GPW13, with the objective of promoting country autonomy. The method can be used even when some indicators are not available in a country.

6.1 A concept framework for healthier populations

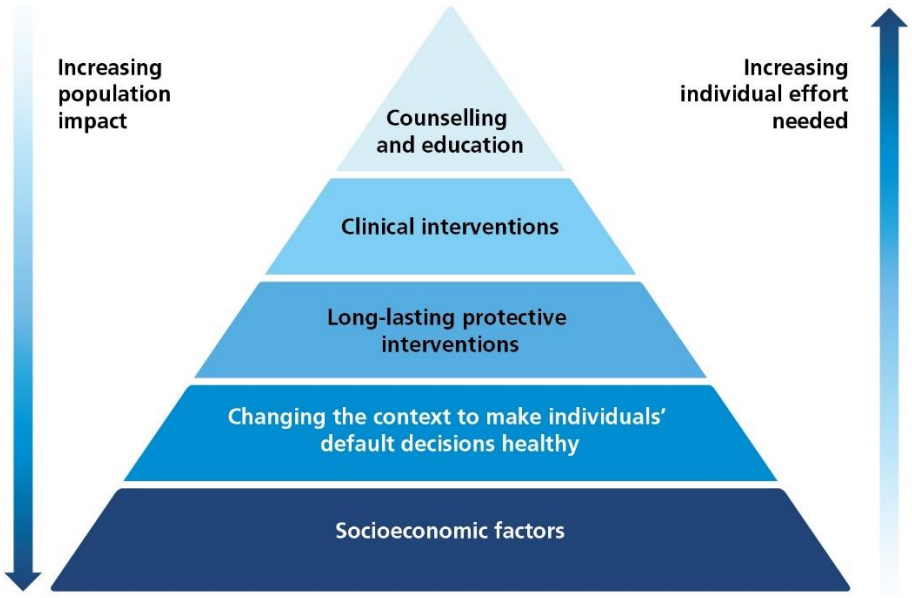
A useful conceptual framework to illustrate the areas targeted for the Healthier Populations (HPOP) Billion is the health impact pyramid (Frieden, 2010). As shown in Fig. 6.2, this pyramid illustrates the impact and focus of interventions ranging from individual-level interventions at the top, to those addressing socioeconomic factors at the bottom. Interventions at the top of the pyramid require more effort to generate benefit for individuals; those at the bottom are more complex but have the potential to generate greater impact at the population level. Much of the focus of the work carried out to achieve the HPOP Billion target is centred on ensuring that the environmental, social and economic contexts in which individuals live are

conducive to healthy choices. While individuals have responsibility for their decisions (to be physical active or not) and choices (of what to eat, drink and whether to smoke), there are numerous social and behavioural influences over what choices are made available to individuals.

Furthermore, factors such as the design of urban infrastructure can play an important role in influencing the choice to walk or cycle. For example, individuals are less likely to choose modes of transport that are more physically active if the environments are unsafe. As such, ensuring healthier behaviours on the part of individuals requires changes to context so that the default or easiest choices (what to eat, what to drink, what mode of transport to use, etc) become the healthiest choices.

Creating a context that enables healthy behaviours requires interventions that address the bottom layer of this pyramid: the socioeconomic factors. As mentioned before, such interventions are complex and often involve actions and the leadership of sectors outside health. The price of oil, for example, influences the choice in transport modes/systems, which directly contributes to the quality of air and subsequently the risk of health outcomes such as asthma. Where oil prices are low, transport systems favour the use of private vehicles, which, in turn, is a disincentive to walking and cycling. The cost of transport is also a factor in determining what types of food products, from what origins, are made available to the public. Similar analyses can be made for other behavioural risks, such as the use of tobacco and alcohol (Forouzanfar *et al.*, 2016).

Fig. 6.2 Health impact pyramid



Source: Frieden, 2010

6.2 The healthier lives approach

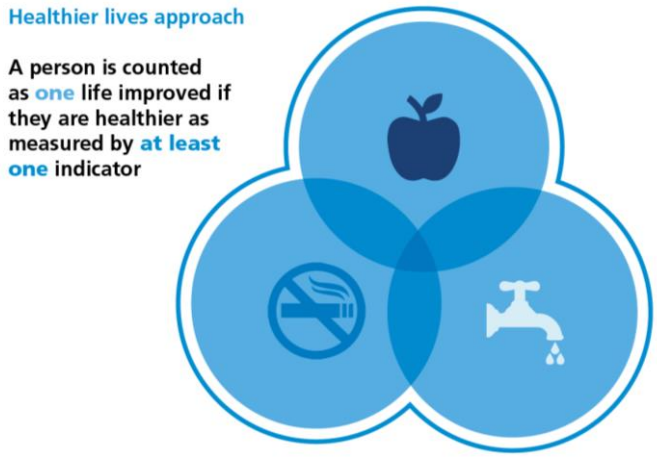
6.2.1 Concept

The healthier lives approach counts the number of people whose lives are newly healthier, as measured by the net change in one or more of the component indicators. Conceptually, if a person becomes newly healthier in more than one way (e.g. clean water and safer roads) then this will be counted as just one extra healthier life. If a person become healthier in one way but less healthy in another (stops use of tobacco but becomes obese) then they would *not* count as a healthier life (the effects are assumed to cancel each other

out). In practice, the healthier lives approach cannot count at the level of an individual – it measures change at an aggregated population level, using change in population prevalence.

The healthier lives approach uses a simple unweighted counting scheme. This approach has the advantage of simplicity, and yet provides a direct measurement of lives: it is comparatively easy to understand, and it is selected so as to be accessible to all countries.

Fig. 6.3 The healthier lives approach



6.2.2 Healthier lives approach – a measure of change

The healthier lives approach measures the net number of people, at a population level, whose lives are newly healthier in some way.

The healthier lives approach only measures change. It does not count the number of people who are fully healthy, and it does not assess the average healthiness of a population. In general, a population may experience better conditions (better air quality, reduced body weight from obese to overweight) but there will be scope for further future improvements (excellent air quality, healthy weight). A "healthier life" does not mean 100% healthy with no room for improvement.

6.3 Indicators for measuring healthier populations

6.3.1 Selected indicators

Sixteen GPW13 indicators will be used to measure the Healthier Populations (HPOP) Billion (Table 6.1).

Table 6.1 Indicators for measuring change in healthiness [update]

SDG/WHA	SDG/WHA short name	Value to be used in billion	Age range	Billion topic description
SDG 3.a.1	Tobacco use	100 – x	15+	Tobacco non-smoking
SDG 3.5.2	Alcohol (litres)	convert	15+	Reduced alcohol use (§)
SDG 3.6.1	Road deaths	convert	all	Road safety (§)
SDG 2.2.1	Child stunting	100 – x	<5	Children not stunted
SDG 2.2.2*	Child wasting	100 – x	<5	Children not wasted
SDG 2.2.2*	Child overweight	100 – x	<5	Children not overweight

WHA66.10'	Obesity	100 – x	5–19 18+	Children not obese Adults not obese
SDG 11.6.2	Mean particulates (PM2.5)	convert	all	Ambient air quality (§)
SDG 7.1.2	Clean fuels	x	all	Clean fuels
SDG 6.1.1	Safely managed water	x	all	Safe drinking water
SDG 6.2.1	Safely managed sanitation	x	all	Safe sanitation
SDG 4.2.1	Developmentally on track children	x	<5	Child development
SDG 5.2.1	Partner violence for women	100 – x	partnered women 15+	Reduced partner violence
SDG 16.2.1	Violence against children	100 – x	<18	Reduced child violence
WHA 66.10	Trans fats policy	convert	all	Healthy fats (§)
SDG 3.4.2	Suicide deaths	convert	all	Reduced suicide attempts (§)

(§) Indicates where a transformation to prevalence is used

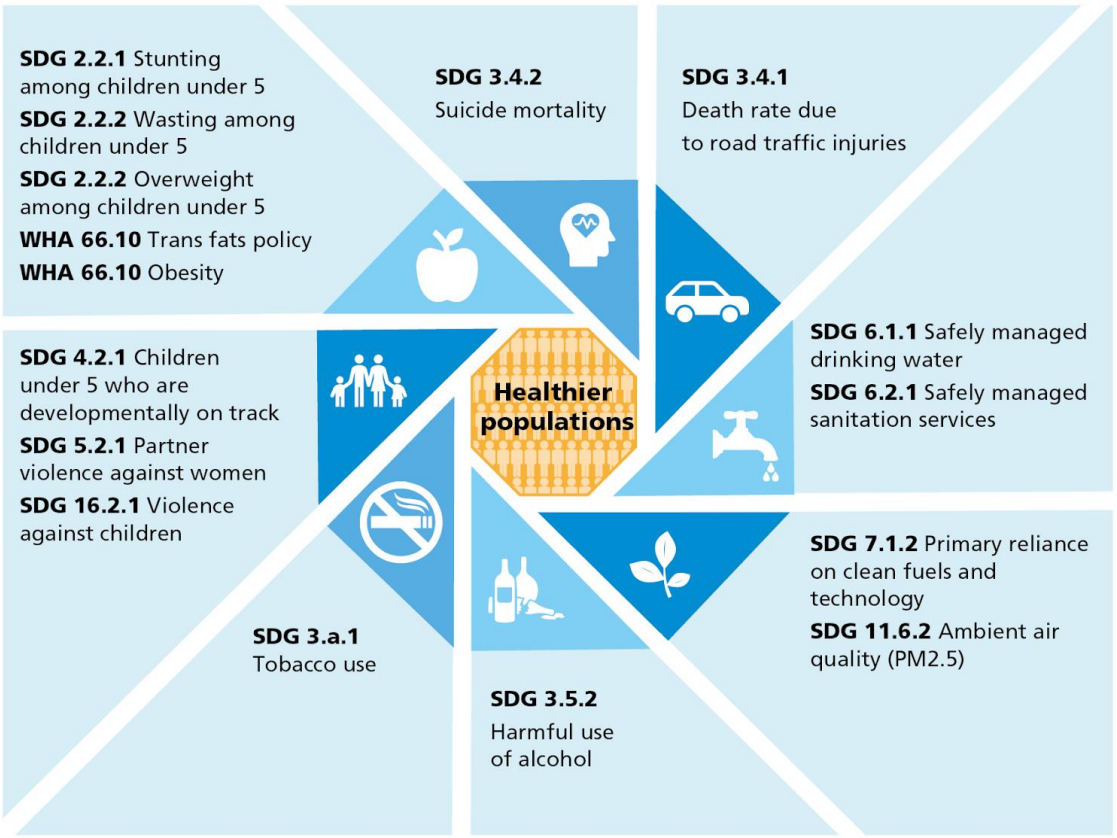
** Wasting and overweight are both forms of unhealthy weight, as measured by ratio of height to weight. The indicators will be shown separately, but for some parts of the Healthier Populations calculations account is taken of the fact that these derive from one measurement. Obesity is a single indicator, but is tracked by two (differently defined) measures for different age groups: over 18s and age 5–19. In some contexts the two values will be presented separately.*

The chosen indicators were selected from the GPW13 indicators based on the following criteria:

- significant impact on population healthiness
- motivates change
- emphasis towards healthiness
- indicator is a measure of risk or can be used as a proxy for risk
- ideally, indicator measures population prevalence
- focus is largely outside health sector.

Most of the selected indicators measure exposure or risk to health (e.g. prevalence of tobacco use, (lack of) access to clean water). The trans fats indicator is an example of an indicator directly measuring policy or regulation (see also Section *6.3.4);* it is the only policy indicator in GPW13. Policy indicators are less directly translatable into healthier lives (see Appendix E.2).

Fig. 6.4 16 Indicators selected for inclusion in the Healthier Populations Billion



6.3.2 Reframing indicators for healthiness

For the healthier population calculations, all indicators will be represented on a scale of healthiness from 0 to 100, with 0% being the least healthy and 100% being the healthiest. For example, for SDG 3.a.1 Prevalence of tobacco use, the indicator, x, will be transformed to 100 – x. A value of 0%, the least healthy, would mean everyone uses tobacco, and a value of 100%, the healthiest, would mean no one uses tobacco. This inversion is required for tobacco use, stunting, wasting and overweight in under 5s, obesity, intimate partner violence, and violence against children (Table 6.1). Alcohol, road safety, PM2.5, trans fats and suicide indicators are not on a 0 – 100 scale and require transformation to a scale of prevalence (see Section 6.3.3).

6.3.3 Transforming non-prevalence indicators

Five of the selected indicators are not measures of prevalence but are included in the HPOP Billion because each is a key contributor to global healthiness. Given that each of these is important for the billion, and as countries do not wish to gather additional information, a compromise approach is used. This is to calibrate a simple transformation of each indicator into a measure of prevalence. The transformations are approximations and require some subjective choices to be made. In choosing the transformations, the goal has been to find approaches that:

- are straightforward to apply
- measure an increase in healthiness that is justifiable/comparable to other indicators
- make intuitive sense
- allow a standard approach across all Member States
- do not require Member State to collect additional data.

The transformations to be used are outlined below and do not require countries to collect any further data beyond the GPW13 indicators (see also Appendix E.2 for additional details).

Reduced harmful use of alcohol

The alcohol-related SDG 3.5.2 indicator measures total alcohol per capita (15+ years) consumption (APC) in litres of pure alcohol per calendar year. For the HPOP Billion, populations are deemed healthier (in terms of alcohol consumption) if either heavy episodic drinking is decreased or abstinence is increased – both implying a reduced alcohol consumption. The transformation for alcohol will therefore relate changes in mean alcohol consumption to changes in prevalence of abstainers and of heavy episodic drinkers, using this as a measure of the proportion of the population that can be considered healthier. The transformation is based on analysis of existing modelled estimates of drinking behaviours at country populations levels (Manthey *et al.*, 2019;) Appendix E.2).

Road safety

The SDG indicator measures traffic-related mortality and is used as a proxy for road safety. Safer roads not only result in fewer deaths and injuries, but also provide key health-related benefits, for example people are more likely to walk or cycle and be physically active if roads are safer. For the HPOP Billion, the additional population avoiding road injury or death will be counted as "healthier". This transformation is likely to be an underestimate of benefit because it does not account for the important secondary effects of safer roads, but is the best that can be done using available data sources. The number of road injuries is estimated based on a simplified relationship linking road mortality, road injuries, and country social demographic index (SDI: a measure of the development level of a country which is based on average income per person, educational attainment and total fertility rate)(Lim *et al.*, 2016). The fitted relationship effectively describes how the probability of dying from a road incident is typically lower in more developed countries. It allows approximate estimation of the number of injuries and deaths from road accidents based on the SDG mortality values (Appendix E.2). This is used to estimate the change in prevalence of peope avoiding death or injury from roads (over a 5-year period).

Clean air

The SDG 11.6 indicator for air particulates measures the median concentration of PM2.5 in $\mu g/m^3$. For counting towards the HPOP Billion, a reduction of PM2.5 by 100 $\mu g/m^3$ is equated to 100% of the population being healthier. Smaller changes contribute to the HPOP Billion in a proportional manner. For example, improving the median PM2.5 by 10 $\mu g/m^3$ would be counted as equivalent to 10% of the population being healthier. Note that the benefit of better air quality is likely to be experienced as a significant proportion of the population gaining partial healthiness benefit (rather than a few people experiencing a large change (Section **Error! Reference source not found.**) (Cohen *et al.*, 2017) (Appendix .2).

Trans fats

The trans fats indicator is a policy indicator that records whether WHO best-practice policies for eliminating industrially produced trans fatty acids (TFA) have been implemented. For inclusion in the HPOP Billion, countries which implement best-practice TFA policy during the GPW13 period will contribute 2.1% of their population to the billion. This is a simplified approach based on estimated global averages. It estimates the proportion of the population who are expected to reduce intakes of trans fats to within guideline levels during the five years following policy implementation.

Mental health

Mental health is an important aspect of healthiness. Inclusion in the HPOP Billion requires a suitable transformation of SDG 3.4.2, mortality due to suicide, into a measure of prevalence of healthiness. The

number of additionally healthier lives will be counted as the estimated number of people avoiding suicide or a suicide attempt. The WHO World Mental Health Survey estimates that for each adult who dies by suicide there are more than 20 others who made one or more suicide attempts (Kessler and Ustun, 2008). This ratio is used to estimate the prevalence of number of people who avoid suicide attempts over a 5-year period. This measure is an underestimate of the number of people who would benefit from improvements that benefit mental health.

6.3.4 Making use of policy information

Policy, laws, taxation, advocacy, regulation, education and investments are key drivers for change in social, environmental and behavioural risks (Magnusson and Patterson, 2011). They are critical to addressing risks to health and to achieving healthier populations. It is not possible to base the GPW13 HPOP Billion directly on policy and regulation data, because the health-related SDGs and GPW13 indicators (other than trans fats) are not measures of policy. However, many of the healthier population indicators run alongside programmes that support and measure interventions (e.g. MPOWER for tobacco, INSPIRE for violence against children, NCD progress monitoring, etc.)(WHO, 2008, 2016). In many cases, such data are collected and collated by WHO and can be used to understand what interventions have already taken place and thus assist with implementing the HPOP Billion. It is intended that information on policy implementation and legislation will be reported and tracked alongside the HPOP Billion. Countries will not be required to provide such data, but where available it will be presented.

6.4 Calculating the Healthier Populations Billion

The healthier lives approach adds up lives by counting people who have become healthier. To introduce the concept, consider the simplified case of zero population growth and no one getting more than one improvement in healthiness. In this case, the contribution to the billion from an indicator *i,* would be:

$$Contribution_i = pop_i \times \Delta p_i$$

where pop_i is the population relevant to indicator *i* (e.g. adult population aged 15+) and,

Δp_i is the change in prevalence (expressed as a proportion) for indicator i over a period of time.

For example, in a given country, if the adult population (age 15+) is 1 million and the prevalence of no tobacco use is 81% at the start of the period and 83% at the end of the period, then

$$Contribution_{tobacco} = 1\,000\,000 \times 0.02 = 20\,000$$

The healthier lives calculation uses the above approach as its basis, but additionally deals with population growth and allows for double counting when adding contributions up across several indicators.

Reducing double counting

It is likely that there will be some overlap in which populations receive benefits from more than one indicator. For example, some people may both stop smoking and gain access to clean water.

The double-counting correction is used when adding up contributions to the HPOP Billion and ensures that the contribution to the Healthier Populations (HPOP) Billion can never exceed the country population. It is a simplified, first-level correction that aims to address the concerns of Member States, whilst being realistic about available data sources. This compromise limits overcounting of contributions. The correction also takes account of the fact that not all indicators are improving, and that not all indicators apply to all age groups. Details of the form of the correction for double counting are given in Appendix E.5.

Handling population growth

The HPOP Billion must count lives that are newly healthier because of intervention, and not lives that are newly healthier simply due to population growth.

As with the UHC and Health Emergencies (HEP) billions, population growth is handled using a counterfactual approach (see Section 3.6**Error! Reference source not found.**). This compares what might have happened if o additional interventions had taken place with what actually happened. For example, in the case of tobacco use, the status quo would be that the prevalence of tobacco use at the end of the period would be the same as at the start of the period. The benefit of any intervention can be measured by the change in the prevalence of tobacco use. To convert this into a contribution towards the billion, this would be multiplied by the population at the end of the period.

The counterfactual approach outlined above provides a robust method of calculation. Alternative and more general forms of handling population growth are also possible and are considered in Appendix B.1

Negative contributions

Negative contributions to the HPOP Billion can occur if an indicator prevalence has deterioirated over time. Negative contributions point to where there is an ongoing problem and where particular attention is needed. This is likely to be especially important for overweight and obesity, for air quality and for alcohol. Results will be reported to give a breakdown of healthier lives, indicating improved and worsening situations by indicator (see Section Appendix E.7).

6.4.1 Example country calculation for HPOP Billion

This section provides an example calculation of the HPOP Billion. It should be noted that WHO intends to provide online tools that will allow countries to carry out these calculations, especially the double-counting adjustment. The details provided here are to aid understanding.

Step 1: Transforming the data

All indicators are transformed so that 0 represents least healthy and 100 represents most healthy (Table 6.1; Table 6.2). For example, for safe sanitation the data are already on this scale and no adjustment is made, whereas for tobacco the rescaled value is 100 minus the original value. For the non-prevalence indicators, the transformations are more complex but are described in Appendix E.2.

Table 6.2 Example country calculation for the Healthier Populations Billion [update]

Billion topic description	Prevalence at start 2018		Prevalence at end 2023		Change in Prevalence	Relevant population (millions)	Contribution to HPOP Billion (millions)
	(Raw value) **Transformed value**						
Safe sanitation	(62.37),		(65.20),		2.83	85.4	2.4
100 – tobacco use	(30.80),	**69.20**	(29.10),	**70.90**	1.70	66.0	1.1
Reduced alcohol (§)	(2.20),	**81.25**	(2.00),	**82.95**	1.42	66.0	0.9
100 – child stunting	(12.50),	**87.50**	(9.90),	**90.10**	2.60	6.2	0.2
100 – suicides	(8.40),	**99.16**	(7.30),	**99.27**	0.09	85.4	0.1
Healthy fats (§)	(0.00),	**85.70**	(0.00),	**85.70**	0.00	85.4	0.0
100 – child wasting	(0.99),	**99.01**	(1.85),	**98.15**	-0.86	6.2	-0.1
100 – child overweight	(9.73),	**90.27**	(11.12),	**88.88**	-1.38	6.2	-0.1
100 – obesity (5–19)	(7.9),	**92.10**	(9.8),	**90.20**	-1.90	19.9	-0.4
Road safety (§)	(8.90),	**97.01**	(12.30),	**95.87**	-1.90	85.4	-1.6

Ambient air quality (§)	(34.43),	**65.57**	(37.21),	**62.79**	-2.78	85.4	-2.4
100 – obesity (adult)	(28.2),	**71.80**	(32.2),	**67.80**	-4.00	62.6	-2.5
100 – partner violence	No data		(11.00),	**89.00**	NA	62.6	**-**
Clean fuels			No data			85.4	-
Safe drinking water			No data			85.4	-
Child development			No data			6.2	-
100 – child violence			No data			6.2	-

(§) Indicates where a transformation to prevalence is used

Notes: Change in prevalence is multiplied by the relevant population in order to quantify the contribution to the HPOP Billion. Data are available for 12 of the 17 possible indicators (two indicators are used for obesity for two age ranges). Indicators without data for this country will simply not be counted into the HPOP Billion. Prevalence change shows the 5-year change in the indicator for the transformed values. The "relevant population" is the population to which the indicators apply, e.g. the number of children under 5 for wasting. The "healthier people" column shows the number of additionally healthier people over the 5-year historical period.

Step 2: Convert change to number of healthier people

To convert the change in prevalence into a number of healthier people, the change in prevalence as a proportion is multiplied by the relevant population at the end of the 5-year period. For example, for alcohol this is the population of 15+, whereas for stunting this is the population of children under 5.

For example, for stunting, the change in prevalence is 2.6 and the population of children under 5 is 6.2 Hence:

$$Healthier\ lives\ due\ to\ reduced\ stunting\ =\ 6.2 * 2.6/100\ =\ 0.14\ Million$$

Step 3: Total number of healthier people and adjust for double counting

It is expected that there will be some overlap in who benefits from change in the indicators i.e. double counting. The number of additional healthier lives and the number of additional less healthy lives is calculated using the double-counting adjustment detailed in Appendix E.2. The contribution to the HPOP Billion is the net number of newly healthier lives, and is the difference between the number of additional healthier lives and the number of additional less healthy lives (Table 6.3). In this case, there has been a decline in healthier lives due to worsening air quality, road safety and obesity.

Table 6.3 Example country contributions to Healthier Populations Billion

Newly healthier lives	4.6 million
Newly unhealthier lives	–6.8 million
Contribution to billion = net healthier lives	**–2.2 million**
Final population	85 million
% population leading healthier lives	**–2.6%**

6.4.2 Identifying country shares of the Healthier Populations Billion

For healthier populations, all countries are encouraged to make progress. Several of the indicators, such as obesity, are important in countries of all levels of income. For the HPOP Billion to be achieved in a world of 8 billion people (by 2023), this would represent 1 in 8 people worldwide living healthier lives. An indicative guideline is proposed for which progress should be shared out in proportion to the population of each

country; each country would aim for 1 in 8 people to be healthier. This is indicative – countries may choose their own objective.

6.5 Limitations of the healthier lives approach

The healthier lives approach is a first step in measuring changes in population healthiness and its use is tied specifically to the GPW13 programme. The method has several known limitations. The GPW13 indicators are less than optimal for measuring non-health-sector healthiness – they do not include all environmental, behavioural and social risks affecting healthiness, and they do not cover all aspects of the life course equally.

An important disadvantage of the approach is that disparate impacts of interventions on individuals, such as access to clean air, access to safe sanitation, and avoiding partner violence, are given equal weight. For example, cessation of smoking typically has a greater impact on health than access to clean sanitation – but is weighted equally. More complex approaches were also considered, including a simplified weighting scheme but, on balance, the simpler approach is preferred (see also Appendix E.4, Appendix E.6).

The measurement approach taken here is an initial, relatively simple approach that provides a practical way forward, given the constraints of the GPW13 programme and the requirement that the method can be assimilated by Member States. The accuracy of the HPOP Billion will additionally be limited by the time delays in obtaining data (which may require extrapolation/projection of data) and the gaps in datasets: healthier lives are currently calculated only where estimates for indicators are available.

Further discussion of recognized limitations may be found in Appendix B.1 and Appendix E.6.

6.6 Healthier populations for the future

It is anticipated that lessons will be learned during GPW13 and that our understanding of the best way to measure changes in world population healthiness will develop further. This may inspire a broader and more general and comprehensive index of healthiness. Whilst the approach detailed here captures change in several key risk factors linked to healthiness, it does not provide a comprehensive coverage of factors and sectors. We are likely to wish to revisit the selection of indicators beyond GPW13.

A more general index and framework for healthiness could be envisaged, with a broader coverage of sectors and factors, and with more balancing across the life course and more comprehensive adjustments for population growth and double counting. A future index, with more flexibility and time for reflection over choice of indicators, could use policy indicators, or more sophisticated accounting, such as weighting by health gain (e.g. DALYs averted) (WHO Thirteenth Programme of Work Expert Reference Group, 2019).

7 Healthy life expectancy (HALE)

Healthy life expectancy (HALE) quantifies expected years of life in good health at a particular age, and is a summary measure of the overall health of populations. It is used within GPW13 as an overarching and comparable measure that monitors the overall progress made in achieving the Triple Billion targets.

HALE has been selected because it can be used to monitor the overall progress made and because of its alignment with SDG 3. It will be used for GPW13 baseline reporting and monitoring in future years for each Member State. HALE will facilitate cross-country comparisons and comparisons within countries over time.

HALE is currently reported annually as part of the WHO's Global Health Estimates (GHE) and also as part of the Global Burden of Disease (GBD).

WHO is tasked with developing standard guidance, and providing tools and technical assistance to Member States to help them apply standardized methods to measuring and reporting on HALE.

7.1 Calculation of HALE

HALE is estimated using Sullivan's method (Sullivan, 1971). Two main variants of this method exist – the conventional approach and the GBD approach. Both approaches share the same conceptualization but differ in the levels of precision of the disability measurement (e.g. whether severity of the health conditions or disability is accounted for), depending on the availability of corresponding information in the data inputs. The GBD approach is the most widely used method for the estimation of HALE, being used by institutions such as WHO and IHME, although with some differences in data inputs (Hay *et al.*, 2017; Mathers and Ho, 2018)

In the simpler **conventional approach**, prevalence of disability from population-based, nationally representative surveys are used. The input data are:

1. sex-specific period life tables by country
2. age-sex-specific prevalence of overall morbidity, preferably adjusted for severity although not commonly practised, by country.

For each age-interval, the total person-years lived in the period life table is partitioned into those lived in healthy and unhealthy states, using the prevalence of overall morbidity as the fraction.

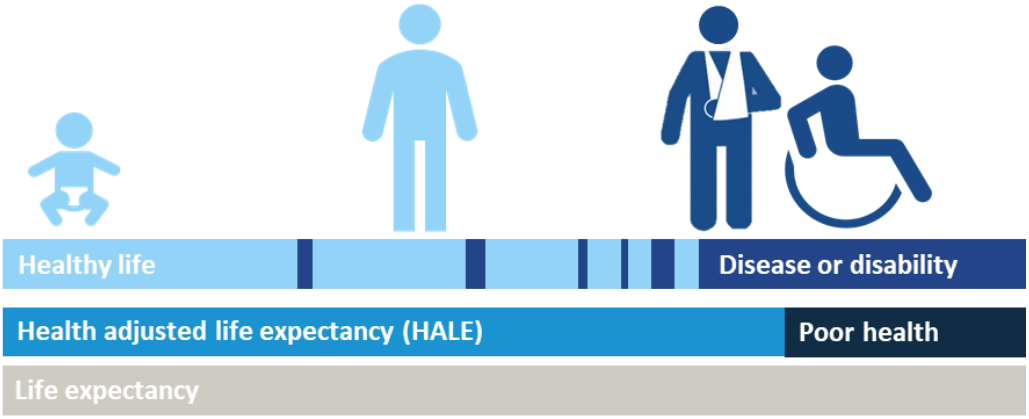
In the **GBD approach** the input data are:

1. sex-specific period life tables by country
2. age-sex-specific estimates of years of healthy life lost due to disability (YLD) by cause across a comprehensive set of disease and injuries, adjusted for severity.

By summing YLD over all causes and adjusting for independent morbidity by country, age, and sex, the fractions of years of healthy life lost in total years lived by each age-sex-country group are derived. For each age interval, the corresponding fraction is then used to partition the years lived in the period life table into years lived in healthy and unhealthy states.

In both methods, to estimate HALE at age x, the total person-years lived in a healthy state in all age intervals above age x are summed and divided by the survivor at age x in the period life table. The GBD approach will be used to calculate HALE for the GPW13 impact framework.

Fig. 7.1 Difference between life expectancy and healthy life expectancy



Note: The top bar illustrates that different forms of disability condition can occur at varying stages along one's life course, and is not adjusted for the severity of the condition. In contrast, HALE (second bar) is severity adjusted.

Life Expectancy (LE): a measure of **length** of life.
The average number of years a person is expected to live.

Healthy life expectancy (HALE): a more comprehensive measure assessing both the **length** and **quality** of life.
The average number of years that a person is expected to live in good health, accounting for years lived in less than full health due to diseases and/or injury.

7.2 Contribution of the Triple Billions to HALE

Ideally, the contribution of each of the Triple Billions to changes in HALE will be quantified. It requires that underlying data are available to quantify the impact of improvement in indicators of the Triple Billions on overall mortality and cause-specific morbidity. A particular issue will be to deal with some of the direct health-related overlaps between the indicators used in the Triple Billions (e.g. vaccines in both the UHC Billion and the HEP Billion) and the indirect overlaps when an indicator of a risk factor or intervention and its related health outcome appear in more than one of the Triple Billions (e.g. tobacco smoking in the UHC Billion and HPOP Billion, and high blood pressure due to smoking in the UHC Billion). Given the extensive additional data that will be needed for the calculations and the complex analysis, it remains a challenge to develop a cost-effective method tailored for GPW13 to attribute changes in HALE to the Triple Billions.

7.3 Equity for HALE

HALE estimates will be calculated at the country level and disaggregated by sex, allowing for between-country and within-country inequality monitoring. Comparisons between countries can be made based on country income, e.g. by comparing the situation in low-income countries with the global average. Ideally, the situation should be improving faster in low-income countries in order to close existing gaps and reduce between-country health inequities. Moreover, within-country sex-related inequalities can be compared across countries.

In the future, it is hoped that in some countries subnational estimates of HALE can be calculated. This will require disaggregation of disease burden subnationally. HALE may additionally be subdivided by life-course stage.

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Appendices

Appendix A Outcome indicators

Appendix A.1 Example of metadata for one of the outcome indicators (SDG 1.5.1)

Milestone 1	Reduce the number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population
Indicator	Number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population
SDG/Core 100	SDG 1.5.1
Definition	This indicator measures the number of people who died or went missing from disasters per 100 000 population.
Method of estimation/calculation	$\frac{\text{Number of deaths attributed to disasters}}{Global\ population} * 100\ 000$
Numerator	Number of deaths attributed to disasters: The number of people who died during the disaster, or directly after, as a direct result of the hazardous event. The Sendai Framework and SDG 1.5.1 do not include deaths that are conflict-related, or violent deaths.
Denominator	Global population
Preferred data sources	Data are available from the Sendai Framework monitoring platform, overseen by UNISDR (https://sendaimonitor.unisdr.org/). Sendai Framework Focal Points provide the data. In most countries, disaster data are collected by line ministries and national disaster loss databases are established and managed by special-purpose agencies, including national disaster management agencies, civil protection agencies, and meteorological agencies. The Sendai Framework Focal Points in each country are responsible for data reporting through the Sendai Framework Monitoring System.
Other possible data sources	Disaster loss data for Sustainable Development Goals and Sendai Framework Monitoring System (DesInventar Sendai; https://www.desinventar.net/); Global Health Observatory; International Disaster Database (EM-DAT; https://www.emdat.be/)
WHO GPW13 Framework	
Disaggregation	Country (country population as denominator); hazard type
Expected frequency of data collection	Annual
Limitations	Currently data from UNIDSR and UNSD are available for only 73 countries in 2017. Data availability are expected to increase during the period. Data disaggregated by hazard type (e.g., biological, climatological, hydrological) will be available in future years allowing for narrowing the scope to hazards pertinent to health emergency responses.
Data type	Rate
Related links	Official SDG Metadata URL: https://unstats.un.org/sdgs/metadata/files/Metadata-01-05-01.pdf <to be updated with new docs> Internationally agreed methodology and guideline URL:

	Technical guidance for monitoring and reporting on progress in achieving the global targets of the Sendai Framework for Disaster Risk Reduction (UNISDR 2017) https://www.preventionweb.net/files/54970_collectionoftechnicalguidancenoteso.pdf Other references: Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction (OEIWG). Endorsed by UNGA on 2nd February 2017. Available at: https://www.preventionweb.net/publications/view/51748

Appendix A.2 Availability of indicator data values for outcome indicators [to be updated]

Outcome indicator	Number of countries with no data, 2000-18	Number of countries with >=1 data point 2015 or later	Number of countries with trend data
SDG 1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	80	70	49
SDG 1.a.2 Proportion of total government spending on essential services (education, health and social protection)	2	190	190
SDG 2.2.1 Prevalence of stunting (height for age <-2 standard deviation from the median of WHO Child Growth Standards) among children under 5 years of age	51	38	38
SDG 2.2.2 SDG 2.2.2 Prevalence of malnutrition (weight for height <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (wasting)	52	38	38
SDG 2.2.2 Prevalence of malnutrition (weight for height >+2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (overweight)	53	36	35
SDG 3.1.1 Maternal mortality ratio	13	181	181
SDG 3.1.2 Proportion of births attended by skilled health personnel	11	95	95
SDG 3.2.1 Under-5 mortality rate	0	194	194
SDG 3.2.2 Neonatal mortality rate	0	194	194
SDG 3.3.1 Number of new HIV infections per 1,000 uninfected population, by sex, age and key populations	65	129	128
SDG 3.3.2 Tuberculosis incidence per 100,000 population	0	194	194
SDG 3.3.3 Malaria incidence per 1,000 population at risk	87	107	107
SDG 3.3.4 Hepatitis B incidence per 100,000 population	0	194	0
SDG 3.3.5 Number of people requiring interventions against neglected tropical diseases	0	194	194
SDG 3.4.1 Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease	11	183	183
SDG 3.4.2 Suicide mortality rate	11	183	183

SDG 3.5.1 Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance use disorders	194	0	0
SDG 3.5.2 Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol	5	189	189
SDG 3.6.1 Death rate due to road traffic injuries	0	174	174
SDG 3.7.1 Proportion of women of reproductive age (aged 15–49 years) who have their need for family planning satisfied with modern methods	65	54	52
SDG 3.8.1 Coverage of essential health services	29	165	0
SDG 3.8.2 Proportion of population with large household expenditures on health as a share of total household expenditure or income (10% or 25% threshold)	76	3	3
SDG 3.9.1 Mortality rate attributed to household and ambient air pollution	11	183	0
SDG 3.9.2 Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)	11	183	0
SDG 3.9.3 Mortality rate attributed to unintentional poisoning	11	183	183
SDG 3.a.1 Age-standardized prevalence of current tobacco use among persons aged 15 years and older	48	146	146
SDG 3.b.1 Proportion of the target population covered by all vaccines included in their national programme: a. DTP3	0	194	194
SDG 3.b.1 Proportion of the target population covered by all vaccines included in their national programme: b. MCV2	30	164	162
SDG 3.b.1 Proportion of the target population covered by all vaccines included in their national programme: c. PCV3	60	134	130
SDG 3.b.3 Proportion of health facilities that have a core set of relevant essential medicines available and affordable on a sustainable basis	194	0	0
SDG 3.c.1 Health worker density and distribution: Doctors	1	145	145
SDG 3.c.1 Health worker density and distribution: Nurses	1	145	144
SDG 3.c.1 Health worker density and distribution: Dentists	6	118	117
SDG 3.c.1 Health worker density and distribution: Pharmacists	8	109	108
SDG 3.d.1 International Health Regulations (IHR) capacity and health emergency preparedness	0	180	179
SDG 4.2.1 Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex	123	26	0
SDG 5.2.1 Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by current or former intimate partner in previous 12 mths	119	28	0
SDG 5.6.1 Proportion of women aged 15–49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care	143	18	12
SDG 6.1.1 Proportion of population using safely managed drinking water services	109	84	84

SDG 6.2.1a Proportion of population using safely managed sanitation services	117	77	77
SDG 6.2.1b Proportion of population using a hand-washing facility with soap and water	117	70	70
SDG 7.1.2 Proportion of population with primary reliance on clean fuels and technology	87	88	88
SDG 11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)	4	190	0
SDG 16.2.1 Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month	111	27	0
Health Emergencies: Vaccine coverage of at-risk groups for epidemic or pandemic prone diseases	194	0	0
Health Emergencies: Proportion of vulnerable people in fragile settings provided with essential health services	194	0	0
WHA68.7: Patterns of antibiotic consumption at national level	194	0	0
Percentage of bloodstream infections due to antimicrobial resistant organisms	194	0	0
WHA66.10: Prevalence of obesity: 5-19 years	4	190	190
WHA66.10: Prevalence of obesity: Adult	4	190	190
WHA66.10: Age-standardized prevalence of raised blood pressure (BP) among persons aged 18+ years (systolic BP >140 mmHg and/or diastolic BP >90 mmHg) and mean systolic BP	4	190	190
WHA66.10: Protection of the population of a country by effective policy/regulation on industrially produced trans fatty acids (TFA)	78	116	116
WHA68.3: Eradicate poliomyelitis	0	168	168

Appendix B Triple Billion concept

Appendix B.1 Handling population growth

In the context of the Triple Billions, it is important to consider carefully how to handle population growth: in particular, how the additional people in a population will impact each of the Triple Billions. We wish to avoid the situation where the Triple Billions can be achieved by population growth alone (e.g. adding in all new non-smokers for the Healthier Populations Billion). Conversely, without care, a decline in population could cause negative contributions to the Triple Billions, even where indicators have improved.

Handling population growth for GPW13

The GPW13 method for calculating the billions uses a simple robust approach to population growth, which is to calculate the change over 5 years and multiply by the final population.

$$Contribution_i = pop_{end} \times (prev_{i-end} - prev_{i-start})$$

For example, for healthier populations this would be the change in prevalence of an indictator times the population. The approach can be interpreted as comparing (a) what might have happened if no additional interventions had taken place (the status quo) with (b) what actually happened. This assumes a counterfactual scenario: without intervention, the counterfactual scenario would be that the additional population would have the same proportion of smokers as the baseline population. In the case of tobacco use, the status quo would be that the prevalence of tobacco use at the end of the period would be the same as at the start of the period. The benefit is then measured as the change in prevalence of tobacco use multiplied by the population at the end of the period. This is a good approximation for many indicators but may be less desirable for indicators where population growth requires increased investment to maintain service levels.

Note that it is not practical within GPW13 to deal with population growth by tracking changes in population age structure. For most SDG/GPW13 indicators we do not know the breakdown by age. Also, the level of complexity would be disproportionate to the rest of the approach.

Alternative population growth approach

A more complex population growth method was also evaluated for use in GPW13. The approach assumed that population growth should be treated differently for different indicators (and countries). For example, indicators such as water and sanitation require additional resources to maintain the same prevalence of access to safe water for a larger population. This is because, without intervention, the larger population would have proportionally less access to safe water than the current population (the additional population would "dilute" access to safe water). This generalization is more flexible but also requires estimation of a parameter and was complicated by cases where there is a decline in the population. At present, the use of the simpler but robust approach described above is preferred.

Appendix B.2 General limitations of the Triple Billion methods

Limitations linked to indicators

The GPW13 Triple Billions are calculated using only GPW13 indicators. These are mainly SDGs, respecting the wishes of countries to minimize the burden of additional data collection. A consequence is that some indicators are non-optimal for counting the Triple Billions as they are not fully representative of relevant health issues and risks, and other obvious key indicators are missing. They do not cover the life course equally, and they include several proxies that need rescaling before they can be used.

Limitations linked to data availability

There are many gaps in data availability of the GPW13 indicators, even for the SDG datasets. Issues include availability of estimates and availability of the underlying or primary data (Section 3; Appendix A.2). Measurements are often only made every few years and there can be significant lags in time before estimates become available. Issues with data timeliness will be a major challenge, given the time-frame of the GPW13 programme and the need to estimate change by 2023. Unless the timeliness of data improves, projection and forecasting may be required.

Limitations linked to lack of supporting information

The Triple Billions combine information from several component indicators. However, there is a lack of information on how datasets are interconnected (correlated) and how changes in indicators fit together. For example, it is not known how improvements in UHC service coverage link with levels of financial hardship; or how different improvements in healthier lives may be distributed within sub-populations. In the absence of this information, it has been necessary to use simplifying assumptions in the calculations.

Limitations linked to methodology

The Triple Billion measurement calculations are kept relatively simple, in keeping with the purposes of the specific billion and the requirement that the methods can be assimilated by all Member States. The focus has been to begin with a practical way forward, avoiding complexities where possible. For example, in the HPOP Billion the indicators are unweighted, despite differences in relative health impacts (Appendix E.4). Population growth uses a basic approach, neglecting differences between indicators in the interplay between population growth and impact.

Limitations linked to overlaps

The Triple Billions include some overlaps. For example, some indicators feature in more than one of the billions (e.g. tobacco use in the UHC and HPOP billions; IHR in UHC and HEP billions). There are also overlaps caused by related indicators, e.g. blood pressure and tobacco use.

Limitations linked to uncertainty

It is anticipated that the uncertainty in the estimated contributions to the billions will be considerable. This reflects issues with data that include representativeness, quality, data frequency and reporting delays. Noise in the data due to sample size and measurement errors, especially those spread over time, will add to uncertainty. Smoothing and use of consistent estimates will be used when available; even so, it is likely that interpolation and extrapolation will be needed, and these too will add to uncertainty.

Limitations linked to time delays

Interventions put in place during GPW13 may not produce effects quickly enough to be measured by 2023. GPW13 is likely to measure, in part, actions taken before the start of the GPW13 programme.

Appendix C Universal health coverage

Appendix C.1 Tracer indicators for UHC service coverage

14 tracer indicators are used to calculate Average Service coverage. These are based on the SDG 3.8.1 tracer indicators (UN Statistics Division, 2018) with the following adjustments.

Table C.1.1 Tracer indicators for UHC service coverage

Tracer area	Indicator Definition	SDG Indicator	Preferred Data source	Proxy Indicator	GPW13 Rescaling (unscaled) -> (rescaled)	Adjustments Made from SDG3.8.1
Reproductive, maternal, newborn and child health						
Family Planning	The percentage of women of reproductive age (15–49 years) who desire either to have no (additional) children or to postpone the next child and who are currently using a modern contraceptive method.	SDG 3.7.1	National population-based survey			
Pregnancy and delivery care	Percentage of women aged 15−49 years with a live birth in a given time period who received antenatal care, four times or more times from any provider.		National population-based survey			
**Child immunization	Percentage of infants receiving three doses of diphtheria-tetanuspertussis containing vaccine	SDG 3.b.1	National population-based survey/ routine facility information system			
Child treatment (care-seeking for symptoms of pneumonia)	Percentage of children under 5 years of age with suspected pneumonia (cough and difficult breathing NOT due to a problem from a blocked nose) in the two weeks preceding the survey taken to an appropriate health facility or provider.		National population-based survey			
Infectious diseases						
Tuberculosis	Number of new and relapse cases that were notified and treated in a given year, divided by the estimated number of incident TB cases		Routine facility information system / surveillance systems			

	in the same year, expressed as a percentage.					
HIV/AIDS	Percentage of people living with HIV currently receiving ART among the estimated number of adults and children living with HIV.		Routine facility information system			
Malaria	Percentage of population in malaria-endemic areas who slept under an ITN the previous night [only for countries with moderate to high transmission in sub Saharan Africa]		National population-based survey			Denominator adjusted to capture only at-risk population
**Water and sanitation	Percentage of households using improved sanitation facilities		National population-based survey			
Noncommunicable diseases						
Hypertension	Age-standardized prevalence of raised blood pressure among persons aged 18+ years (defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg), and mean systolic blood pressure.		National population-based survey (in which blood pressure was measured, not self-reported)	X	(50%-100%) -> (0-100%)	
Diabetes	Age-standardized prevalence of raised blood glucose/diabetes among persons aged 18+ years or on medication for raised blood glucose (defined as fasting plasma glucose value ≥ 7.0 mmol/L (126 mg/dL) or on medication for raised blood glucose among adults aged 18+ years)		National population-based survey	X	(7.1 - 5.1 mmol/L) -> (0-100%)	
Tobacco	Age-standardized prevalence of current tobacco use among persons aged 15+ years.	SDG 3.a.1	National population-based survey	X	(32% - 100%) -> (0-100%)	Rescaling adjusted as SDG 3.8.1 method (50%-100%) - > (0-100%) did not

						include all MS values
Service capacity and access						
Hospital access	Total number of hospital beds per 10 000 population		Routine facility information system/national database	X	(0-18 per 10 000) -> (0-100%)	
Health workforce	Density of health workers per 10 000 population (doctors + nurses and midwives)	SDG 3.c.1	Health worker registry	X	(0-155 per 10 000) -> (0-100%)	Adjusted indicator from (physicians, psychiatrists and surgeons) to (physicians and nurse/midwives)
Health security	Percentage of attributes of 13 core capacities that have been attained at a specific point in time. The 13 core capacities are: (1) National legislation, policy and financing; (2) Coordination and National Focal Point communications; (3) Surveillance; (4) Response; (5) Preparedness; (6) Risk communication; (7) Human resources; (8) Laboratory; (9) Points of entry; (10) Zoonotic events; (11) Food safety; (12) Chemical events; (13) Radionuclear emergencies.	SDG 3.d.1	Key informant survey	X		

Two adjustments to the 14 SDG 3.8.1 tracer indicators have been made for GPW13. These include:

Tobacco non-smoking: The rescaling of the prevalence of non-use of tobacco has been adjusted to include all observed values (since 2000). The range 32% is rescaled to represent zero service coverage, and 100% to represent 100% service coverage.

Health work force density: The health work force indicator has been improved to measure the density of physicians, nurses and midwives. The indicator is more closely aligned with the SDG 3.c.1 Health worker density and distribution, for which the data availability has made recent significant progress – the three categories of health workers represent more than half of the health work force. This indicator is a proxy for service coverage, and is rescaled using a maximum density of 154.74 per 10 000 population, which is the 95th percentile across all national densities from 2000 to 2017. Densities above that level are reset at 100%. The indicator replaces the SDG 3.8.1 tracer for physicians, psychiatrists and surgeons for which data availability is poor, and which neglects the large and important catergory of nurses.

Note, the remaining four proxy indicators were examined to determine if the (re)scaling could be improved, but there was no case for adjustment. Three of the proxies are problematic and not good measures for judging service coverage (fasting blood glucose, hospital beds, prevalence of normal blood pressure). There is insufficient (SDG) data for an alternative at this stage.

Appendix C.2 Comparing arithmetic and geometric averages

Average service coverage (ASC) is used to measure the percentage of needed services that are provided at a population level. It is calculated as the nested arithmetic average of 14 tracer indicators (Section 4.3). The use of an arithmetic average in place of geometric average allows a better and simpler interpretation of changes in service coverage at the population level so as to calculate people benefiting from UHC.

An arithmetic mean is always higher that the geometric mean (for positive valued data). Geometric means are highest when indicators have similar values, but can be much reduced relative to an arithmetic average if, say, there are one or two indicators with much lower values than the rest. Depending on the exact changes in indicators, a change in one indicator can sometimes make a disproportionately small or large effect on the geometric mean. The use of an arithmetic average is considerably more intuitive when considering change. For the data in question, we anticipate seeing somewhat smaller increases in ASC over time than might have been seen for the geometric average.

The use of arithmetic means in place of geometric means results in some differences in the observed level of service coverage and change over time. Service coverage tends to be higher when using arithmetic mean compared to the geometric mean for countries with low average service coverage (Fig. C.2.1). The change in service coverage between 2012 and 2017 when using arithmetic means tends to be lower for countries that made significant progress compared to countries that made less progress (Fig. C.2.2). The change in relative ranking between countries is not majorly affected (e.g. the top five and top bottom countries remain exactly the same).

Fig. C.2.1 Nested geometric average versus nested arithmetic average of service coverage, 2017

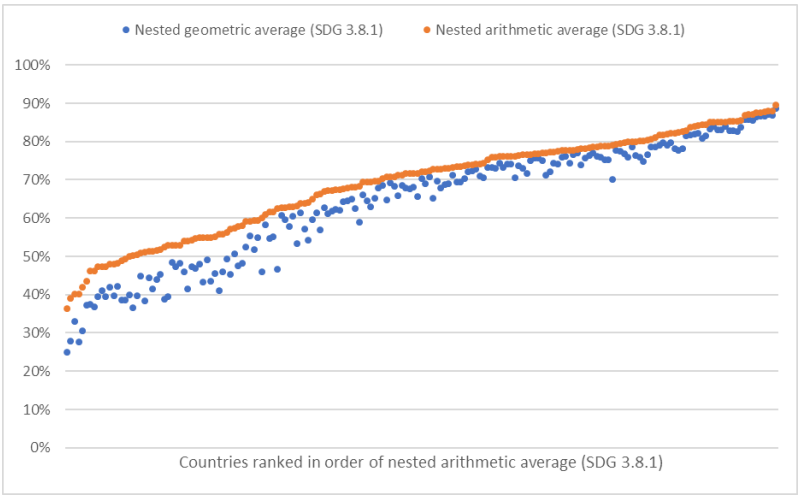


Fig. C.2.2: Change in percentage points using nested geometric average versus nested arithmetic average of service coverage, 2012–17

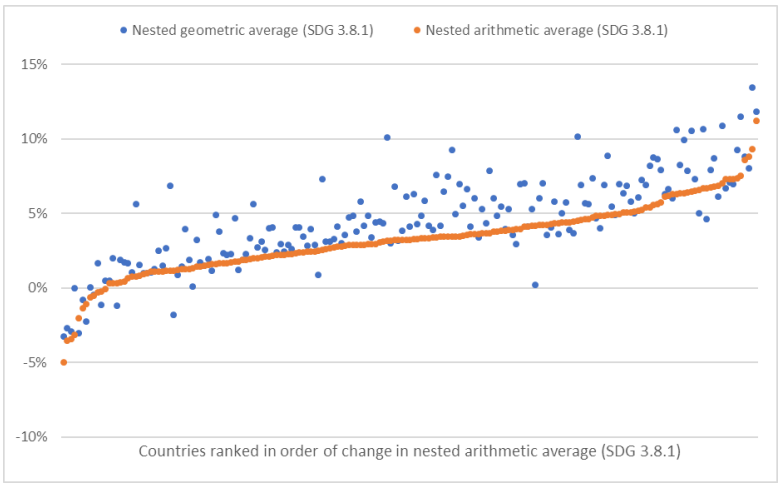
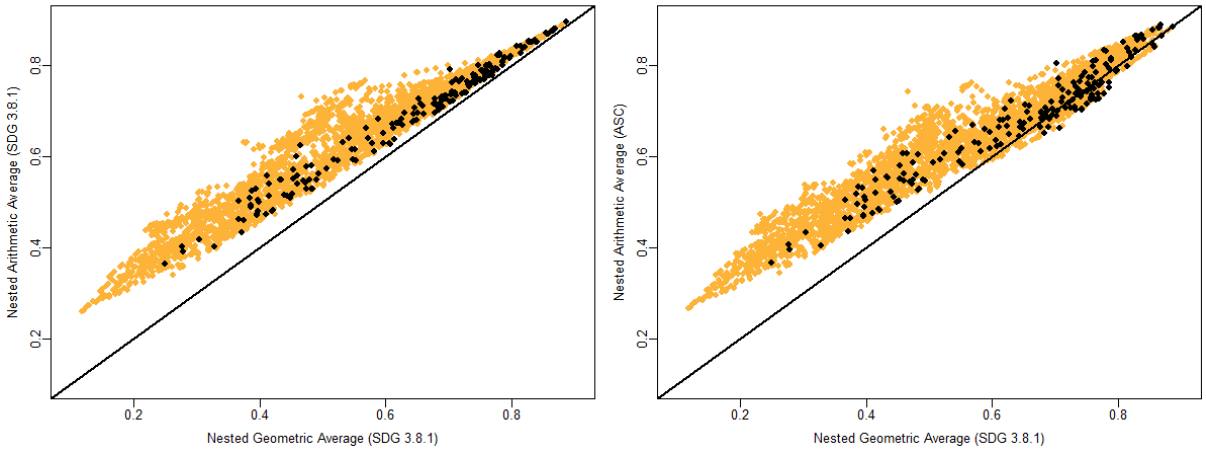


Fig 0.1 below compares the geometric SDG 3.8.1 UHC index of service coverage and the arithmetic average service coverage (ASC) of the 14 tracer indicators. In the left hand plot the scatter and non-linearity are the result of the different averaging approaches; in the right hand plot, the effect of the adjustments made to the indicators for the UHC Billion is included.

Fig. C.2.3 Relationship between (a) SDG 3.8.1 UHC Index (nested geometric) and the nested arithmetic averages of the same 14 tracer indicators, and (b) SDG 3.8.1 UHC Index and the ASC (with revised health work force and tobacco)



Note: Indicators for service coverage for 183 countries; data estimates for 2000 to 2017, with values for 2017 shown in black.

Appendix C.3 Infilling and extrapolation of UHC indicators

There are many gaps in primary data availability for the UHC service coverage tracer indicators, particularly for recent years (2015–onwards). Across UHC service coverage tracer indicators, in 2019, over a quarter of the latest country data points pre-dated 2010. For estimation of UHC average service coverage (ASC), tracer indicators will be infilled and extrapolated. This is likely to follow the approach used in recent UHC reports (WHO & World Bank, 2017; WHO, 2019c). This included

- Using a validated model to provide estimates. This was used for: met need for family planning (FP); diphtheria-tetanus-pertussis, three doses (DTP3); HIV (ART) coverage; tuberculosis case detection and treatment (TB); \ use;ccess to at least basic sanitation (WASH); prevalence of non-elevated blood pressure (BP); mean fasting plasma glucose (FPG); and prevalence of tobacco non-use (TOB).
- Linearly interpolating between available data points and/or extending latest reported value to subsequent years when no newer data are available.
- Imputing from countries with similar characteristics (WHO region or World Bank income group). This is used when no data points exist for an indicator for a country.

For financial hardship, data will also likely be infilled using a mixture of interpolation and extrapolation similar to that described above. Note that where insufficient recent data are available, it may not be possible to calculate a country-based UHC Billion contribution.

Appendix C.4 UHC and "full" (85%) service coverage

The WHO has previously estimated the number of people globally who are considered to have "full" UHC service coverage (WHO, 2019c). This method uses additional data sets to measure average service coverage and then combines this with co-coverage data to convert average coverage to "full" coverage, i.e. ≥85% of essential services. The average service coverage uses eight of the SDG 3.8.1 indicators but adds four additional tracer indicators. For co-coverage, household survey data on maternal and child health intervention are used to estimate co-coverage. This is based on a series of regressions relating co-coverage of these health interventions to determine who has 85% of services needed. At present, there is very limited data on co-coverage and it covers only some child/maternal health services (i.e. not the range of services included in SDG 3.8.1). This adds considerable uncertainty to the calculation. The method can only sensibly be used to estimate contributions to the UHC Billion at a regional or income-group level and does not allow country contributions to be measured.

The above approach is not recommended for counting the UHC Billion. It is a more complex approach, with greater uncertainty and requiring more data and analysis. The results are sensitive to the choice of threshold, and to any extensions to the service-coverage indicators. It is not suitable for calculation by countries because insufficient data are available for estimation at a country level.

How different are average service coverage and the 85% service coverage approach?

The GPW13 Billion average service coverage (ASC) approach and the 85% service coverage approach are both valid ways to count how many people have UHC – although the concept and interpretation is a little different. ASC provides a simpler, more robust, more transparent approach, better suited to use by Member States for counting the GPW13 UHC Billion.

The UHC 2019 report estimates that at current rates the increase in population with UHC service coverage from 2018 to 2023 would be somewhere between 400 and 600 million people. Using the approach proposed for the UHC Billion, the likely increase in service coverage alone is around 350 milllion and that attributed to service coverage without financial hardship is around 300 million (both with considerable uncertainty). This is due in part to the use of arithmetic averaging, and in part due to the inclusion of the financial component which reduces the number of people estimated to have UHC.

With all approaches, considerable acceleration will be required if the UHC Billion is to be achieved.

Appendix C.5 Limitations of the UHC Billion

Representative service coverage indicators

The 14 service coverage tracer indicators do not adequately reflect the wide remit of UHC services (Hogan *et al.*, 2018; Lee, Wu and Liu, 2018). The indicators that were included in SDG 3.8.1 aimed to be representative of key essential services, but the choice was ultimately driven by availability of data. The index is heavily geared towards key issues in the developing countries and is less relevant to more developed countries [add ref]. There are no indicators that directly measure service coverage of NCDs (e.g. treatment for cancer, cardiovascular or mental disorders) and there are no measures of several key health services such as access to surgical care or to essential medicines, nor of mental or social support. Several of the service coverage indicators are considered sub-optimal and could be improved without necessarily increasing the burden of data collection (e.g. antenatal care, ITNs). Some indicators are recommended to be replaced as soon as is feasible (e.g. hospital beds).

Use of proxies for service coverage

Several of the UHC service coverage indicators are proxies in that they do not directly measure service coverage. These indicators provide some measure of level of service, however interpretation as a proportion of population is flawed. The interpretation of service coverage as a measure of population is limited by this issue.

Limitations of indicators for financial hardship:

Ideally, the UHC billion would use a measure of financial protection. In the UHC Billion the indicator used is a measure of financial hardship (Section; SDG 3.8.2). The complement of indicators of financial hardship do not measure financial protection. This is because the indicators of financial hardship track the impact of out-of-pocket payment resulting from using services. People not spending on health out of pocket can be due to:

- financial protection mechanisms in place to exempt (some) people from any direct payment on health
- financial barriers to access needed services, leading to unaffordable care (pointing to failures in financial protection).

It is not possible to differentiate between these groups of people in the absence of information on access and utilization of services.

The indicator of catastrophic health spending used within the SDG monitoring framework is easy to communicate and compute but has limitations when monitoring within-country socio-economic inequalities in experiencing financial hardship. It is anticipated that it will be refined or replaced once other approaches are systematically explored and compared.

Data availability

The UHC Billion calculations face major limitations linked to the availability of SDG data.

Data for service coverage components and for financial hardship would ideally be available annually or for the same year. For both service coverage and financial hardship, annual values will need to be estimated by infilling or extrapolation (Appendix C.3). The lack of recent data for financial hardship (catastrophic spending) and the long delays in obtaining new datasets is of particular concern. If not addressed, this could mean that many country-level estimates for the UHC Billion cannot be calculated. Even where some catastrophic health spending estimates are available, it may not be possible to estimate change. Where there are insufficient recent estimates available, the computation of the UHC billion may not be possible, or will be based on the assumption of no change in indicator values since the last meaurement.

The lack of a common data source for service coverage and financial hardship

The UHC SDG indicators 3.8.1 and 3.8.2 separately measure two dimensions of UHC. However, they are obtained from different data sources and cannot be used to determine within a given country who benefits from service coverage without financial hardship. For an accurate picture of the number of households and persons who benefit from service coverage without incurring catastrophic health spending, the two indicators would need to be collected within the same data source. This data does not currently exist.

The absence of jointly collected data at household level on financial hardship and service coverage means we have no real understanding of the interrelationship at household level between these two indicators. It is important to gather joint data on financial hardship and service coverage and better understand the joint distribution of these components. Nevertheless, this will not replace the individual service coverage data sources that are required for the service coverage component. A joint source would provide information relevant to how best to combine service coverage and financial hardship; it would not replace existing data sources for service coverage.

Assumption of independence (lack of correlation)

Given the lack of a joint data source at household or country level, it has been necessary to incorporate an assumption that service coverage and financial hardship components are independent (uncorrelated), and that each of the tracer indicators are not too heavily correlated. This assumption provides a first step, given the current lack of joint data. In reality, the underlying situation is complex, depending on many local factors and exactly which services are considered (e.g. some key services are free; services that cause catastrophic spending are not necessarily those included in the service coverage component). In high-income countries, financial hardship is likely to have a greater overlap with access to needed services, whilst in countries where out-of-pocket payments are the primary source of funding for the health system many people with catastrophic spending on health may not benefit from all needed services.

The assumption of independence may lead to biases in the estimation of the billion. Alternative approaches were considered during development of GPW13 but were not practical. These included developing models describing the co-distribution of level of service coverage and proportion of catastrophic spending. These lack suitable datasets and are too complex for use in GPW13. Use of a multidimensional index approach, e.g. arithmetic or geometric average of the two UHC dimensions, was also considered, recognizing that the two SDG indicators are measured separately. However, this approach does not allow a population equivalence for conversion to a UHC Billion.

Combining service coverage and financial hardship (restricted applicability)

The method used to combine service coverage and financial hardship (catastrophic health spending) is necessary for calculation of the UHC Billion. It has been constructed solely for this purpose. It does not

replace or amend any part of the existing SDG 3.8.1 indicators. It provides a first attempt at measuring change, at population level, of service coverage provided without catastrophic health spending. It should be anticipated that the approach will be refined or replaced once there is sufficient data for this to be practical.

Uncertainty of the UHC Billion

There are considerable uncertainties in estimates of both the service coverage and financial hardship components used in the billion. This reflects issues with data, including representativeness, quality, data frequency and reporting delays. Use of a proportional approach to combine the components will exacerbate this uncertainty by multiplying two uncertain numbers and then looking at change. It is anticipated that the uncertainty in the estimated contributions to the billion will be considerable.

Double counting

The SDG 3.8.1 component indicators include three indicators that are also included in other billions. These are safe sanitation and tobacco (also counted in the Healthier Population Billion) and International Health Regulations (used in the Health Emergencies Protection Billion). This double counting is not ideal but has been anticipated since the inception of GPW13 (WHO, 2019e).

Using population equivalence

The UHC Billion will calculate a population equivalence and not a number of individuals (this is also true for the other billions). If a population received an additional 10% of needed services without catastrophic health spending, then the contribution to the UHC Billion will be counted as equivalent to 10% of the population. In reality, the services will be distributed unevenly across the population (case 3 of Section 3.5). The approach differs from an alternative approach used in the WHO UHC reports (WHO & World Bank, 2017; WHO, 2019c) which estimated the global number of people receiving ≥85% of services (with no financial component). The latter is not suited to estimating the UHC Billion because it is complex to apply, it requires additional data beyond the SDG 3.8.1 indicators, and there are insufficient data for calculation at a country level (see Appendix C.4).

Quality of services/Effective service coverage

The GPW13 UHC Billion, like SDG 3.8.1 does not take into account quality/effectiveness of service coverage. Nor does it address accessibility. This is an important dimension of UHC.

Appendix C.6 Using historical data to estimate the UHC Billion

The UHC Billion will count change in UHC over a 5-year period. Initial calculations have been carried out for the historical 5-year period 2012-2017. These were based on infilled and extrapolated data for service coverage tracer indicators and for financial hardship (catastrophic spending). Recent data on financial hardship is particularly lacking. Two approaches were used. In the first, country contributions were only estimated if there was at least one SDG 3.8.2 estimate from 2012 onwards: this accounted for around 55% of the world population. The final figure was scaled up to account for the population with missing values. The second approach used regional estimates for the countries lacking data for financial hardship. With both approaches values were similar (given that the expected uncertainty is large). Based on this analysis, if the change seen over 2012–2017 continues at a steady rate, the number of additional people expected to benefit from service coverage would be around 350 million. Approximately 25 million additional people would suffer financial hardship. The total expected contribution to the UHC billion would be around 300 million. The figures are approximate, but the message is clear: considerable acceleration is needed for achievement of the UHC billion.

Appendix C.7 Stages in UHC Billion development [draft]

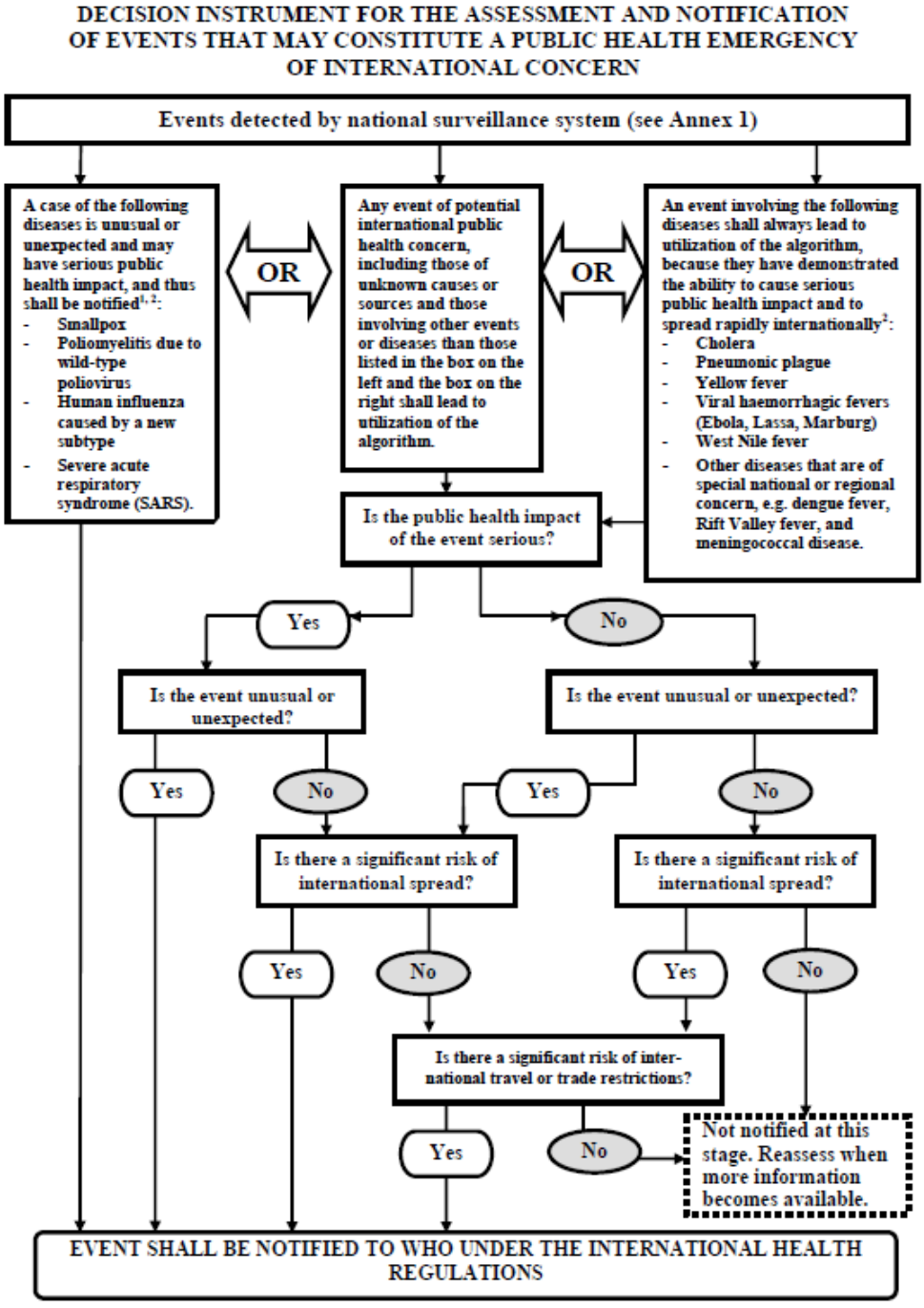
The method for calculation of the UHC Billion has undergone several phases. This is in recognition of the fact that the existing SDG 3.8 UHC has several limitations (Ng *et al.*, 2014; Fullman and Lozano, 2018, 2020; Wagstaff and Neelsen, 2020). For example, SDG 3.8.1 does not measure effective service coverage or accessibility of services. There are also concerns about the use of geometric averaging in the SDG. For several countries the relative values of the SDG 3.8.1 index do not conform to expectations.

Phases of the UHC Billion measurement discussion have included the following:

- a recommendation by GPW13 expert reference group (ERG) to create a new UHC index based on effective service coverage and using a matrix approach to types of care and the life course
- a submission by WHO to IAEG to request an update to the UHC SDG 3.8.1 method
- a rejection by IAEG to a change of method for now, and a request by IAEG that a simplified effective coverage approach be developed and piloted
- in response to a request from Member States not to increase the data burden, and given IAEG response, a decision by WHO to base GPW13 indicator on existing SDG 3.8
- proposal to base UHC Billion on the average seven service coverage tracer indicators (which directly translate into population) in response to an issue raised with use of SDG 3.8.1 in the Triple Billion because it does not directly translate to a population
- comments from countries and regions that it is confusing to have another index of service coverage and that SDG 3.8.1 is preferred
- compromise to use all 14 tracer indicators from SDG 3.8.1 but to use arithmetic averaging with minor adjustments to 2 of the tracer indicators.

Appendix D Health Emergencies Protection Billion

Appendix D.1 Emergencies detection decision instrument



[1] As per WHO case definitions.
[2] The disease list shall be used only for the purposes of these Regulations.

Appendix D.2 Initial estimation of the Health Emergencies Protection Billion [review]

The Health Emergencies Protection (HEP) Billion is a new concept and includes new indicators. Initial estimates of how the HEP Billion might look have been based on existing datasets to 2019. The estimates use the following simplifications:

- Prepare indicator: 2019 data reported for 155 countries. The data are reported via a new tool (SPAR), which began in 2018: this means it is too early to estimate future trend. Only the change observed so far is included in the 5-year estimate of the billion.
- Prepare indicator: uses trend estimates from the last three years and assumes this would to continue at the same rate over a 5-year period.
- Detect & respond indicator: uses an initial historical database that has been compiled from 344 IHR events over the last five years. This data is used to make a first estimate of the possible contributions that would arise at the end of 2023.

Using the above (conservative) estimates leads to an estimated total contribution to the HEP Billion of approximately 500 million. This will be improved upon if more countries begin to provide timeliness information. However, effort will be needed to ensure this billion target is met.

Appendix E Healthier Populations Billion

Appendix E.1 Choice of indicators for Healthier Populations Billion

Table E.1 lists the potential indicators that were considered for inclusion in the Healthier Populations (HPOP) Billion – these are the GPW13 indicators that have some focus beyond the health sector, most of which are health-related SDG indicators. The indicators not selected were excluded for the following reasons:

- Avoidance of mortality data, where there is an alternative exposure indicator (WASH, air pollution mortality), or where global burden is lesser (mortality due to poisoning)
- Main focus is inside the health sector, although impacted by health and non-health sector policies (e.g. access to contraception), and more relevant to health decisions (e.g. informed sexual choice).

Note that whilst stunting and wasting conditions should be handled by the health sector *once* they exist, they are caused by factors outside the health sector (e.g. social determinants, lack of safe water and sanitation, poor feeding practices, lack of education, etc). On these grounds, they are considered to belong in the HPOP Billion.

Table E.1 Indicators considered for Healthier Populations Billion [update]

		Data coverage						
	Indicator short name	High	Medium	Limited	Ovelaps with Health sector	Outcome	Prevalence	Policy measure
GPW13 indicators selected								
SDG 3.a.1	Tobacco use	●					●	
SDG 3.5.2	Alcohol (litres)	●						
SDG 3.6.1	Road deaths	●				●		
SDG 2.2.1	Childhood stunting <5		●			●	●	
SDG 2.2.2	Childhood wasting <5		●			●	●	
SDG 2.2.2	Childhood overweight <5		●			●	●	
WHA66.10	Obesity	●				●	●	
SDG 11.6.2	Mean particulates (PM2.5)	●						
SDG 7.1.2	Clean fuels	●					●	
SDG 6.1.1	Safely managed water		●				●	
SDG 6.2.1	Safely managed sanitation		●				●	
SDG 4.2.1	Developmentally on track u5			●		●	●	
SDG 5.2.1	Partner violence for women			●			●	
SDG 16.2.1	Violence against children			●			●	
WHA66.10	Protected from trans fats		●					●
SDG 3.4.2	Mortality due to suicide	●			●	●		
GPW13 indicators considered but not used								
SDG 3.9.1	Mortality ambient air pollution					●		
SDG 3.9.2	Mortality unsafe WASH					●		
SDG 3.9.3	Mortality poisoning.					●		
SDG 5.6.1	Informed sexual choice (F)				●		●	

Appendix E.2 Additional transformation details for non-prevalence indicators

This section provides further details of the transformations used for the non-prevalence indicators. Typically, existing external datasets are used to calibrate a transformation that can be applied without any ongoing need for the external data. The external data are only used in the initial calibration and will not be needed by countries.

Reduced harmful use of alcohol

The relationships between alcohol per capita consumption (APC) and prevalence of abstainers and prevalence of heavy episodic drinkers is approximately linear (Fig. E.2) and can be calibrated as follows:

prevalence heavy episodic drinkers (%) = beta x total APC (litres)

where beta = 2.99 (s.e. 0.067), r^2 = 0.91

prevalence abstainers (%) = 100 - alpha x total APC (litres)

where alpha = 5.96 (s.e. 0.137), r^2 = 0.91.

The contribution to the billion will be an estimate based on the increase in abstainers together with the reduction in heavy episodic drinkers. A proportion of those who stop heavy episodic drinkers will become abstainers. To avoid these people being counted twice, a correction is introduced – handled by the term f below.

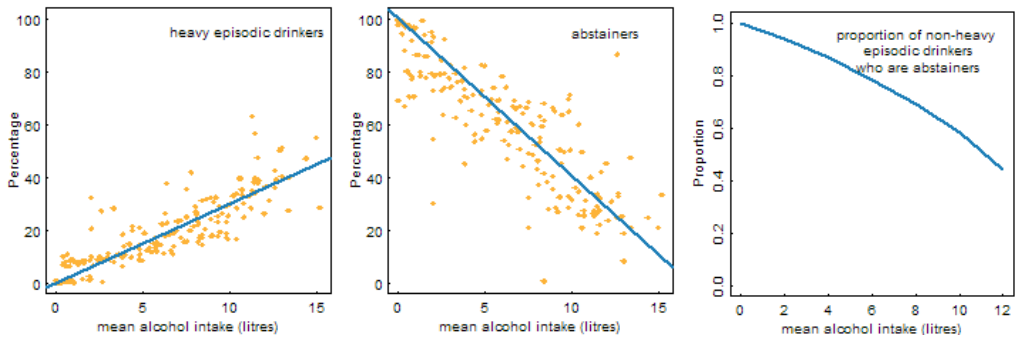
*Proportion of population who are healthier for alcohol = Change in total APC * (alpha + beta * (1- f))*

where *f* is estimated by

$$f = APC_{start} \times (alpha) / (100 - APC_{start} \times beta)$$

and f can be interpreted as the proportion (at the start of the period) of abstainers amongst the non-heavy episodic drinkers (see Fig. E.2 below). For example, if 20 % of the population are heavy episodic drinking, then the prevalence of non-heavy episodic drinkers = 100 – 20 = 80%. If 40% of the population are abstainers, then the proportion of abstainers amongst these non-heavy episodic drinkers =40/80 = 0.5 = f.

Fig. E.2.1 Relationship between total APC and prevalence of heavy episodic drinking in the past month and abstainers for past 12 months



An approximate linear relationship is seen in the left and centre diagrams. The proportion of non-heavy episodic drinkers who are abstainers (used in estimation) is factor f.

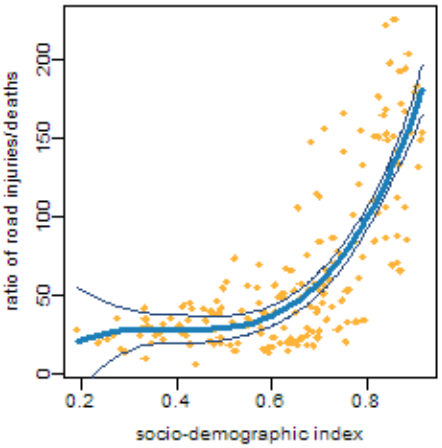
Road safety

For the HPOP Billion, the SDG road-traffic-related mortality rate is used to estimate the number of road injuries and road deaths. The probability of death from road injuries is dependent on many factors, including health care and other services in a country. A relevant measure is the social demographic index (sdi), a measure of the development level of a country based on average income per person, educational attainment, and total fertility rate (Lim *et al.*, 2016; Global Burden of Disease Collaborative Network, 2018). Fig E.2.2 illustrates the relationship between the ratio of road injuries to road deaths as a function of the social demographic index (sdi) to which a cubic equation has been fitted

$$fitted\ ratio = -35.69 + 497.40\ sdi - 1272.90\ sdi^2 + 1075.56\ sdi^3$$

This relationship is used to transform SDG 3.6.1, road mortality, into an estimate of the proportion of the population experiencing injury or death due to roads over a 5-year period. The sdi value used in this transformation will be fixed at the baseline year 2018.

Fig. E.3 Relationship between ratio of road injuries to road deaths and the social demographic index (sdi)



Note: The blue line shows a fitted cubic equation plus 95% confidence intervals for the fitted line.

Source: Data from IHME, June 2018 (Global Burden of Disease Collaborative Network, 2018).

Clean air

The SDG 11.6 indicator for air particulates measures the median concentration of PM2.5. For the HPOP Billion, a reduction in PM2.5 of 100 µg/m^3 is equated to 100% of the population being healthier. This range covers the range of observed country values (5 – 93 µg/m^3) and means that improvements in air quality will be recognized for all countries. Smaller changes will contribute to the HPOP Billion in a proportional manner. For example, improving the median PM2.5 by 10 µg/m^3 would be counted as the equivalent of 10% of the population being healthier. For historical data (2011– 2016), this results in a net total of around 180 million lives having become less healthy over the most recent five years. It is, however, a simplification – health benefits from changes in air pollution are not linear over the range 0 –100 µg/m^3.

Other approaches were also considered for transformation of SDG 11.6 but rejected because they did not adequately capture the global trends in air quality. A threshold approach was used to determine the proportion of populations with safe air quality in each country i.e. median PM2.5 of less than the 10 µg/m^3 WHO guideline level. For this, underlying gridded data were used to estimate the proportion of population who are above and below this threshold. This approach resulted in around 170 million people benefiting over a historical 5-year period – most of this occurring in developed countries such as in Europe and the USA. The results were unable to capture the issue of worsening global air quality seen in many other countries – for example, the 10 µg/m^3 threshold does not count cases where air quality already exceeds 10 µg/m^3 and is worsening. A further refinement was to add a second threshold level (e.g. 25 µg/m^3) and to count people who get better/worse air quality at one or other level. This approach also shows a similar net positive contribution to the HPOP Billion. Neither approach captures a worsening global air quality. The proportional approach outlined above is preferred.

Trans fats

Countries which fully implement WHO best practice policy on trans fatty acids (TFA) during the GPW13 period will contribute 2.1% of their population as being additionally healthier. This 2.1% contribution was derived using data on mean trans fats consumption (Global Burden of Disease Collaborative Network, 2018), which was used to estimate two factors:

1. The global average prevalence of excessive intake of TFA (>1% of total energy intake) for people living in countries that do not have a WHO best-practice policy on TFA. Based on data for 144 countries, this is estimated to be 14.3% of the population.

2. The expected reduction in the prevalence of excessive intake of TFA (> 1% of total energy intake) that follows implementation of best-practice TFA policy (over a 5-year period). Implementation of best-practice policy can significantly reduce excessive consumption of trans fats (Parziale and Ooms, 2019). Based on seven countries where a best-practice policy has been in effect over a number of years (Austria, Chile, Denmark, Hungary, Iceland, Norway, South Africa), a 15.0% reduction in prevalence of excessive TFA is estimated.

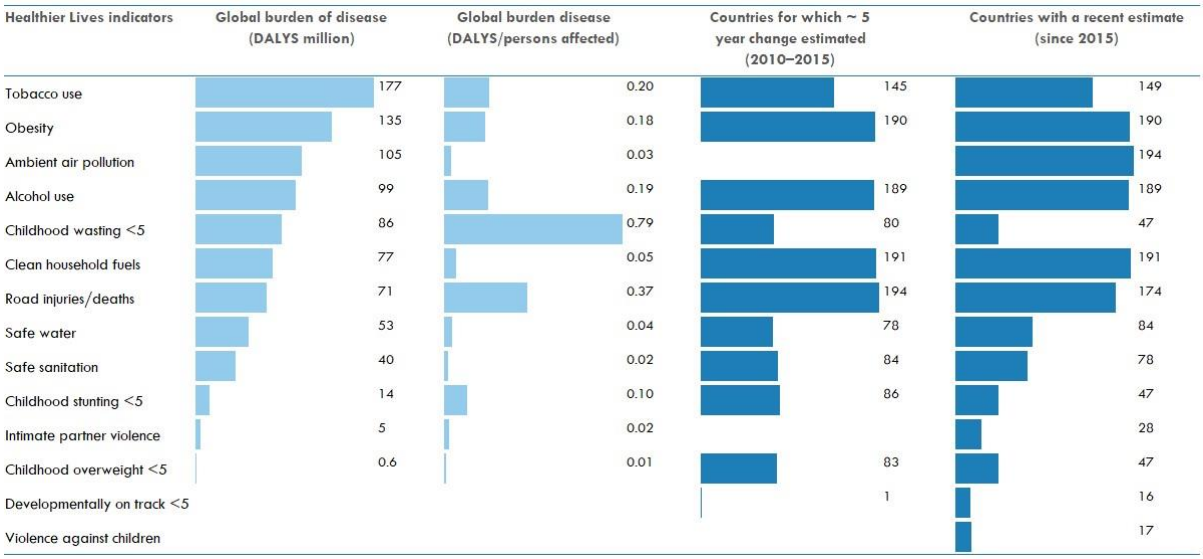
Thus, introduction of a TFA policy could mean that 14.3/100 x 15% = 2.1% of the population benefit over the following 5 years. Note that this is a global average, based on very varied underlying data sources and different country situations. In reality, the impact at a country level could vary significantly from this value. A standard value is used in order that trans fats can be counted towards the billion.

Appendix E.3 Weightings in the Healthier Population Billion

[needs update]

A key limitation of the method used to calculate the Healthier Population (HPOP) Billion is that changes in the indicators are not weighted by health gain. It is therefore important to ensure that the counting of additional healthiness from the indicators corresponds to an important health gain. One common measure of health impact is the global burden of disease. Fig. E.3.1 shows the burden of disease associated with the indicators in the index, demonstrating the important impact on health made by many of the indicators. It should be noted that additional healthiness is not necessarily best measured by burden of disease. For example, the effect of intimate partner violence and of childhood overweight appears relatively small. But these factors can have long-lasting implications for people's lives.

Fig. E.3.1 Global burden of disease and current data availability for indicators in the Healthier Populations Billion [out of date]



Notes: DALYs are from IHME GBD, 2018 (WHO does not produce DALYS for most of these risk factors). Indicators are ordered by Global Burden of Disease. Data availability columns show (a) those indicators for which it was possible to calculate a change over a 5-year period (approximately 2010–2015 – see also Section Appendix E.7) and (b) indicators for which recent estimates are available. Data from GHO and UN SDG databases (WHO, 2019b). *[update]*

Appendix E.4 Possible methods for measuring HPOP Billion

Criteria for choice of method

The following criteria have been used in selecting the method for counting the HPOP Billion:

- The method should estimate the number of lives that are healthier.
- The method should be simple to understand, straightforward to apply and suitable for calculation by all countries.
- The method must be based on indicators from the GPW13 outcome indicators (largely SDG indicators) and avoid imposing the burden of further data collation on member states.
- The method should count change that is meaningful for healthiness (e.g. new access to water is likely to result in a healthier life; implementing a policy at population level would not mean all the population is healthier).
- The method should be ready to use and not require a long development schedule.
- Simplicity and broad applicability is preferred over sophisticated complexity. The method will be a first attempt that can be further developed and refined over time.

Based on the above, the recommended method for measurement of healthier populations is the healthier lives approach (Fig. 6.3).

Alternative methods have been considered, notably (1) a GPW13 Expert Reference Group (ERG) recommendation to weight indicators by Disability Adjusted Years of Life Expectancy (DALYs) averted so as to estimate a relative health gain for each indicator and (2) a simplified weighting scheme. These alternatives are typically more complex, require more development, and are considered less likely to be easily assimilated by all Member States. It is possible that these (or variants) may be used in the future to create an improved measure of healthier lives (or perhaps even a Healthiness Index).

DALYS averted

The GPW13 ERG recommended development of an approach in which each of the indicators is converted into an equivalent health gain. The use of DALYS averted was proposed. This addresses an obvious shortcoming of the healthier lives approach which is that all indicators are treated as having equal impact on healthiness.

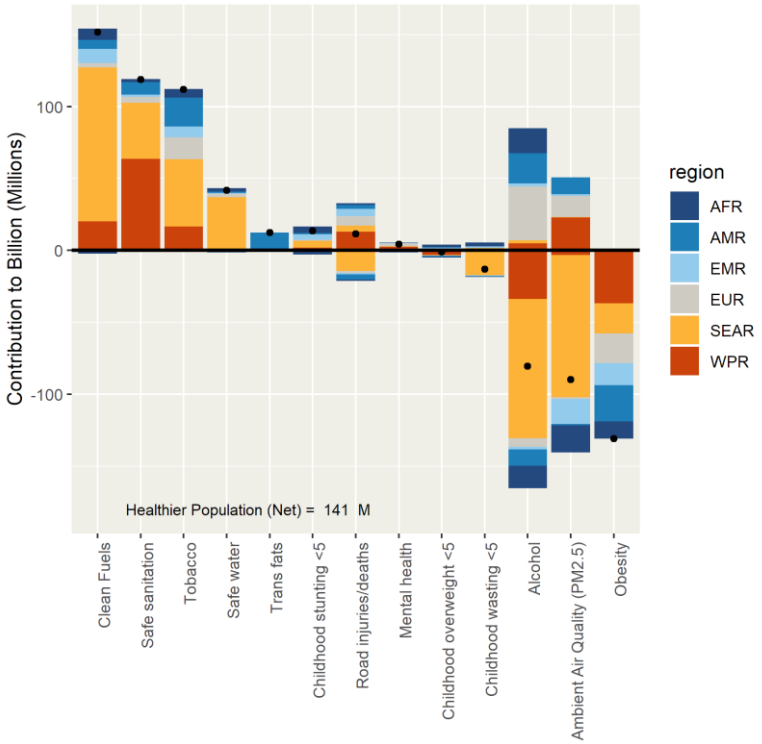
The approach aims to quantify the relative health gain due to different indicators, e.g. for reduced harmful use of alcohol versus a violence-free childhood. It requires determining both a weighting scheme and then a means of converting the health gains back into a number of lives. The use of DALYs averted as weights is conceptually appealing in that it provides a principled basis for aggregation across disparate efforts. A disadvantage is that it requires considerably more effort to communicate how the calculations are implemented and does not map as directly onto the "billion persons" heuristic. Furthermore, DALYs averted may not provide the ideal weighting scheme for measuring change in healthiness. Care would be needed in how DALYs are applied to age groups (total DALYs averted across the full age spectrum would probably have to be used). For example, changes in overweight under 5s and teenage smokers could be considered key ages with the potential to most impact long term population healthiness. A young smoker is more likely to end up as a lifelong smoker, an overweight under 5 may be more likely to end up as an obese adult. Yet the DALYs for these age groups are low because health impacts are not felt until later in life. Secondly, it is not clear that DALYs fully capture all aspects that constitute healthiness, such as the associated well-being and impacts on relationships. The impact of "on track" child development or violence issues may affect healthiness in a way that extends beyond lives lost or disability.

Simplified weightings

During consultations there were several suggestions that a simplified weighting should be investigated further – despite its inherent subjectivity. This approach involves using a fixed weight between 0 and 1 to count the contributions of each indicator into the billion. A value of 1 indicates that a change in the indicator is equal to a full healthier life (e.g. stopping use of tobacco). A lower value indicates some change in healthiness which would be equated to a partially healthier life. This could be used as a simple means of balancing different indicators, e.g. stopping smoking has a bigger health impact than safe sanitation.

A simplified fixed weighting scheme was tested as an experiment. Over half of indicators were given a full weight of 1 (e.g. tobacco, stunting, obesity) because a change in these was considered to mean a person would have a strong health benefit. Other indicators were given smaller weightings roughly determined by relative global average DALYs/affected person. (For example, sanitation was given weight of .16, air pollution a weight of 0.3.) The effect of the weighting was to reduce some of the big positive and negative contributions (especially for air quality and sanitation). The net effect was to reduce the historical estimate of expected contribution to the HPOP Billion to around [update] million (Fig. E.5).

Fig. E.4.1 Contributions to the HPOP Billion using a simplified weighting scheme [out of date]



The simplified weighting scheme has issues in that the choice of weightings remains subjective. For those indicators given a weight of 1, there remains no distinction between the relative health benefits (so it still suffers from the original problem of the unweighted approach). If all weights were less than 1, then it becomes apparent that a different stand point is need so as to look at how the health benefits combine, i.e. it suggests the requirement for something like an index of healthiness. This quickly becomes a case for using a more comprehensive method, akin to the DALYs averted approach detailed above, i.e. beyond the scope of GPW13. As an aside, simplified weighting also makes it much more challenging (unrealistic) to reach the HPOP Billion. Whilst it was hoped that simplified weighting could perhaps provide an intermediate solution and a simpler alternative to DALYs averted, it is too subjective and not justifiable for the GPW13 billion. Use of the unweighted approach, with clear recognition of its limitations is preferred.

Index of healthiness

A further option for the future is to consider if it would be possible to create an index of non-health-sector-related healthiness. This would be an index that would rank the healthiness of a population from 0% (worst possible) to 100% (best possible). This would provide a measure of healthiness at a point in time (and thus would not be limited to measurement of change). It would require a more complex approach and would require significant methodological developments.

Appendix E.5 Details of the correction for double counting

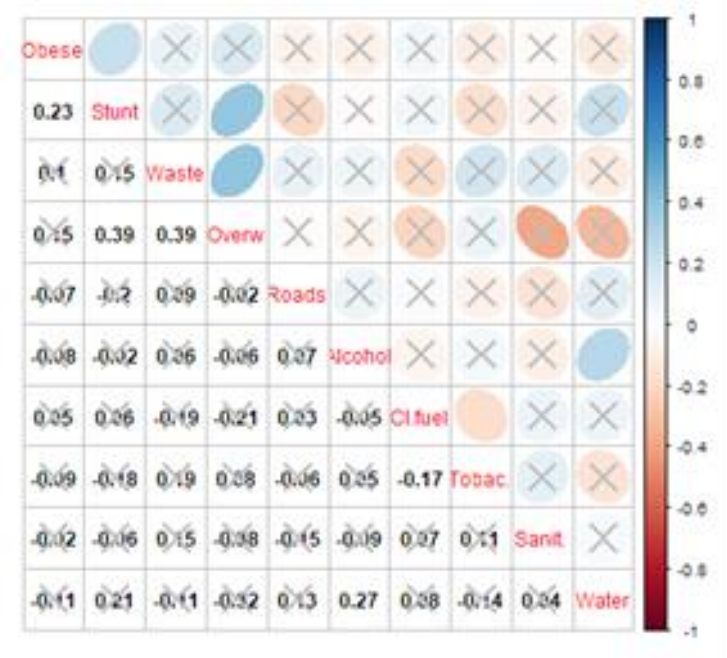
The double-counting correction is used when adding up contributions to the HPOP Billion. It is a simplified, first-level correction that aims to address Member State concerns, whilst being realistic about available data sources. The correction is based on the assumption that the *changes* in each of the indicators occur randomly across the population (independently). It ensures that the contribution to the billion can never exceed 100% of the population. It does not deal with significant correlations in the data (see below).

To illustrate the approach, consider the extreme case in which 100% of a population (newly) gets both clean air and clean water. If these two contributions were counted separately and without a correction into the billion, then 200% of the population could be counted as healthier. This is not desirable. Now, consider if 50% of the population newly gets clean air, and 50% clean water. We cannot know if this means that everyone gets one just thing (air or water), or half the population get both (air and water), or somewhere in the middle. The simplest approach is to assume it is random who gets water and who gets clean air. Under randomness, that would typically mean about 25% of the population get just water, 25% get just clean air and 25% get both (simple probabilities). So, using the double-counting correction, this would count 75% of the population as getting clean air, or clean water or both (compared with 100% if we just added 50% and 50% without a correction). This is the basis of the double-counting correction. Note that if there are strong correlations (e.g. most people who get clean air also get clean water) then the correction would not account for this.

A more sophisticated and accurate approach would be to be account directly for the correlations in the populations benefiting from each indicator, e.g. joint distribution estimation. However, this would need much more detailed data than are currently available on a global level. In reality, some indicators are highly correlated with socioeconomic/income levels (e.g. access to safe water and sanitation, clean fuels, childhood stunting) so improvements may be expected to centre on addressing needs of lower-income populations – and this could cause double counting that will not be captured.

Note that the assumption of independence is for *changes* in indicators; this is not the same as assuming independence between the indicators. Whilst we do not have data on correlations on sub-populations of countries, the assumption of independence of change appears to be reasonable when considered at a between-country level: historical data show maximum observed correlations for changes in indicators are <0.4 (See Fig. E.6 in which correlations are shown as coloured ellipses (top right) and as numbers (bottom left). X indicates that the correlation is not significant (0.05 level). (Data from GHO and UN SDG (WHO, 2019b))

Fig. E.5.1 Correlations in changes in observed indicators for historical data (2010- 2015 approx.). [redo]



The total contribution to the HPOP Billion, correcting for double counting, is the difference between the proportion of the population that is healthier, as measured by one or more indicators, and the proportion that is less healthy. This can be written as follows:

$$Contribution = \sum_j pop_j \left\{ \left(1 - \prod_{\Delta p_i > 0} (1 - |\Delta p_i|) \right) - \left(1 - \prod_{\Delta p_i < 0} (1 - |\Delta p_i|) \right) \right\}$$

which simplifies to:

$$Contribution = \sum_j pop_j \left\{ \prod_{\Delta p_i < 0} (1 - |\Delta p_i|) - \prod_{\Delta p_i > 0} (1 - |\Delta p_i|) \right\}$$

where $|\Delta p_i|$ is the absolute value of the change in prevalence for indicator *i*, *j* are distinct population tranches (e.g. under 5s in rural areas, 5–9s, over 18s in urban areas) and *i* are the indicators relevant to each population tranche. The population is divided up by age (under 5s, 5–14, 15–17, 18–19, 19+), by location (rural/urban) and by status (ever-partnered women, other). Different tranches of the population are affected by different sets of indicators (e.g. compare indicators relevant to under-5s versus indicators relevant to adults). For water and sanitation data there are several countries which have estimates for either rural or urban values (but not the total).

The above formula derives from simple probabilistic arguments. First, note that $(1 - |\Delta p_i|)$ is the proportion of the population seeing no change in indicator *i*. Then $(1 - |\Delta p_1|) \times (1 - |\Delta p_2|)$ is the proportion of the population with no change in indicator *1* and no change in indicator 2, and $\prod_i (1 - |\Delta p_i|)$ is the proportion of the population with no change in any of the *i* indicators. This means that the remaining proportion, $1 - \prod_i (1 - |\Delta p_i|)$, is the proportion of the population for which one or several indicators have changed over the period, i.e., the proportion living newly healthier lives.

The correction also needs to take account of the fact that not all indicators are improving. Where $\Delta p > 0$ it means that the population has reduced exposure to risks to healthiness, and where $\Delta p < 0$ it indicates the population is experiencing increased exposure to risks to healthiness. If 10% of a population become

healthier due to improved air quality and 10% become less healthy due to increased body weight, then, in the healthier lives approach, the net number of healthier lives is zero – the two changes offset each other

In the equation above, the first term, 1-$\prod_{\Delta p_i>0}(1-|\Delta p_i|)$, is the proportion of population who became healthier, and the second term, 1-$\prod_{\Delta p_i<0}(1-|\Delta p_i|)$, is the proportion who became less healthy. The net contribution is the difference between these two (see also Appendix E.6 below).

Appendix E.6 Known issues and limitations with the healthier lives approach

The objective of the GPW13 billion is to measure and encourage improvements in the healthiness of the world's populations. The proposed method offers a solid first attempt at this – the ability to monitor important changes in population healthiness linked to GPW13 – whilst being a method that can be applied at country level. It does, however, have its limitations. Limitations common to all the billions are listed in Appendix B.2. Issues specific to the HPOP Billlion (and some response to these) include:

- The framework for the HPOP Billion is built on indicators that were selected for the GPW13 programme (mainly SDGs). This a non-optimal set of indicators for measuring change in overall population healthiness – the indicators are not comprehensive of all environmental, behavioural and social risks affecting healthiness. The healthier lives approach proposed here will be specific to the GPW13 programme. In the future a more general index and framework for healthiness should be envisaged, with a broader coverage of sectors and factors. Table E.2 shows candidate additional indicators which would broaden the measurement of change in healthiness and address key missing topics.

Table E.6.1 Sectors and indicators that should be considered for future measurement

Sector	Indicator
Climate	Health-related climate support*
Healthy lifestyle	**Physical activity**
Labour	**Long working hours**
Food safety	Access to safe foods
Dietary	Salt intake
Dietary	Sugar intake
Poverty	Urban housing (SDG 11.1.1)
Human Capital Index	
Wellbeing	Happiness
Chemicals	**Poisoning**
Older people	Accessibility/safety
Gender equality	

*Note: Items in bold have existing data sets that could be used but which are not included in the GPW13 outcome indicators. *SDG indicators for climate change have not yet been agreed.*

- The GPW13 healthier population framework does not allow fully for the life course. There are important differences in the number and type of indicators that apply to different population groups. Young children are arguably both under and over represented – there are several indicators specific to under 5s, but at the same time, the counting scheme, which counts all indicators equally, is likely to underplay the importance of a healthy start in life. Other ages groups may also not be well represented, for example adolescents and the elderly.
- The index is an index of change, not absolute level. The method will not provide a ranking of (non-health-sector) healthiness. It is not designed for this purpose.
- The method weights all indicators equally. Although a change in each indicator marks an important step in healthiness, this is not ideal. For example, consider the situation in which a country has worsening air pollution equivalent to 7% of the population and improved tobacco use, equivalent to 5% of the population. This would approximately total to less healthy population (-2%). But, arguably, tobacco has a bigger impact on health than air pollution – this might mean that the population is actually healthier (i.e. the contribution to the billion could be misleading as an overall measure of change of healthiness). It is important to examine underlying changes and not just the top level numbers, and to remember that the billion is intended to drive change rather than provide a perfect count.
- There has been noticeable concern during consultations about the impact of double counting on the billion. This has been partially addressed using a correction based on assumptions of independence of change. The correction ensures that it is not possible to count more than 100% of the population and reduces the impact of double counting but does not account for within-population correlations.
- Not all indicators are expressed as a prevalence and not all indicators are measures of risk (for example, road deaths are an outcome, used as a proxy for risk). The transformations used to convert indicators into an estimate of prevalence are subjective and the choices involved can make a big difference to the billion. In creating the transformations, the objective has been to make the changes in healthiness due to the different indicators as equivalent as possible. For the two mortality indicators, there were very limited options available and it is recognized that these indicators are under-represented in the billion.
- Some GPW13 datasets are not yet available for all regions. For example, water and sanitation data are badly lacking in Africa. It is hoped that this will improve during GPW13. Availability of new data will make an important difference to estimated contributions to the HPOP Billion.

Appendix E.7 Testing the Healthier Populations Billion using historical data

The healthier lives approach measures change over a period. To test the performance of the approach, contributions were calculated at country level for indicators for which change could be measured over the most recent 5-year period (approximately). If data were available for a slightly longer or shorter period these were used and rescaled to a 5-year period. Even so, not all indicators have enough data for this historical period to measure change. In some cases, there are important regional data gaps, e.g. very few countries are included in the Africa region for water and sanitation. The summary contributions by region and by indicator are shown in Table E.7.17.1, Fig. E.7.1. No infilling has been performed and the values only sum change where it was measured.

Important things to note from this exercise:

- No infilling of missing data has been made, and additional contributions are expected (e.g. for water and sanitation). If new data from large countries are added, the totals will be impacted. For example, without the hefty contribution from China for sanitation, the total would be much reduced.
- The calculation uses a simplified estimate of change over five years. In the future, better methods of projection/trend estimation should be used.
- For the historical 5-year period the contribution to the billion is around 600 million, but with considerable uncertainty. It seems most likely that the HPOP Billion will require acceleration during GPW13.
- There are typically a mix of negative and positive contributions within a region. Negative values indicate that, overall, lives have become less healthy. Alcohol has the most mixed picture, with some regions making progress (EUR) and others losing ground (WPR, SEAR). Increases in air pollution and obesity are globally the largest contributor to less healthy lives.

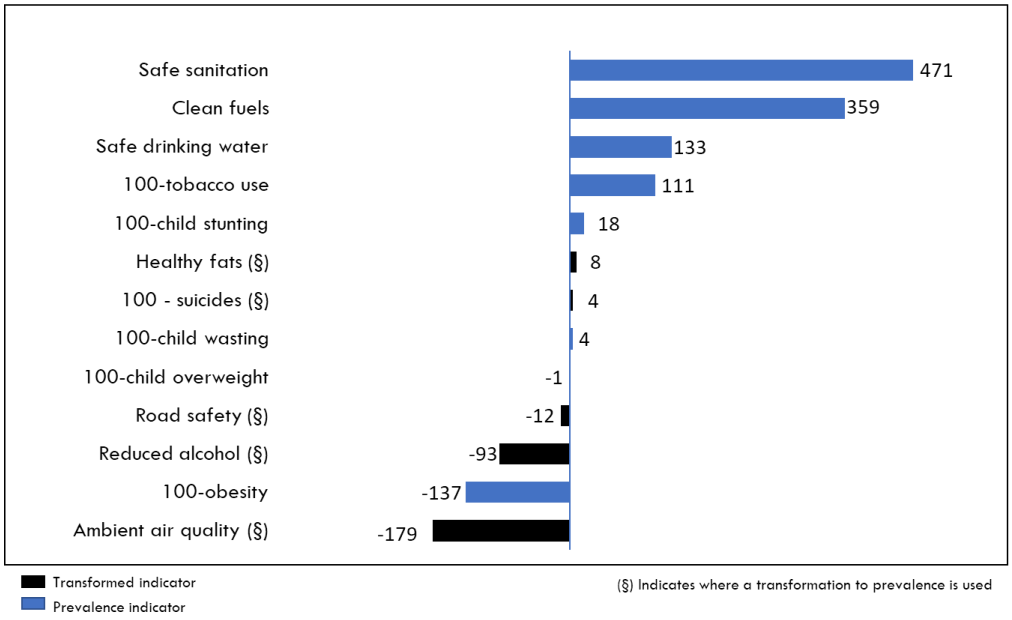
Table E.7.1 Estimated number of people with healthier lives, by indicator and region (millions) [update]

Billion Topic description	AFR	AMR	EMR	EUR	SEAR	WPR	Total
Safe sanitation	8	48	7	18	118	271	471
Clean fuels	2	31	31	28	219	48	359
Safe drinking water	8	5	1	10	109	0	133
100-tobacco use	6	20	8	15	45	18	111
100-child stunting	3	1	3	1	9	2	18
Healthy fats (§)	0	8	0	0	0	0	8
100 - suicides (§)	2	0	0	0	0	1	4
100-child wasting	0	-1	0	2	0	2	4
100-child overweight	1	0	1	0	0	-3	-1
Road safety (§)	0	-3	5	0	-19	5	-12
Reduced alcohol (§)	2	11	0	31	-108	-30	-93
100-obesity	-14	-27	-17	-21	-22	-36	-137
Ambient air quality (§)	-40	19	-32	23	-184	34	-179
Total (corrected)	-20	95	8	98	137	297	616

(§) Indicates where a transformation to prevalence is used

Notes: Figures provisional and expected to change, values are summed over countries where there is sufficient data to estimate change over recent 5 years. The row showing totals includes the correction for double counting (thus is less than the sum of the values in the column above). Data from GHO and UN SDG databases (extracted March 2019) with some additions (WHO, 2019b).

Fig. E.7.1 Contributions to the Healthier Populations Billion for historical 5-year period by indicator and region [update]



Notes: Positive and negative contributions are shown separately. Reductions in air quality and increases in obesity are the largest contributors to less healthy lives. Alcohol has the most mixed picture, with some regions making progress and others losing ground (WPR, SEAR). Data from GHO and UN SDG databases (extracted March 2019) with some additions (WHO, 2019b).

Appendix F HALE

Appendix F.1 Healthy life expectancy metadata

Name abbreviated	Healthy life expectancy (HALE)
Indicator name	Healthy life expectancy at age x (e.g, at birth, at age 60 years, etc)
Definition	Average remaining number of years that a person can expect to live in "full health" at a certain age by taking into account years lived in less than full health due to disease and/or injury.
Method of estimation/calculation	HALE is a metric based on methods by Sullivan (1971). It provides a single summary measure of population health across all causes, combined by weighting years lived with a measure of functional health loss before death, and is the most comprehensive among competing expectancy metrics. HALE at age x is the sum of YWD_i from i = x to w (the last open-ended age interval in the life table) divided by l_x (survivors at age x): $$HALE_x = \left[\sum_{i=x}^{w} YWD_i\right] / I_x$$ $YWD_x = L_x(1 - D_x)$ – Years lived without disability, equivalent years of healthy life lived between ages x and x+5. I_x – Survivors at age x. L_x – Total years lived by the life table population between ages x and x+5. D_x – Equivalent lost healthy year fraction between ages x and x+5.
Numerator	See above
Denominator	See above
Preferred data sources	Vital registration systems that record deaths with sufficient completeness to allow estimation of all-cause death rates. National health examination surveys on the prevalence of diseases, injuries, and disabilities.
Other possible data sources	Sample registration systems; verbal autopsy.
WHO GPW13 Framework	Outcome
Disaggregation	By sex, location (urban/rural, major regions/provinces), and socio-economic characteristics (e.g., education, wealth quintile).
Expected frequency of data collection	
Limitations	Lack of reliable data on mortality and morbidity, especially from low income countries. Lack of comparability of self-reported data from health interviews and the measurement of health-state preferences for such self-reporting.
Data type	Number of years
Related links	WHO: http://www.who.int/healthinfo/statistics/LT_method.pdf; GBD 2016 DALYs and HALE Collaborators. Lancet. 2017; 390:1260-1344; Sullivan DF. HSMHA Health Rep, 1971; (Kassebaum *et al.*, 2016)

Appendix F.2 HALE calculation template

An Excel spreadsheet (or online tool) will be made available to countries who wish to calculate HALE. An example of this is shown in Table F1.

Table F.2.1 Illustration of calculation of HALE for a country using an Excel spreadsheet template

	Period Life Table					Estimating HALE			
Age Interval	Survivors	Total years lived in age interval	Total years lived from age x	Life expectancy	Years lost due to disability per capita	Total Years lived without disability in age interval	Total Years lived without disability from age x	HALE	
x	l_x	L_x	$\sum L_x$	LE_x	YLD_x	$YWD_x=(1-YLD_x)*L$	$\sum YWD_x$	$HALE_x=\sum(YWD_x)/l$	
0	100,000	99,469	7,962,789	79.6	0.032	96,286	7,062,248	70.6	
1-4	99,429	397,297	7,863,320	79.1	0.019	389,748	6,965,962	70.1	
5-9	99,251	495,934	7,466,023	75.2	0.035	478,576	6,576,214	66.3	
10-14	99,132	495,382	6,970,089	70.3	0.039	476,062	6,097,638	61.5	
15-19	99,019	494,680	6,474,707	65.4	0.058	465,989	5,621,575	56.8	
20-24	98,842	493,631	5,980,027	60.5	0.066	461,051	5,155,587	52.2	
25-29	98,602	492,327	5,486,396	55.6	0.078	453,925	4,694,536	47.6	
30-34	98,323	490,695	4,994,069	50.8	0.088	447,514	4,240,610	43.1	
35-39	97,935	488,421	4,503,374	46.0	0.095	442,021	3,793,096	38.7	
40-44	97,419	485,370	4,014,953	41.2	0.101	436,348	3,351,075	34.4	
45-49	96,703	481,048	3,529,583	36.5	0.099	433,424	2,914,728	30.1	
50-54	95,667	474,821	3,048,535	31.9	0.108	423,540	2,481,303	25.9	
55-59	94,182	466,048	2,573,714	27.3	0.115	412,452	2,057,763	21.8	
60-64	92,101	453,021	2,107,666	22.9	0.15	385,068	1,645,310	17.9	
65-69	88,915	432,755	1,654,645	18.6	0.169	359,619	1,260,243	14.2	
70-74	83,769	398,542	1,221,890	14.6	0.201	318,435	900,623	10.8	
75-79	74,883	340,869	823,348	11.0	0.235	260,765	582,188	7.8	
80-84	60,423	254,919	482,479	8.0	0.288	181,502	321,423	5.3	
85-89	40,815	150,691	227,560	5.6	0.355	97,196	139,921	3.4	
90-94	19,905	60,758	76,869	3.9	0.427	34,814	42,725	2.1	
95-99	5,995	14,368	16,111	2.7	0.516	6,954	7,911	1.3	
100+	893	1,743	1,743	2.0	0.451	957	957	1.1	

Appendix G Global-level inequality monitoring of outcome indicators and targets

Appendix G.1 Methods

Between December 2018 and August 2019, indicator focal points from across WHO HQ were contacted and asked for their expert opinion with regards to data disaggregation/inequality monitoring for the indicators from their respective outcome areas. For each indicator, focal points were asked to indicate whether disaggregation is possible or not and, if yes, to identify up to four inequality dimensions for data disaggregation (in order of importance). For each dimension, focal points were asked to specify:

1. The name of the inequality dimension
2. The priority subgroup(s)
3. The data source from which disaggregated data are available
4. The number of countries for which disaggregated data are currently available.

Additionally, focal points were asked to provide information on whether district-level data are available, and, if yes, from which data sources and for how many countries.

Appendix G.2 Results

Table G.1 provides an overview of the answers received from programmes at WHO HQ, listing the proposed inequality dimensions and priority subgroups for each outcome indicator. Information on data sources and data availability tended to be very rough estimates, and were therefore excluded from the analysis. This information will be verified in the next step, along with a baseline analysis of the global situation.

According to the answers received from programmes, disaggregation is possible for 38 out of the 46 outcome indicators. Eight indicators are national-level indicators and cannot be disaggregated. These include:

- number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population (SDG 1.5.1)
- proportion of total government spending on essential services (education, health and social protection) (SDG 1.a.2)
- number of people requiring interventions against neglected tropical diseases (SDG 3.3.5)
- health-worker density and distribution (SDG 3.c.1)
- International Health Regulations (IHR) capacity and health emergency preparedness (SDG 3.d.1)
- proportion of vulnerable people in fragile settings provided with essential health services (health emergencies)
- patterns of antibiotic consumption at national level (WHA68.7)
- percentage of people protected by effective regulation on trans fats (WHA66.10).

Out of the 38 indicators that can be disaggregated, disaggregation is an inherent part of four indicators, including:

- number of new HIV infections per 1000 uninfected population, by sex, age and key populations (SDG 3.3.1)
- 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, noncommunicable diseases and service capacity and access, among the general and the most disadvantaged population) (SDG 3.8.1)
- proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex (SDG 4.2.1)

- proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age (SDG 5.2.1)

Table G.1 Inequality dimensions [update]

#	SDG/WHA #	Indicator	Inequality dimension	Priority subgroup
1	SDG 1.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population	Not applicable	Not applicable
2	SDG 1.a.2	Proportion of total government spending on essential services (education, health and social protection)	Not applicable	Not applicable
3	SDG 2.2.1	Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age	1. Economic status	Poorest quintile
			2. Place of residence	Rural
			3. Mother's education	No/low education
			4.	
4	SDG 2.2.2	Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (wasting)	1. Economic status	Poorest quintile
			2. Place of residence	Rural
			3.	
			4.	
5	SDG 2.2.2	Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age (overweight)	1. Economic status	Richest quintile
			2. Place of residence	Urban
			3.	
			4.	
6	SDG 3.1.1	Maternal mortality ratio	1. Education	No/low education
			2. Age	Adolescents
			3. Economic status	Poorest quintile
			4. Place of residence	Rural
7	SDG 3.1.2	Proportion of births attended by skilled health personnel	1. Education	No/low education
			2. Age	Adolescents
			3. Economic status	Poorest quintile
			4. Place of residence	Rural
8	SDG 3.2.1	Under-5 mortality rate	1. Economic status	Poorest quintile
			2. Place of residence	Rural; Peri-urban
			3. Mother's education	No/low education
			4. Sex	Female
9	SDG 3.2.2	Neonatal mortality rate	1. Economic status	Poorest quintile
			2. Place of residence	Rural; Peri-urban
			3. Mother's education	No/low education
			4. Sex	Female
10	SDG 3.3.1	Number of new HIV infections per 1 000 uninfected population, by sex, age and key populations	1. Sex	Male
			2. Age	Adolescents / Young adults (15-24 years)
			3. Key populations	1. Commercial Sex Works (CSW), 2. Injecting Drug Users (IDUs), 3. Men who have sex with men (MSM), 4.

#	SDG/WHA #	Indicator	Inequality dimension	Priority subgroup
				Transgender, 5. Clients of CSW
			4.	
11	SDG 3.3.2	Tuberculosis incidence per 100 000 population	1. HIV status	HIV positive
			2. Age x Sex	Elderly men
			3.	
			4.	
12	SDG 3.3.3	Malaria incidence per 1000 population at risk	1. Age	Children (<5 years)
			2. Economic status	Poorest quintile
			3.	
			4.	
13	SDG 3.3.4	Hepatitis B incidence per 100 000 population	1. Economic status	Poorest quintile
			2. Mother's education	No/low education
			3. Place of residence	Rural
			4.	
14	SDG 3.3.5	Number of people requiring interventions against neglected tropical diseases	Not applicable	Not applicable
15	SDG 3.4.1	Mortality rate attributed to cardiovascular disease, cancer, diabetes or chronic respiratory diseases	1. Sex	Male
			2.	
			3.	
			4.	
16	SDG 3.4.2	Suicide mortality rate	1. Age	1. Adolescents / Young adults (15-29 years); 2. Elderly (70+ years)
			2. Age x Sex	1. Middle-aged men (40-59 years); 2. Adolescent women (15-19 years)
			3.	
			4.	
17	SDG 3.5.1	Coverage of treatment interventions (pharmacological, psychosocial and rehabilitation and aftercare services) for substance use disorders	1. Substance type	Opioid
			2.	
			3.	
			4.	
18	SDG 3.5.2	Harmful use of alcohol, defined according to the national context as alcohol per capita consumption (aged 15 years and older) within a calendar year in litres of pure alcohol	1. Age	Adolescents (15-19 years)
			2. Sex	Female
			3.	
			4.	
19	SDG 3.6.1	Death rate due to road traffic injuries	1. Place of residence	Rural
			2. Sex	Male
			3. Age	Adolescents / Young adults (15-29 years)
			4. Economic status	Poorest quintile
20	SDG 3.7.1	Proportion of women of reproductive age (aged 15–49 years) who have their	1. Age	Adolescents
			2. Marital status	Not married
			3. Place of residence	Rural; Peri-urban

#	SDG/WHA #	Indicator	Inequality dimension	Priority subgroup
		need for family planning satisfied with modern methods	4. Education	No/low education
21	SDG 3.8.1	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, noncommunicable diseases and service capacity and access, among the general and the most disadvantaged population)	1. Economic status	Poorest quintile
			2. Place of residence	Rural
			3. Sex	Female
			4. Age	All age groups
22	SDG 3.8.2	Proportion of population with large household expenditures on health as a share of total household expenditures or income	1. Sex of the household head	Female
			2. Age of the household head	Unknown*
			3. Place of residence	Rural
			4. Economic status	Poorest quintile
23	SDG 3.9.1	Mortality rate attributed to household and ambient air pollution	1. Place of residence	Rural
			2.	
			3.	
			4.	
24	SDG 3.9.2	Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)	1. Age	Children (<5 years)
			2. Sex	Female
			3.	
			4.	
25	SDG 3.9.3	Mortality rate attributed to unintentional poisoning	1. Place of residence	Rural
			2. Age	Children (<5 years)
			3. Sex	Male
			4. Occupation	Farmer
26	SDG 7.1.2	Proportion of population with primary reliance on clean fuels and technology	1. Place of residence	Rural
			2.	
			3.	
			4.	
27	SDG 11.6.2	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)	1. Place of residence	Urban
			2.	
			3.	
			4.	
28	SDG 3.a.1	Age-standardized prevalence of current tobacco use among persons aged 15 years and older	1. Sex	Male
			2. Age	Variable**
			3. Education	Variable**
			4. Economic status	Variable**
29	SDG 3.b.1	Proportion of the target population covered by all vaccines included in their national programme	1. Economic status	Poorest quintile
			2. Education	No/low education
			3. Place of residence	Rural
			4. Sex	Female
30	SDG 3.b.3	Proportion of health facilities that have a core set of relevant essential	1. Place of residence	Rural; Peri-urban
			2.	

#	SDG/WHA #	Indicator	Inequality dimension	Priority subgroup
		medicines available and affordable on a sustainable basis	3.	
			4.	
31	SDG 3.c.1	Health worker density and distribution	Not applicable	Not applicable
32	SDG 3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness	Not applicable	Not applicable
33	SDG 4.2.1	Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex	1. Sex	Female
			2. Economic status	Poorest quintile
			3. Place of residence	Rural; Peri-urban
			4. Mother's education	No/low education
34	SDG 5.2.1	Proportion of ever-partnered women and girls aged 15 years and older subjected to physical, sexual or psychological violence by a current or former intimate partner in the previous 12 months, by form of violence and by age	1. Age	Adolescents / Young adults
			2. Economic status	Poorest quintile
			3. Place of residence	Rural
			4. Marital status	Partnership / Co-habiting union
35	SDG 5.6.1	Proportion of women aged 15–49 years who make their own informed decisions regarding sexual relations, contraceptive use and reproductive health care	1. Economic status	Poorest quintile
			2. Age	All age groups
			3. Education	No/low education
			4.	
36	SDG 6.1.1	Proportion of population using safely managed drinking water services	1. Place of residence	Rural
			2. Economic status	Poorest quintile
			3.	
			4.	
37	SDG 6.2.1	Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water	1. Place of residence	Rural
			2. Economic status	Poorest quintile
			3.	
			4.	
38	SDG 16.2.1	Proportion of children aged 1–17 years who experienced any physical punishment and/or psychological aggression by caregivers in the past month	1. Sex	Male
			2. Economic status	Poorest quintile
			3.	
			4.	
39	Health emergencies	Vaccine coverage of at-risk groups for epidemic or pandemic prone diseases	1. Age	Children; Elderly
			2. Sex	Female
			3.	
			4.	
40	Health emergencies	Proportion of vulnerable people in fragile settings provided with essential health services	Not applicable	Not applicable
41	WHA68.3	Number of cases of poliomyelitis caused by wild poliovirus (WPV)	1. Age	Children (<5 years)
			2. Sex	Variable2
			3.	
			4.	
42	WHA68.7	Patterns of antibiotic consumption at national level	Not applicable	Not applicable

#	SDG/WHA #	Indicator	Inequality dimension	Priority subgroup
43	WHA67.25, WHA68.7	Percentage of bloodstream infections due to antimicrobial resistant organisms	1. Age	Children (<5 years); Elderly (65+ years)
			2. Sex	Unknown
			3.	
			4.	
44	WHA66.10	Age-standardized prevalence of raised blood pressure among persons aged 18+ years (defined as systolic blood pressure of >140 mmHg and/or diastolic blood pressure >90 mmHg) and mean systolic blood pressure	1. Age	Elderly
			2. Education	Variable2
			3. Economic status	Variable2
			4. Sex	Male
45	WHA66.10	Protection of the population of a country by effective policy/regulation on industrially produced trans fatty acids (TFA)	Not applicable	Not applicable
46	WHA66.10	Prevalence of obesity	1. Education	Variable2
			2. Economic status	Variable2
			3. Sex	Variable2
			4.	

* *The priority subgroup is currently not known due to a lack of evidence.*

** *The priority subgroup varies from country to country.*