Methods for 13th General Programme of Work (GPW13) Impact Measurement

DRAFT FOR CONSULTATION

VERSION 1.3.1

30 Jan 2020

Document intended for consultation and discussion only.
This is a working document and is not yet complete.

Warning

This is a working document, intended for review, consultation and discussion. The documentation is not yet complete, and the methods are not yet finalised. All content and examples are draft and may be expected to change. The document has not yet been formally edited or laid out.

The document is downloadable from https://www.who.int/about/what-we-do/thirteenth-general-programme-of-work-2019-2023. It is planned that regular updates will be made to this document as it evolves. The document will be versioned and dated. Please check the above web page for updates.

Once methods are completed and agreed, a final report will be produced (May 2020).

Version History

v0.x 28 Aug 2019 Used for Internal consultation and comment

v1.0 03 Sep 2019 Draft for wider consultation

v1.1 12 Sep 2019 (First Online version) Updates to UHC chapter

v1.2 10 Oct 2019 (Second Online version) Incorporates comments from programmes, restructuring of UHC chapter, new material for Emergencies Detect and Respond and combined indicator. Some updates to Healthier Population Billion.

v 1.3 27 Jan 2020 (Third Online version). Adjustments following comments from regions, countries and experts. Change to UHC method, further details of HEP Billion, shortening of Healthier Population chapter, addition of new chapter on context. Additional appendices for HALE and equity. Initial document edit.

Contributors and Acknowledgements

[add]

Table of contents

List of figures

List of tables

Abbreviations

AASC	arithmetic average service coverage
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 emergency protection
HEPI	Health Emergency Protection Index
HIS	health information system
HLI	Healthier Lives Index
HP	healthier population
IHR	International Health Regulations
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
UHC	universal health coverage
WHS	World Health Survey
WHS+	World Health Survey Plus

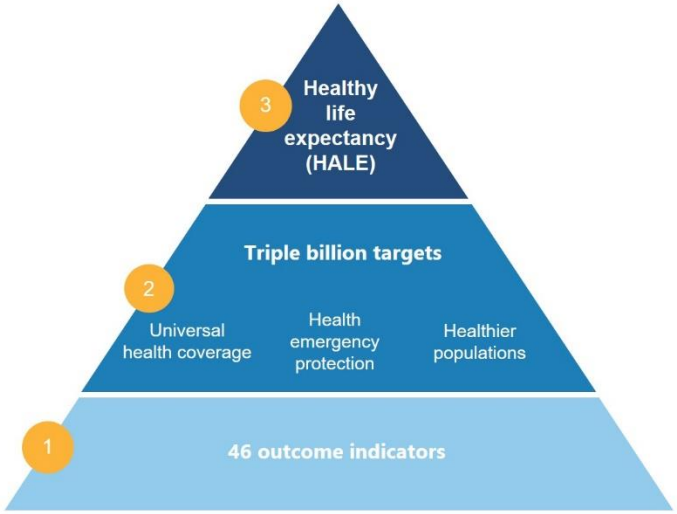
Executive summary

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 document has provided the basis for consultation and discussion prior to the finalization of the methods. It will evolve into the definitive write-up of the GPW13 measurement methods.

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 2020 (WHA73) 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: antimicrobial resistance, polio, risk factors for noncommunicable diseases, and emergencies. The 46 outcome indicators are associated with 2023 global targets.

The outcome indicator approach is flexible: countries select which indicators are a priority based on the respective national health strategies, and track progress towards the 2023 targets. Not every country will necessarily track every indicator; it will depend on the priorities in a country. Indicators will be disaggregated by key inequality measures (such as sex, age and location).

WHO will work with countries as a priority to address significant gaps in data collection: for around one-third of countries there is no recent data for over half of the SDG health-related indicators [WHS report 2019].

The context of the Triple Billion

The Triple Billion targets provide a measurement strategy for WHO that focuses on the execution and delivery of ambitious improvements in world health.

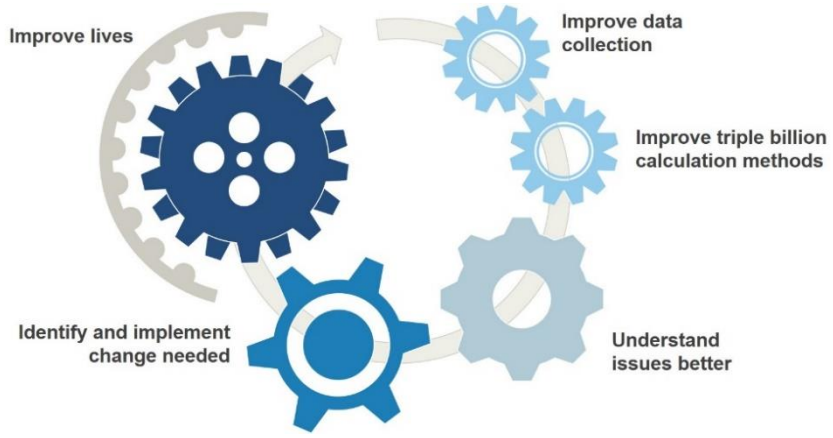
The Triple Billion targets:

- Advocate for ambitious improvement in world health
- Guide country-level implementation priorities
- Highlight data gaps that must be addressed
- Measure the change that results
- Increase accountability via measurement.

The Triple Billion targets highlight the considerable gaps in SDG data in many parts of the world; improvements in data collection will be key to the GPW13 programme. 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 can be expected to evolve beyond GPW13, in keeping with advances in data and understanding.

The Triple Billion calculations described in this report are the result of much debate and consultation. The choice of methods is not just about providing the most accurate estimates (although that is an important aim). The Triple Billions are the starting point for actionable data and for creating impact. The Triple Billion measurement calculations are kept relatively simple, in keeping with the purposes of the targets and the requirement that the methods can be assimilated by all member states.

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



The Triple Billions will be assessed at a population level and are designed to count lives that benefit from intervention, and not just additional lives due to population growth. Contributions to the Triple Billions will be reported at country level as both percentage of population and as total numbers of people. This will ensure that all countries are visible, even if they are small.

WHO intends to support countries to carry out their own calculations and will therefore provide simple online tools to allow countries to run calculations with their own indicator values, and to answer "what if?" type questions (e.g. how would halving tobacco use change my contribution to the Triple Billion targets).

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. Universal health coverage (UHC) is a part of the Sustainable Development Goals (Target 3.8) and will be based on the two UHC SDG indicators: an index of coverage of essential health services (indicator 3.8.1); and a measure of the proportion of population with large household expenditure on health as a share of total household expenditures or income (indicator 3.8.2).

SDG 3.8.1, the UHC service coverage index, is currently measured using 14 sub-indicators, of which eight are measures of coverage and the rest are proxy measures. Calculation of the UHC Billion from the SDG indicators is not entirely straightforward because SDG 3.8.1 provides a directional index of UHC levels but is not a measure of service coverage that converts directly into population count. To allow the SDG 3.8.1 data to be used to estimate the UHC Billion, an arithmetic average of the sub-indicators will be used (Section 4.5). The service coverage measure will be combined with the SDG 3.8.2 financial hardship indicator (catastrophic spending on health >10%) using a proportional approach (Section 4.4), where financial data allow.

Considerable acceleration will be needed if the target of 1 billion people receiving needed quality health services without financial hardship is to be achieved. If current progress towards UHC service coverage is maintained at a steady rate, and financial hardship does not change, it might be expected that an additional 500 to 700 million people would be covered.

The Health Emergency Protection Billion

The Health Emergency 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).

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. The indicator will include only the priority infection hazards relevant to each country. The indicator can be adapted to include other mass-vaccination campaigns that are needed (e.g. pandemic influenza, Ebola virus disease).

Current vaccinations used in the prevent indicator are:

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

Vaccination data will be compiled from a variety of sources, particularly on the coverage of campaigns, for which data tend to be patchy.

The emergency **detect & respond** indicator measures the proportion of IHR-notifiable public health events that 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. The indicator is still being refined and updates are anticipated.

The Health Emergency Protection Index (HEPI) is calculated as the average of the prepare, prevent, and detect & respond indicators. Countries will be categorized into five levels of HEPI (0–30, 30–50, 50–70, 70–90 and >90%). The "1 billion better protected" will be measured at the end of the 5-year period by converting the change to a proportion of population being better protected. Where progress is slower, a smaller fraction of the population will be counted. The approach encourages incremental progress in all countries. It is expected that all countries will have scope for improvement, especially for the new timeliness indicator.

The Healthier Population Billion

The Healthier Population (HP) Billion goal aims to support the world's population 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 Heathier Lives Index is constructed using indicators from GPW13 that are enablers of healthier populations. 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. These will be measured based on data on social, environmental and behavioural risks. The index is not intended to include factors primarily controlled within the health care system.

The HP Billion is based on:

- 16 indicators selected from the GPW13 outcome indicators (Section 6.3). These are health indicators covering environmental, behavioural and social/health risk factors. They 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. Most of them are SDG indicators.
- Use of a simple unweighted counting scheme, the healthier lives approach, to create the Healthier Lives Index, which will measure progress of populations towards the HP Billion (Section 6.4).
- Making simple adjustments to mitigate double counting and population growth, as outlined in Section 6.4.3.
- Reporting data on policy implementation and legislation alongside the Healthier Lives Index – such interventions will be key to progressing the HP Billion. Policy measures will not be directly included in the index as they are not GPW13 indicators (with the exception of trans fats).

The HP Billion calculation is straightforward but captures progress on key factors. It is designed to be accessible so that countries can calculate their own contributions to the Healthier Lives Index (Section 3.10).

Considerable acceleration and improvements will be required if the HP Billion is to be achieved, particularly to indicators where decreases in healthiness are anticipated. If current progress is maintained, the number of additional people leading healthier lives could be around 400 million. The HP Billion is expected to include a mix of positive contributions (e.g. sanitation, clean household fuels) and negative contributions (obesity, air pollution, alcohol).

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 care must not leave behind those in the greatest need. Measures of inequality will be made at all three levels of the GPW13 framework: the component 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 so that it can be addressed at a country level.

1 Introduction

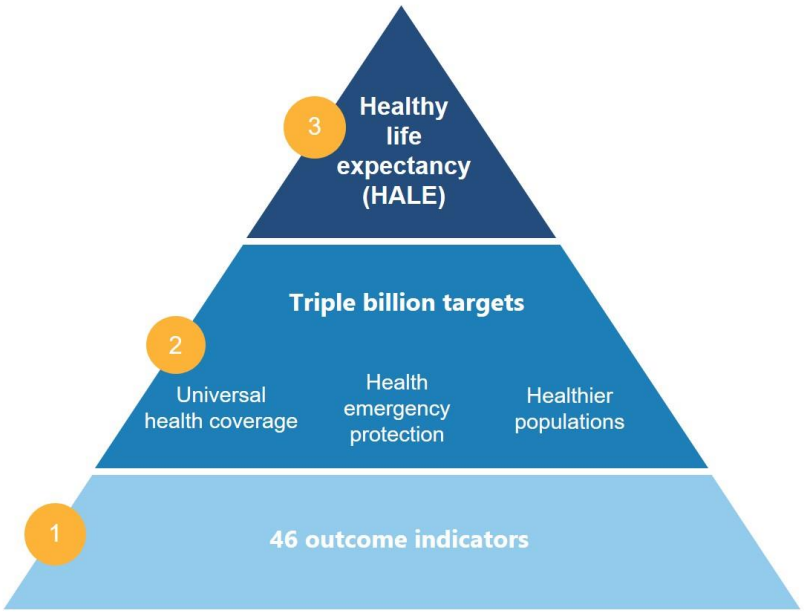
1.1 The WHO Impact Framework

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

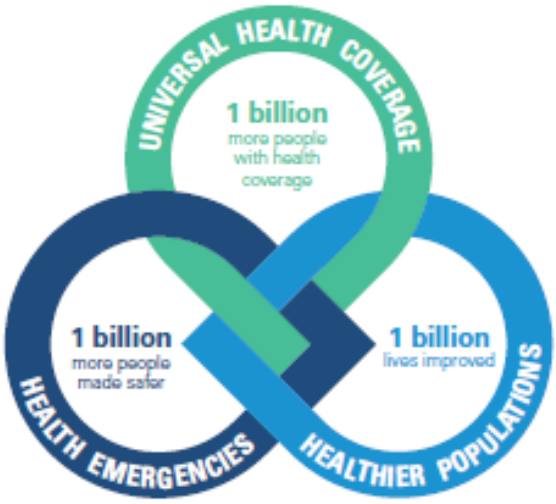


The Impact Measurement Framework measures progress on three levels:

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 the Triple Billions will be measured using composite indices. The billions may overlap; some people may benefit from more than one of the billions (Fig. 1.2).

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 proposed to use HALE 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 at all levels of the framework (Chapter 8).

1.2 Delivering the Triple Billions

Dr Tedros 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.

1.3 Scope of this report

This document describes the current state of the (proposed) methods for use in the GPW13 Impact Measurement Framework. It includes details of method and examples, where known.

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 (or will provide) example calculations and considers both the global and country level.

In cases where the method is still under debate, or where examples have not yet been constructed, it suggests options under consideration. Sections on status (as below) provide a summary of work in progress and will not form part of the final report.

This report is intended to evolve into a publication that documents the methods of the GPW13.

1.4 Status of methods

The GPW13 formally commenced at the beginning of 2019. Development of the GPW13 methods has involved an extensive process of consultation (see below).

Current key areas remaining to be determined:

UHC: The method is largely decided, but details such as rescaling of some indicators are still being finalized (Section 4.5.1).

Health emergency protection: Some evolution is to be expected for the new but important detect & respond indicator. The method for combining the sub-indicators into an overall index and converting this to contributions to the billion is undergoing testing.

Healthier populations: Five of the proposed indicators require transformation into prevalence and these are still being tested. A method for inclusion of mental health is being evaluated.

1.5 The consultation process

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)
- 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.

Next steps planned:

- continuation of internal working groups
- WHO Executive Board (Feb 2020)
- country testing in around 20 selected countries (March 2020)
- World Health Assembly (May 2020)

This report is presented with the aim of being the best that can be offered now and with the hope of facilitating progress and rapid completion of the methods. Updates will be issued as methods become finalised.

2 Outcome indicators

2.1 46 outcome indicators

The outcome indicators cover a range of health issues and will be used to measure the outcomes of the programme budget and help track and 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. Countries will track progress using the associated outcome indicators.

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, 2019d). 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)
- 7 non-SDG indicators address priorities identified by Member States: antimicrobial resistance; polio; risk factors for noncommunicable diseases; and emergencies

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 3.8.2 UHC financial hardship. SDG 3.8.1 has 14 tracer indicators and 6 of these are either outcome indicators or are closely associated with outcome indicators. (For example, tuberculosis treatment is used as a SDG 3.8.1 tracer indicator, and tuberculosis incidence rate is one of the outcome indicators.)

For the Health Emergency Protection (HE) Billion, two of the outcome indicators are used to estimate the billion. Two further indicators monitor equity of emergency protection.

For the Healthier Population (HP) Billion, all component indicators are selected from the outcome indicators.

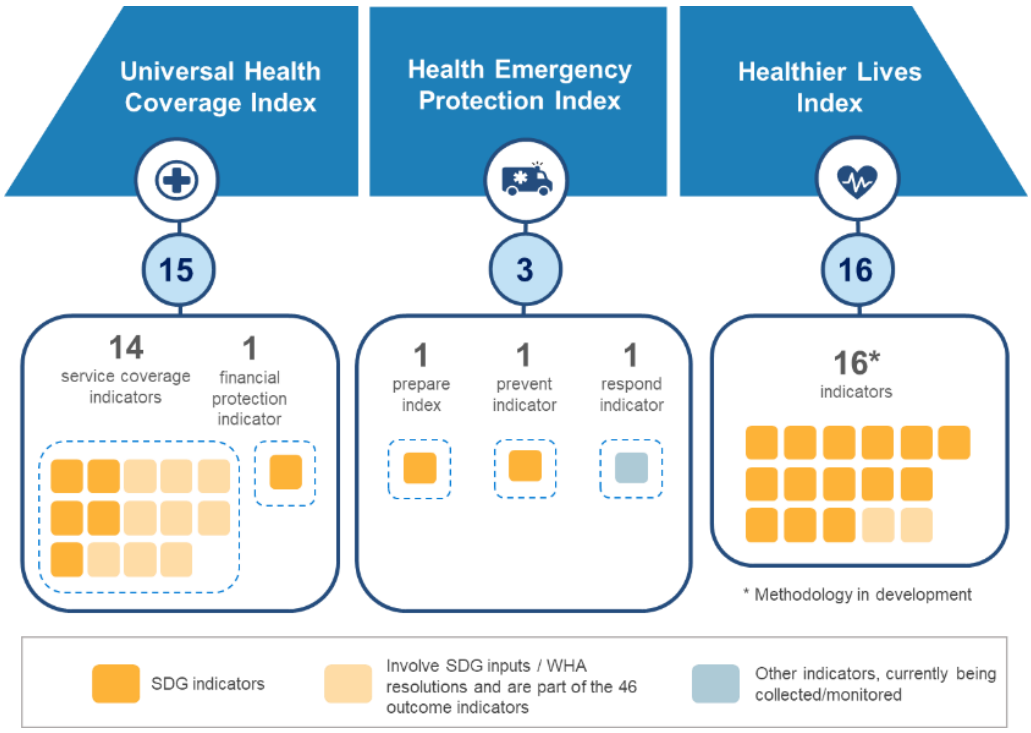
Table 2.1. Outcome indicators

SDG/WHA indicator no.	Indicator
SDG 1.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100 000 population
SDG 1.a.2	Proportion of total government spending on essential services (education, health, and social protection)
SDG 2.2.1	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	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	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 3.1.1	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
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 3.4.2	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	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	Death rate due to road traffic injuries
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	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	Proportion of population with large household expenditures on health as a share of total household expenditures or income
SDG 3.9.1	Mortality rate attributed to household and ambient air pollution
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 3.9.3	Mortality rate attributed to unintentional poisoning
SDG 7.1.2	Proportion of population with primary reliance on clean fuels and technology
SDG 11.6.2	Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)

SDG/WHA indicator no.	Indicator
SDG 3.a.1	Age-standardized prevalence of current tobacco use among persons aged 15 years and older
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	Health worker density and distribution
SDG 3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness
SDG 3.d.2	Percentage of bloodstream infections due to antimicrobial resistant organisms
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
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
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	Proportion of population using safely managed drinking water services
SDG 6.2.1	Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water
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
Health Emergencies	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)
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
WHA66.10	Percentage of people protected by effective regulation on trans fats
WHA66.10	Prevalence of obesity

Notes: 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, Table A.2. The data are compiled from two key sources of data:

- Data were primarily extracted from the UN Global SDG Indicators Database (UN Statistics Division, 2019). This database contains country-reported data or official estimates agreed with countries.
- In cases where data were not available from this source, data from WHO's Global Health Observatory was used (WHO, 2019b).

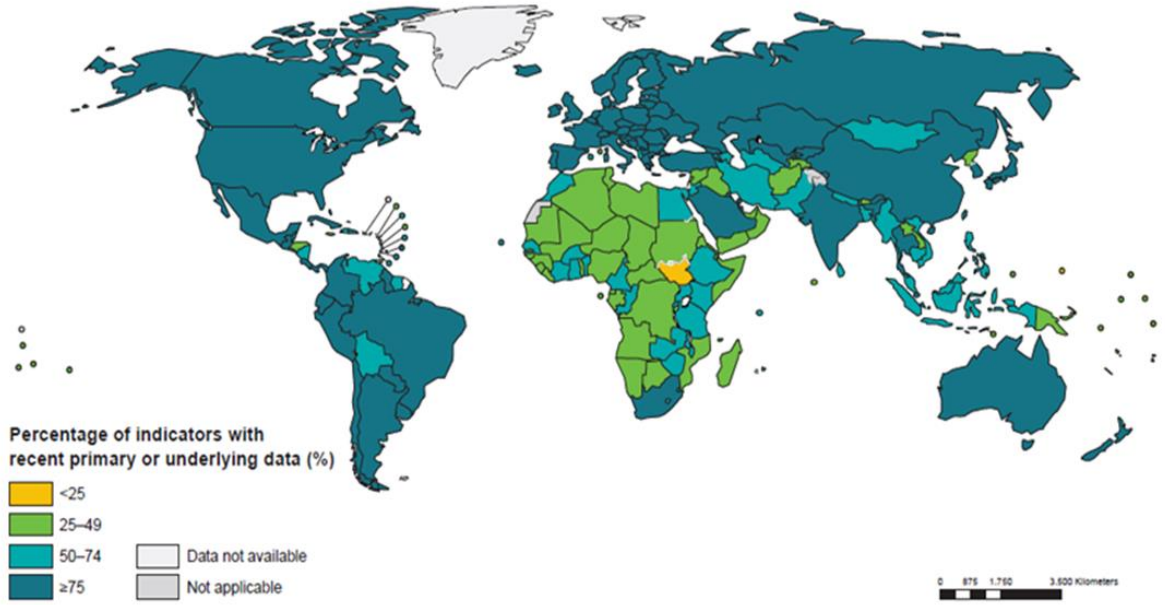
Data are available on the indicators from 2000 to 2018.

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 indicators may be available, they are not always derived from primary data. For countries with no data, indicators such as under-five mortality and neo-natal mortality are estimated. The World Health Statistics 2019 reported that 63 of 194 WHO Member States lack recent primary data for more than half of the health-related SDGs indicators, and for 40% of indicators fewer than half of countries have recent primary data (Fig. 2.2). 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, 2019e)

Fig. 2.2. Availability of primary or underlying data for 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 SDG indicators, GPW13-specific 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 Equity for outcome indicators

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

For national-level monitoring, each country will identify:

- at least one key dimension of inequality for each of its selected outcome indicators and targets
- at least one priority subgroup for each key inequality dimension.

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.

The key dimension(s) of inequality and priority subgroup(s) may differ between indicators (Fig. 2.3). Even for a given indicator, the key dimension(s) and priority subgroup(s) may differ from country to country and need not be the same as that used for global monitoring. Furthermore, the choice of key dimension(s) and priority subgroup(s) may be influenced by local data availability.

Fig. 2.3. Example of dimensions of inequality for country monitoring

Countries should consider the following:

- At least one key dimension of inequality should be selected for each indicator, and for each inequality dimension at least one priority subgroup should be identified. The priority subgroup is typically the most disadvantaged (most vulnerable) subgroup.
- Geographical inequalities may be captured using administrative/district-level data. Where possible, this should be included in addition to the other key dimension(s).
- Double-disaggregation should be considered wherever relevant. For instance, in a study of smoking prevalence in Eastern European countries, data disaggregated simultaneously by sex and income showed opposite patterns in men (higher prevalence among the poor) and women (higher prevalence among the rich).

Details on disaggregation of the indicators can be found in Appendix G.2. Not all the 46 outcome indicators and targets can be disaggregated. Some indicators and targets are only applicable at the national level, such as SDG 3.d.1 International Health Regulations.

2.5 Supporting and strengthening country measurement capacity

The GPW13 impact measurement requires reliable, timely, affordable, country-owned and accessible data, including disaggregation to enable analysis by equity and gender. Measurement of the Triple Billions depends on country measurement systems.

This report focuses on the GPW13 methods. Nevertheless, 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.

3 The 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 provide 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. It represents a new departure for WHO, making WHO and the world more accountable.

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 Billions are the tools to measure the change that results from interventions and improvements. However, their importance goes beyond simple counting. 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 and encourages investment. The Triple Billions package together the heath-related SDGs (and additional GPW13 indicators) in a way that helps guide country-level implementation strategy 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
- Guiding country-level implementation priorities
- Highlighting data gaps that must be addressed
- Measuring the change that results
- Making a start on increasing accountability via measurement.

3.2 Data for the Triple Billions

Measuring the Triple Billions uncovers the enormous data gaps in the existing SDG data availability seen in many parts of the world and highlights the importance of this data. This includes collection of raw data, and issues with data quality and data frequency. It can be argued that it is more important to focus on gathering additional much-needed data than it is to create methods for the Triple Billions. This is perhaps true. But at the same time, by trying to calculate the Triple Billions, it becomes clear how necessary these data are for countries. Also, setting up routines in which these numbers are reviewed and scrutinised for implementation helps solidify the importance of the data for countries so they can make results-based decisions.

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 most needs focus additional data gathering on the most relevant data sets as a priority. Data gaps are to be addressed as a matter of high priority. This includes support for the health information system and for improved gathering of CRVS data and development of a new survey programme, World Health Survey Plus (WHS+). Strengthening of data and information systems for health in countries is a central function of WHO. The Division of Data, Analytics and Delivery for Impact (DDI) has recently carried out an extensive review of strengths and weaknesses and identified gaps in health information systems in countries using the SCORE technical package. WHO is also committed to supporting countries in primary data collection through the WHS+. Working with partners, the

WHS+ is envisaged as a multi-topic, multiplatform, multi-mode exercise to generate data from community-dwelling populations where they are lacking, and filling critical data gaps in key areas of public health importance to track progress on the GPW13 and SDGs.

3.3 How to count the Triple Billions?

The choice of the methods used to count the Triple Billions follows extensive debate and consultation. It has followed the suggestions of experts and has been adjusted to take account of the comments by and requirements of countries.

The choice of methods is not just about arriving at the most accurate estimates (although that is an important aim). The Triple Billions are the starting point for creating impact. If SDG targets are to be met by 2023 and 2030, progress towards the Triple Billions needs to start now, which requires a rapid choice of the most suitable methods. In selecting the methods we ask "is it good enough?", rather than "is it perfect?". We seek the best that is practical, given the reality of the available SDG data, in order to allow implementation for impact to begin now.

The Triple Billion measurement calculations are kept relatively simple, in keeping with the purposes of the Triple Billions, differences in quality and quantity of data at country level, 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.

It is important that the Triple Billions precipitate and encourage change. The scope to improve and refine the methods for the Triple Billions is eclipsed by the much bigger priority of making an impact now.

3.4 The Triple Billions both measure and drive change

By measuring change, the Triple Billions also drive further change (Fig. 3.1) including

- improvements in data availability, quality and timeliness
- identification of new data that is needed
- stronger evidence base to inform policy and implementation
- improvements to the billion methods.

The Triple Billions provide an important mechanism to measure progress and, ultimately, impact on the lives of the people we serve. The improved data availability, quality and timeliness of data will strengthen the evidence base for policy and implementation decisions. It is through the monitoring and use of this data that we will see accelerated improvements to the health of citizens.

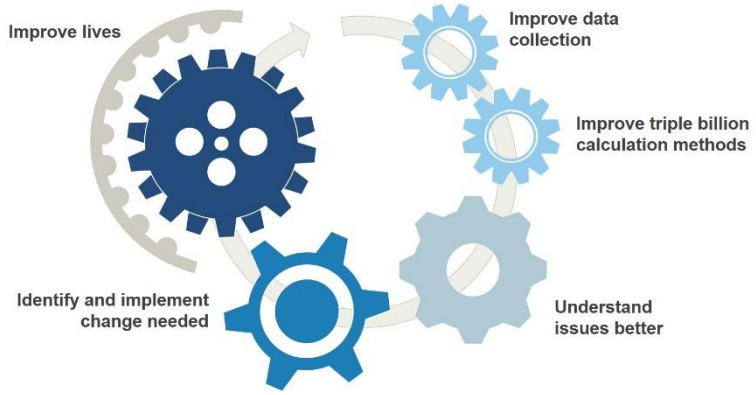
Improvements in data collection additionally move hand in hand with developments of method such as the calculation of the Triple Billions. As more data becomes available it becomes possible to improve the billion methods. In creating the billion methods, it becomes more apparent what is missing or truly required in terms of data and in terms of implementation.

3.5 The Triple Billions are inexact

Estimating the Triple Billions is not an exact science, and the methods described here will result in estimates that are approximations. The methods are in many senses a compromise. They represent the best that is possible given:

- the inherent subjectivity in the definition of the Triple Billions
- the limitations of the SDG data, including the selection of indicators and the quality and availability of data
- the different country and regional contexts
- the time-frame of the GPW13 programme and the need to progress rapidly into implementation
- that this is a first attempt by WHO to measure impact in this way.

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



The Triple Billions are inherently loosely defined. For example, what constitutes a "healthier" life? How can "better protected from health emergencies" be quantified? Even for universal health coverage (UHC), for which there is an existing SDG index, there is subjectivity. For example, how exactly should we count change given that any population contains a mixture of levels of services, and many people have access to some but not all the services they need?

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 minimise any additional burden of data collection.

3.6 Handling population growth

The Triple Billions must count lives that benefit from an intervention, and not just additional lives due to population growth.

For each of the Triple Billions, population growth is handled by comparing (a) what might have happened if no additional interventions had taken place (the status quo) with (b) what actually happened. This is a counterfactual approach. 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 is then measured as the change in prevalence of tobacco use multiplied by the population at the end of the period.

The counterfactual approach provides a robust method of calculation. Alternative and more general forms of handling population growth are also possible but are not recommended at present (see also Appendix B.1).

3.7 Big and small countries are equally important

Big countries that improve population health have the capacity to contribute large numbers of people to the Triple Billions. Even so, GPW13 is concerned with all populations and all sizes of countries. Changes in countries with small populations are just as important to secure. The life of each individual citizen is weighed equally.

Contributions to the Triple Billions will be reported at country level both as percentage of population and as the total number of people. This will ensure that all countries are visible, even if they are small.

3.8 Interpreting the Triple Billions as populations

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

For the Triple Billions, progress in terms of percentages is measured as the equivalent percentage of population. For example, consider a member state for which the contribution to one of the Triple Billions is 10% of the population. The 10% contribution does not distinguish between the following cases

- 10% of people benefitting 100%
- All the population being 10% better off
- A mix of improvements that equates to an average of 10% better off at population level.

For example, in the case of the UHC Billion, this would mean that at a population level a further 10% of needed UHC services were delivered without hardship to the population as a whole. The changes will be distributed across the population in an unknown manner (third case above). In general, it will be necessary to dig down into the contributing indicators to better understand how improvements are occurring. This is a key component of implementation and delivery of the Triple Billion.

Interpreting the Triple Billions in terms of population equivalence has several advantages. It is a robust method that encourages improvements and can be readily interpreted.

3.9 Identifying country shares of the Triple Billions

For GPW13, countries select their own priorities and targets within the overall global goal of achieving the three GPW13 billions by 2023.

During consultation, countries posed the following question to WHO: What is my "expected" contribution to each billion?, i.e. what would my contribution be if the global effort was shared out "fairly"? The suggested expected contributions to each billion are not binding but offer countries a benchmark which may help guide plans. Having these benchmarks will help the country and global community understand if we are on track to reach 3 billion people by 2023 and will help countries prioritize interventions when implementation is off track.

For each billion, all countries are encouraged to make progress, irrespective of size or economic status. It is also important to work to close the gap between countries. Progress will ideally be shared out evenly, in proportion to both the population of each country and the gap between current and ideal status within a country. This approach 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 UHC is already high).

For the Healthier Population Billion, the index measures change, but does not assess overall population healthiness (so the "gap" cannot be measured). For this, the country benchmarks will be in proportion to the population of each country. For the billion to be achieved in a world of 8 billion people (by 2023) , this would represent 1 in 8 people worldwide (and countrywide) living healthier lives. There is considerable scope for encouraging healthier lives irrespective of the wealth and development status of a country e.g. global issue with increasing obesity.

3.10 Support for calculating the Triple Billions

WHO will produce and share the calculations of country contributions to the Triple Billions. It intends to support countries who additionally wish to carry out their own calculations, and will therefore provide simple online tools or software that can be used by countries. This will allow countries to rerun calculations with their own indicator values, 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 in order to ensure a standardized approach.

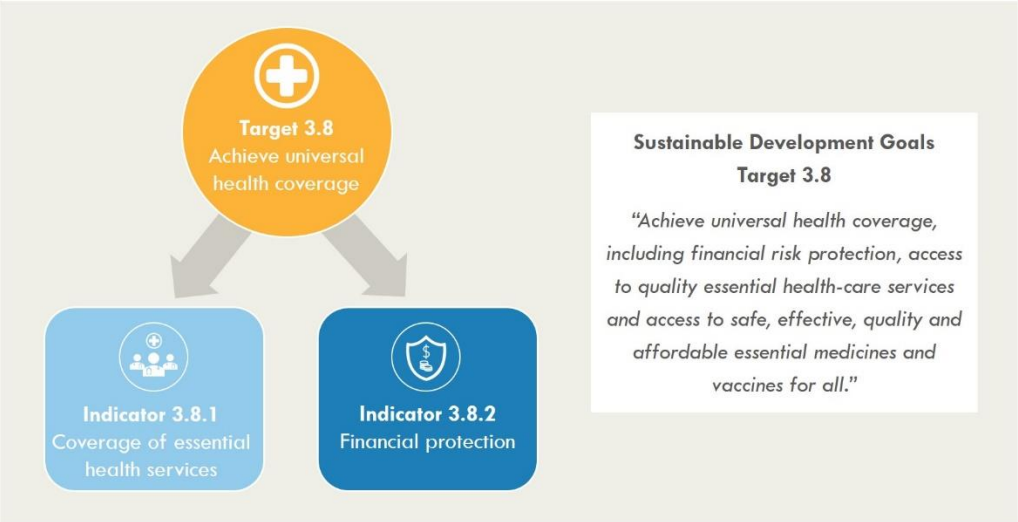
4 Universal Health Coverage Billion

4.1 Introduction

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 is a part of the Sustainable Development Goals and is monitored by two indicators: an index of coverage of essential health services (indicator 3.8.1), and a measure of the proportion of population with large household expenditure on health as a share of total household expenditures or income (indicator 3.8.2). The indicators are measured separately but will be jointly used to estimate the UHC Billion target, i.e., people who receive the services they need without incurring financial hardship.

Fig. 4.1. Universal health coverage within the Sustainable Development Goals



4.2 Status of UHC Billion methods

The UHC Billion will be based on SDG 3.8.1 and 3.8.2 (WHO & The World Bank, 2017b; Lancet Editorial, 2019; WHO, 2019c).

Calculation of the service coverage component of the UHC Billion from SDG 3.8.1 is not entirely straightforward because SDG 3.8.1 is a directional index and not a direct measure of service coverage. It does not convert into a population-based measure. The difficulty of how best to deal with this has led to extended evolution of the UHC index (see Appendix C.1and Appendix C.6 for details).

The preferred option is to use SDG 3.8.1 but with arithmetic averaging in place of geometric averaging – i.e. an arithmetic average service coverage measure derived from the 14 SDG 3.8.1 tracer indicators. The service coverage component will then be combined with the measure of financial hardship for estimation of the UHC Billion.

The remainder of this chapter is based on use of SDG 3.8.1 with an arithmetic average. The arithmetic averaging is expected to be refined to use a nested approach, i.e., averaging within categories and then across categories (in a similar way to the geometric averaging of SDG 3.8.). A possible extension to this approach will be to rescale the proxies in a more consistent manner to help reduce current issues with some

of the proxies being used in counting the UHC Billion. The rescaling is not finalized and is not included at this stage.

4.3 UHC service coverage for the Billion

4.3.1 Selecting a measure of UHC service coverage for the UHC Billion

Measuring UHC service coverage is not an easy task, and remains a relatively recent development in global health metrics. 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). For the UHC Billion, the aim is to make the best use of existing methods and SDG data whilst looking forward to the future.

Use of the SDG 3.8.1 UHC Service Coverage Index is currently the preferred option of Member States for measurement of the service coverage component of the UHC Billion (Barber *et al.*, 2017). However, this is not ideal because SDG 3.8.1 is a directional index rather than a measure of coverage. Two key issues with converting SDG 3.8.1 to the UHC Billion are due to the use of nested geometric averaging and transformed proxies. These mean that SDG 3.8.1 is not a directly scalable measure of service coverage (e.g. if SDG 3.8.1 were to increase by 20% this would not mean service coverage had increased by 20%). It cannot therefore be directly converted into the number of people benefitting from UHC. There is no simple perfect solution for estimation of the UHC Billion based on SDG 3.8.1 alone.

This chapter describes the current proposal, which is to calculate the UHC service coverage component of the UHC Billion by taking the SDG 3.8.1 tracer indicators and calculating the *arithmetic average service coverage* (or AASC). This has the advantage of simplicity and transparency. The arithmetic average uses the same input data as SDG 3.8.1 but averages it slightly differently, making it more reasonable to calculate the number of people benefiting from UHC. The approach avoids any additional data burden on countries and allows the UHC Billion estimate to be fully based on SDG 3.8.1.

Further discussion of the limitations of using SDG 3.8.1 as the basis for estimation of UHC coverage is provided in Section 4.7.

4.3.2 The UHC SDG 3.8.1 service coverage index

SDG 3.8.1 measures the coverage of essential health services (defined in the metadata 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). It is calculated using 14 tracer indicators (Table 4.1; Appendix C.2). These tracer indicators were selected to meet several criteria, including data availability, equity, disaggregation, and lessening of the reporting burden. The indicators include eight direct measures of service coverage and six indicators that are proxy measures.

For the SDG 3.8.1 UHC index, the 14 tracer indicators are combined using a nested geometric averaging approach. Measures of service coverage (e.g., antiretroviral therapy (ART) coverage for people living with HIV) are used directly, whilst proxy measures are rescaled to a 0 to 100 scale (e.g. mean fasting plasma glucose). The rescaled indicators are combined through a series of geometric means to obtain the index. The resulting index is a performance metric (scaled from 0 to 100). Full details of the method and calculations for 2015 are available in the Tracking Universal Health Coverage Report (WHO & The World Bank, 2017b) and the 2019 UHC report (WHO, 2019c).

Table 4.1. Tracer indicators in the UHC SDG 3.8.1 Index

Tracer topic	Current indicator	Coverage measure
1. RMNCH		
Family planning	Family planning (SDG)	✓
Pregnancy care	Antenatal care (4+ visits)	✓
Immunization	3 of diphtheria-tetanus-pertussis	✓
Child treatment	Child pneumonia care-seeking	✓
2. Infectious disease		
Tuberculosis	TB treatment	✓
HIV	HIV treatment (ART)	✓
Malaria	Bed nets	✓
Water and sanitation	Improved sanitation	✓
3. Noncommunicable disease		
Cardiovascular disease	Prevalence of high blood pressure	
Diabetes	Mean Fasting blood glucose	
Tobacco	Tobacco use (SDG)	
4. Service capacity & access		
Hospital access	Hospital bed density	
Health worker density	Physicians, Psychiatrists and Surgeons	
Health security	International Health Regulations (SDG)	

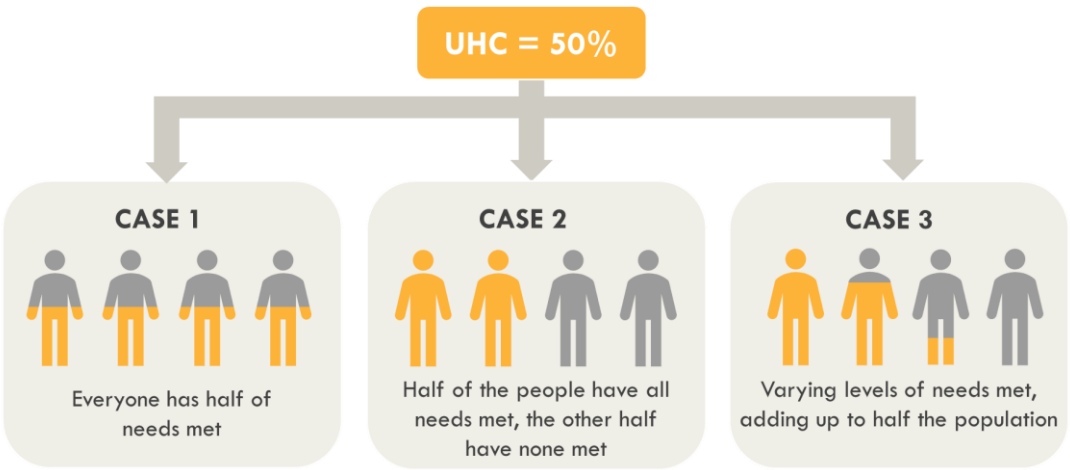
4.3.3 UHC service coverage

The goal of UHC is that everyone should receive all the health services they require, and this equates to a service coverage of 100%.

If average UHC service coverage is 50%, this means that 50% of UHC services were delivered at the population level. However, the approach does not distinguish between the following cases (Fig. 4.2):

- all people have half (50%) of the services they need
- 50% of people have all services they need; the rest have no coverage
- a mix of service coverage that averages to 50% at the population level.

Fig. 4.2. Distribution of UHC service coverage



If average service coverage increases from, say, 50% to 72%, then the increase in service coverage is equivalent to 22% of the population moving from 0% to 100% coverage. In reality, the changes would be distributed across the population in an unknown manner.

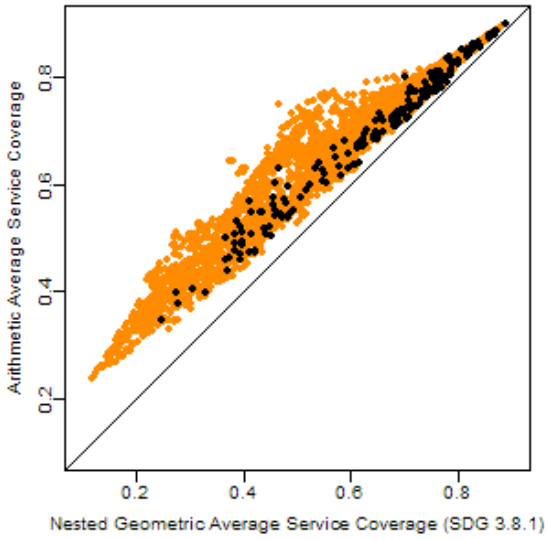
4.3.4 Comparing arithmetic and geometric averages

The SDG 3.8.1 arithmetic average service coverage (AASC) is used to measure the percentage of needed services that are provided at a population level and is the arithmetic average of the 14 SDG 3.8.1 tracer indicators detailed above:

$$SDG\ 3.8.1\ AASC = UHC_{aasc} = Arithmetic\ Average\ of\ 14\ SDG\ 3.8.1\ indicators$$

The use of an arithmetic average allows a better and simpler interpretation of changes in service coverage at population level so as to calculate people benefiting from UHC. The geometric average is strongly affected when a single indicator has a very low value – meaning that small changes in such an indicator can have a big impact on the mean. Equally, changes in an indicator with a high value can be damped by the geometric mean (i.e. improvements will get little recognition). Fig. 4.3 shows the difference between the geometric SDG 3.8.1 UHC index of service coverage and the arithmetic average service coverage (AASC) of the 14 tracer indicators. The two measures are based on the same data: the scatter and non-linearity are the result of the different averaging approaches.

Fig. 4.3. Relationship between SDG 3.8.1 UHC Index nested geometric and arithmetic averages of the 14 tracer indicators



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

4.4 UHC financial hardship

Health-related financial hardship occurs in two settings: when households pay a very large share of their disposable income on health services (catastrophic payments) or when payment for health services pushes the household below the poverty line (impoverishing payments). An important WHO goal is to stop the rise in the percentage of people suffering financial hardship in accessing health services.

Avoidance of financial hardship in obtaining health services is a fundamental part of UHC, and it is important that a financial element is included in the billion. Over 900 million people are thought to incur health-related financial hardship, and service coverage and financial protection appear to be on a diverging path (Dieleman *et al.*, 2018).

SDG 3.8.2 measures the proportion of population with large household expenditures on health as a share of total household expenditure or income. This is therefore a measure of catastrophic payments. Two indicators are collected for the SDGs: the proportion of households spending more than 10% of household expenditure on health in a given year, and the proportion spending more than 25% of household expenditure on heath. Using the 10% threshold, some countries have very high percentages of households with catastrophic payment. The 25% threshold, however, represents a very high bar. Alternative thresholds such as 15% or 20% may be more appropriate for the future. For the UHC Billion, the 10% threshold will be used.

There is currently a lack of recent data for financial hardship. Without such data it will not be possible to calculate the impact of financial hardship in country contributions to the UHC Billion. Improving data on financial hardship will be an important part of improving and measuring UHC during GPW13.

4.5 Calculating the UHC Billion

The contribution to the UHC Billion will be estimated for SDG 3.8 by combining measurements of UHC service coverage and of financial hardship. The UHC Billion will measure improvements at a population level rather than an individual level, looking at the change in the proportion of needed services that are provided without financial hardship to a population.

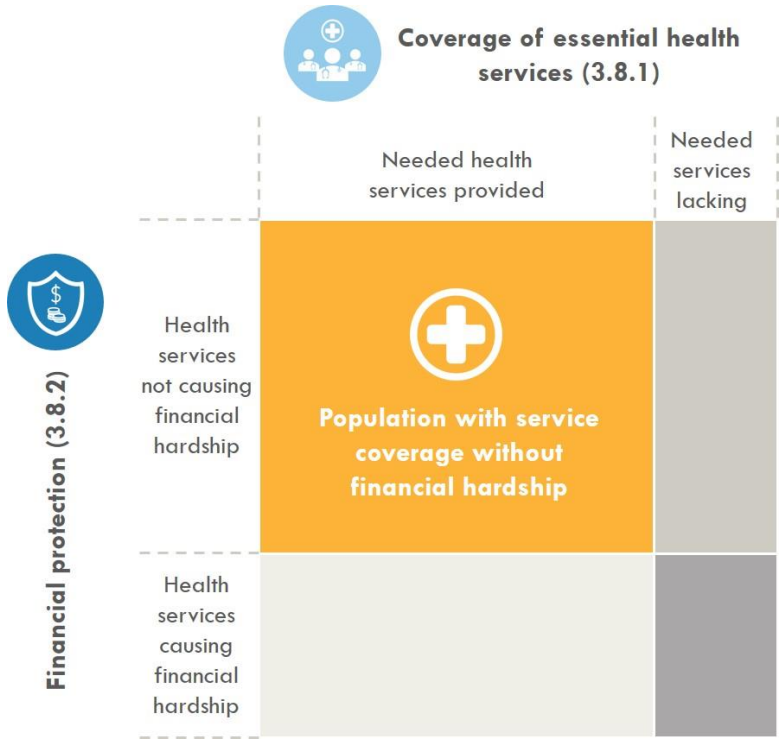
4.5.1 Combining service coverage and financial protection for the UHC Billion

The UHC SDG indicators 3.8.1 and 3.8.2 separately measure two dimensions of UHC. They are obtained from different data sources and cannot be directly used to determine at a household level who receives service coverage without financial hardship. For an accurate picture of the number of households that receive service coverage without financial hardship, the two indicators would need to be collected from the same data source. For the time being this is not feasible as a common data source is lacking. For the future, we should aim to collect this data.

To be able to combine the two UHC dimensions into contributions to the GPW13 UHC Billion, a proportional approach will be used, based on the simplifying assumption that health-related financial hardship is independent of UHC coverage (see Section 4.7). This is illustrated in

Fig. 4.4, where the square is divided horizontally by service coverage and vertically by financial hardship status. The area of the top left quadrant represents the proportion of needed services provided without financial hardship. The remaining areas represent the proportion of needed services not provided, and the proportion of the population exposed to financial hardship, or both. The percentage of the population with essential service coverage without financial hardship will never exceed the average service coverage.

Fig. 4.4. The proportion of UHC received without financial hardship



This approach recognizes that people can incur financial hardship due to health spending even if they receive only some of the services they need. However, the assumption of independence is an over-simplification and unlikely to be completely correct (Section 4.7). In high-income countries, financial hardship is likely to have a greater overlap with access to needed services, whilst in countries where there are many out-of-pocket payments many people with catastrophic spending on health may lack needed services.

The UHC combined index UHC_{ci} measures the percentage of essential service coverage provided to a population without financial hardship:

$$UHC\ combined\ index\ =\ UHC_{ci}\ =\ UHC\ essential\ service\ coverage\ without\ financial\ hardship$$

$$=\ AASC\ *\ (1-\ cata_{10})$$

Here, *AASC* is the arithmetic average service coverage derived from SDG 3.8.1, and $cata_{10}$ measures financial hardship and is the proportion of population with catastrophic spending on health (>10% of household expenditure) (SDG 3.8.2).

For a population to achieve a UHC combined index of 100%, it must receive 100% of service coverage and experience no financial hardship. If service coverage is 60% and there is no financial hardship, then UHC_{ci} will also be 60%. The greater the proportion of the population with financial hardship then the lower the percentage of the population counted into the UHC Billion. For example, if service coverage is 60% and financial hardship is 10% then:

$$UHC_{ci}\ =\ 60\ *\ (1-\ 0.1)\ =\ 54\%$$

In other words, it is assumed 10% of the services received at population level were received in a hardship situation (and are not counted towards the UHC Billion).

4.5.2 Calculating contributions to the UHC Billion

To calculate contributions to the UHC Billion, the change in the UHC combined index is multiplied by the final population.

$$Contribution\ to\ UHC\ billion = Change\ in\ UHC_{ci} x\ population_{2023}$$

$$= (UHC_{ci-2023} - UHC_{ci-2018}) \times population_{2023}$$

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

4.5.3 Country example of calculating contribution to UHC Billion

This section presents a sample calculation of how country change in UHC service coverage and financial protection contribute to the UHC Billion. The calculation is based on hypothetical data for an historical 5-year period (2012 to 2017). For GPW13, data would be for the 5-year period 2018 to 2023 (not yet available). The estimation of the contribution to the UHC Billion proceeds by:

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

Step 1: Calculating arithmetic average service coverage (AASC)

Table 4.2 shows an example of the calculation of AASC for the start and end of a 5-year period, calculated as the arithmetic average of the 14 tracer indicators in each year. In this example, AASC changes from 0.47 to 0.51 between 2012 and 2017.

Step 2: Calculating UHC for the billion

The proportion of services provided to the population without financial hardship, UHCci is calculated by combining the AASC and the catastrophic spending (Table 4.2).

Table 4.2 Calculation for the UHC Billion for country X, based on historical data for 2012 and 2017

Indicator	**Indicator value**	
	2012	2017
Family planning (SDG)	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	0.31
TB treatment	0.45	0.64
HIV treatment (ART)	0.6	0.61
Bed nets	0.38	0.45
Improved sanitation	0.06	0.07
*Prevalence of high blood pressure	0.41	0.58
*Mean fasting blood glucose	1	1
*Tobacco use (SDG)	0.92	0.93
*Hospital bed density	0.15	0.18
*Health worker density	0.04	0.05
*International Health Regulations (SDG)	0.77	0.79
AASC	**0.47**	**0.52**
Financial hardship (catastrophic >10%)	0.08	0.04
UHCci	0.47 *(1-0.08)= 0.43	0.51*(1-0.04) = 0.49
Change in UHCci	**0**	**0.06**

**Proxy indicators*

Step 3: Contribution to the UHC Billion

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

Change in UHC	0.06
Population 2017 (millions)	106.4
Contribution to UHC Billion (millions)	106.4 *0.06 =6.4

4.6 Sharing out the UHC Billion

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 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 fixed percentage (see also Section 3.9).

It will be at the discretion of the country to identify its target for UHC and how to extend this to its population. For example, the country may decide to focus on improving financial protection for the whole population, or to improve service coverage for family planning. Details of how and where to make changes will be based on the underlying data for UHC service coverage indicators and financial protection data.

4.7 Limitations of the UHC Billion calculations

The accuracy of the UHC Billions calculation is limited by the SDG data from which it is created, including choice of indicators and availability, and the SDG methods.

Representative indicators

The tracer indicators in SDG 3.8.1 were selected to be representative of key essential services, and the choice was largely driven by availability of data. However 14 indicators cannot fully reflect the extremely wide remit of UHC (Hogan *et al.*, 2018; Lee, Wu and Liu, 2018). The index is heavily geared towards key issues in the developing countries and is less relevant to more developed countries. 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. Several of the service coverage indicators are considered non-optimal and could be improved without necessarily increasing the burden of data collection (e.g. antenatal care, bed nets).

Use of proxies

Several of the UHC service coverage indicators are proxies and do not directly measure service coverage. These indicators provide some measure of level of service, however interpretation as a proportion of population is flawed.

Double counting

The SDG 3.8.1component 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 [add ref].

Data availability

The UHC Billion calculations face limitations linked to the availability of SDG data. For a large number of countries, the tracer indicator values are estimates (WHO & The World Bank, 2017b).

There is a particular issue with the lack of recent data for financial hardship (catastrophic spending). If not addressed this could mean that many country-level estimates for the UHC Billion cannot be calculated. To remedy this it will be important to obtain more up to date and regular financial data at the country level during GPW13.

Additional supporting data are also needed to further strengthen the methodology, for example to gather joint data on financial hardship and service coverage so as to better understand the joint distribution of these components.

Using population equivalence

The UHC Billion will calculate a population equivalence. If a population received an additional 10% of needed services without financial hardship, then the contribution to the UHC Billion will be 10% of the population. In reality, the services will be distributed unevenly across the population (case 3 of Fig. 4.2) but will be counted as the equivalent population (case 2 of Fig. 4.2). This approach differs from an alternative approach used in the WHO UHC reports (2017, 2019), which estimated the global number of people receiving ≥85% of services (with no financial component). This 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 is insufficient data for calculation at a country level (see also Appendix C.4).

Combining service coverage and financial data

Combining service coverage with financial hardship relies on an assumption that they are independent This is an imperfect approximation and a simplification that should be refined in the future when better data are available. It implies a lack of correlation between these dimensions. When violated, it would 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. This approach lacks suitable datasets and is 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.

4.8 UHC for the future

Approaches to obtaining globally comparable UHC indices will evolve as methods improve and data measurements and health treatments change.

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. It was also planned to add coverage for cervical cancer vaccines and essential medicines in the future. The aim should be to include the most measurable indicators, with the highest impact, that will drive the most important change.

New indices for UHC

SDG 3.8 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.

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

1. focus on quality of treatment coverage, in keeping with the definition of UHC (WHO, 1991)
2. adjust for the varying epidemiological burden in countries
3. 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 (see also Appendix C.5). Challenges are to minimise the additional data burden, to use country data and allow countries to carry out their own calculations.

4.9 Equity for UHC

Equity is inherent to the concept of universal health coverage and aims to ensure that all people have access to the health services they need without suffering financial hardship. Equity in UHC will be assessed by examining between-country inequalities, for example by measuring the absolute and relative difference in UHC index between low-resource settings and the global average or high-resource settings (Hosseinpoor *et al.*, 2018).

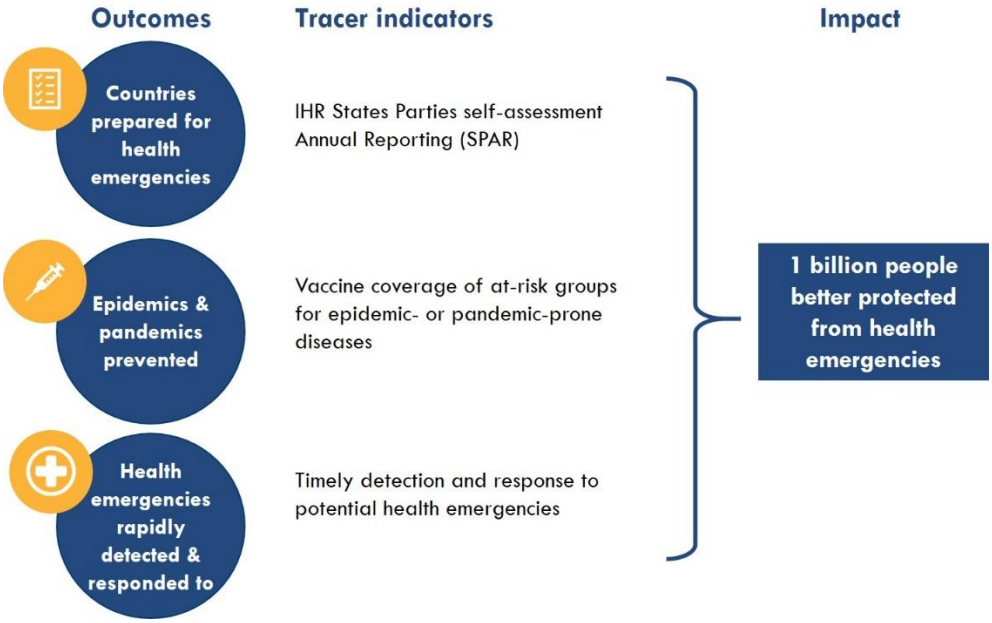
Ideally, within-country inequalities will also be examined. If data availability permits, the UHC index can be determined separately for the national and priority population subgroups of a country to highlight differences between them.

5 Health Emergency Protection Billion

The Health Emergency Protection (HEP) billion target is for 1 billion more people to be better protected from health emergencies. It will be measured using the Health Emergency 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 Emergency Protection Index (HEPI)



The HEP Billion target is consistent with SDGs 3.d and 3.d.1, and with the 2016 Review Committee report on the Role of the International Health Regulations (IHR), 2005 in the Ebola outbreak and response.

5.1 Status of HEP Billion methods

An outline method for the HEP Billion has been completed. The index is based on three indicators:

- **emergency prepare** – method largely complete and initial calculation made
- **emergency prevent** – method largely complete and initial calculation made
- **emergency detect & respond** – outline method proposed and initial calculation made; some details of definitions still to be clarified, e.g. threshold levels are under evaluation.

The approach to counting improvements in health emergencies protection requires testing and may be adjusted.

5.2 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 (IHR, 2015). 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 values for Bangladesh, based on the SPAR

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
Preparedness 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 (SPAR 2018).

The emergency prepare indicator allows countries to be stratified into five levels of preparedness (Table 5.2), enabling prioritization of where preparedness efforts 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.

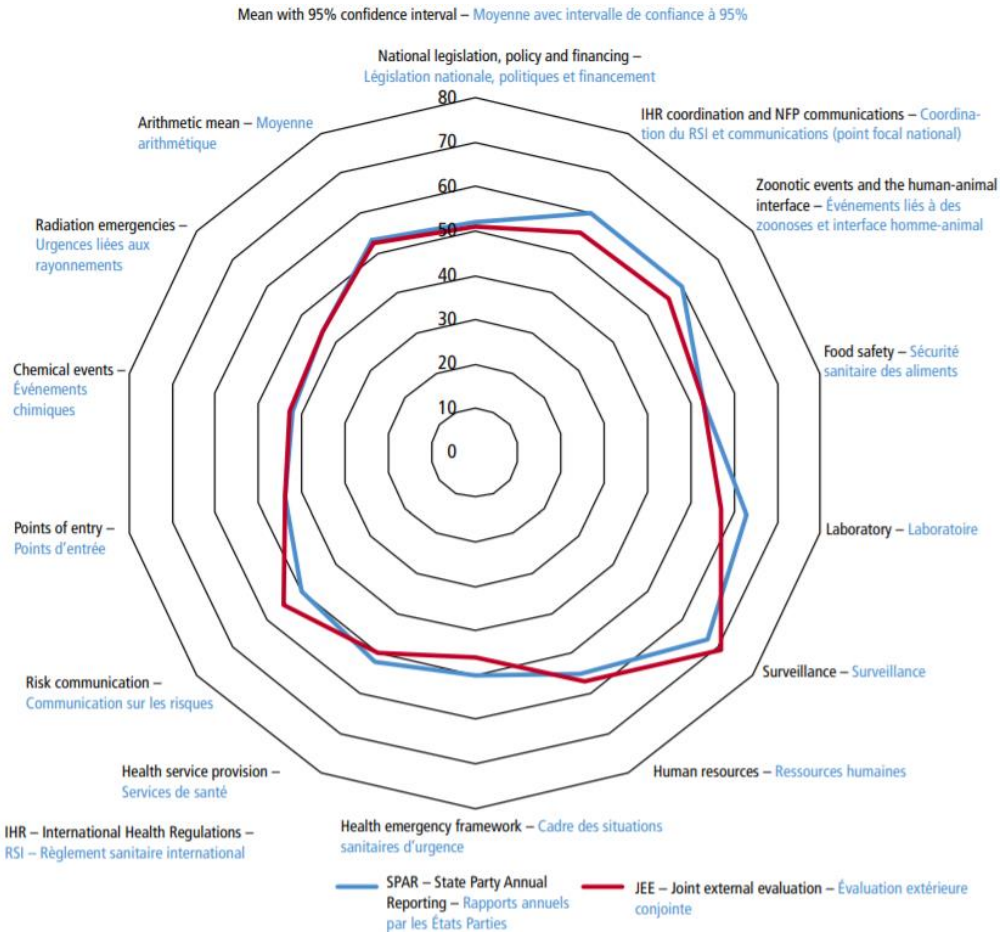
Table 5.2. Emergency prepare indicator categories

Level	Number of Member States	Cumulative population (millions)
Level 5 (≥90)	19	2,231
Level 4 (70 – <90)	46	2,549
Level 3 (50 – <70)	51	1,715
Level 2 (30 – <50)	56	627
Level 1 (<30)	10	114
Data pending	14	316
Total	**196***	**7,552**

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

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. 5.2. Comparison of SPAR and JEE IHR scores



Notes: Kendal, 2019 (https://apps.who.int/iris/bitstream/handle/10665/325623/WER24may2019-iii-vii-eng-fre.pdf)

5.2.1 Example country calculation

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

5.3 The emergency prevent indicator

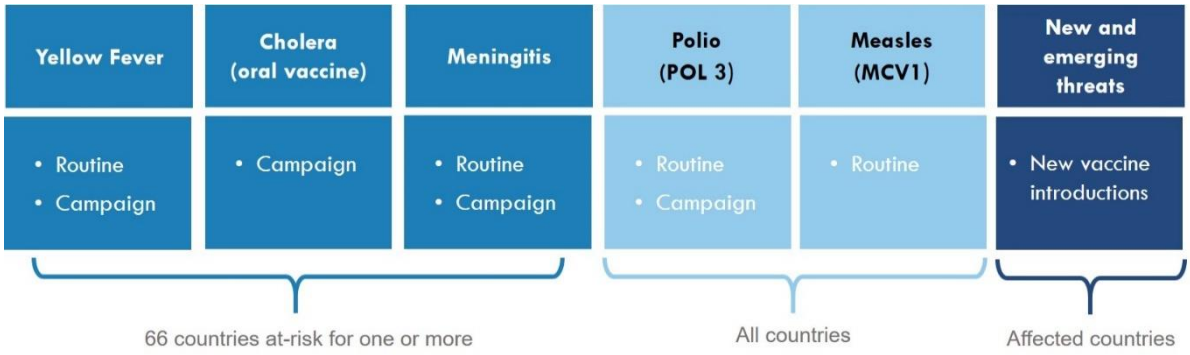
The **emergency prevent** indicator measures efforts to prevent health emergencies via vaccination coverage. Reaching high vaccination coverage in at-risk groups for vaccine-preventable infectious pathogens is key to tackling preventable epidemic diseases and pandemics, leading to the control and elimination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

The emergency prevent indicator incorporates both routine and campaign vaccination for epidemic- and pandemic-prone diseases (Fig. 5.3). It focuses on three priority infectious hazards: yellow fever, meningococcal meningitis A, 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 states
- Polio: all states
- Cholera: if at risk
- Yellow fever: if at risk
- Meningitis: if at risk.

Fig. 5.3. Routine and campaign vaccinations included in the prevent indicator



5.3.1 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

	Number of Member States
Yellow fever (high-risk Member States)	39
Cholera (affected Member States)	47
Meningitis A (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 weighting scheme 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 (e.g. for cholera) had an oversized effect on the mean).

5.3.2 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)
- polio immunization campaign data from WHO/Global Polio Eradication
- additional meningitis, polio 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) (GTFCC, 2017).

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 A. 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.

5.3.3 Example country calculation

A sample calculation of the prevent indicator is provided for Nigeria, which is at risk for yellow fever 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 calculation of the emergency prevent indicator for Nigeria

Country category: At risk for yellow fever, cholera, and meningitis

Surviving infants (UNDP 2018): 6,976,955

Vaccine	Type	Coverage (%)	Relevant population	Vaccinated
Measles	routine	65	6,976,955	4,535,021
Yellow fever	routine	65	6,976,955	4,535,021
Meningitis A	routine	0*	6,976,955	0
Polio	routine	57	6,976,955	3,976,864
Yellow fever	2018 campaign	94	33,633,032	31,605,998
	2017 campaign	87	3,290,824	2,872,799
Meningitis A	2017 campaign	86	2,335,349	2,008,400
	2016 campaign	87	197,117	171,492
	2015 campaign	66	515,967	340,538
Cholera	2017 campaign	104	1,710,984	1,780,520
Total			**69,591,093**	**51,826,653**
Index				0.744

**Introduction of meningitis A vaccination scheduled for 2019*

5.3.4 Initial global results

The 2018 emergency prevent indicator was estimated in October 2019 for 194 Member States and was based on incomplete data (Fig. 5.4, Table 5.5).

The 2018 preliminary results show an average global coverage of 85%, with 5.6 billion persons in 112 Member States having the highest level of prevention (≥90%). This means 2 billion people reside in 82 Member States where routine and emergency vaccination could be strengthened. 50 of the 66 at-risk Member States have mean coverage <90%, with 1.5 billion of 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. 5.4. Mean coverage of emergency prevent indicator (2018 preliminary results)

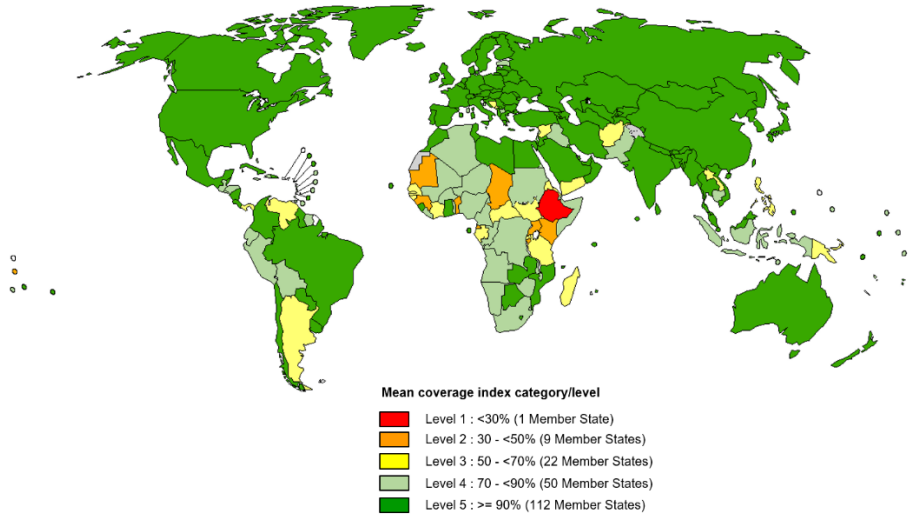


Table 5.5. Emergency prevent indicator levels for all Member States and at-risk Member States (n = 66; preliminary results)

Category	Number of Member States	Total population (millions)	Number of at-risk Member States	Total at-risk states population (millions)
Level 5: ≥90	112	5,613	16	2,140
Level 4: 70 – <90	50	1,267	24	832
Level 3: 50 – <70	22	447	17	393
Level 2: 30 – <50	9	151	8	150
Level 1: <30	1	109	1	109
Total	**194**	**7,587**	**66**	**3,624**

5.4 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 events, including outbreaks and emergencies. Timeliness is a critical aspect of improving public health impacts and protecting lives and is a key performance measure for surveillance systems. The detect & respond indicator will measure the level to which a member state can react appropriately to an event of potential public health concern. It is a developmental indicator 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 report and respond more quickly to major public health emergencies so as to limit their spread. It can used as a valuable performance-management metric.

5.4.1 Concept

The detect & respond indicator will monitor the timeliness of detection, notification, and response to public health emergencies including all IHR notifiable events, together with national public health events. IHR notifiable events are events 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. National public health events are country specific and will depend on the country context. They may include (a) infectious and hazardous diseases on the priority disease list (b) natural disasters such as floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, storms, and other geologic process, (c) other chemical, radiation, and food safety events. Priority diseases include those that pose public health risks and where further research and development is needed, including surveillance and diagnostics.

Both national public health and IHR-notifiable events are required in the indicator because IHR events are highly variable and unpredictable; many Member States will not be affected by them. As an example, out of 194 WHO Member States, 121 (62 %) experienced an event that was notified through EIS in 2014 to 2019. Out of these, from 1 January to 12 September 2019, only 39 countries (20%) had an event notified through EIS. The number and nature of health events varies greatly, depending on the Member State (e.g. their burden of diseases, access to health care, safe water and sanitation, and gross domestic product per capita).

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 (**Error! Reference source not found.**). Further details are shown in Table 5.7, which also lists key proxy measures that can be used to estimate the event milestones.

The definitions of the event milestones are still being refined. The varied types of possible response measures pose a challenge. A single definition for the start of a response is also not currently available. Work is continuing towards identifying a suitable approach to define and facilitate recording of timeliness measures, including through reporting to WHO through the event information site (EIS) available to IHR focal points. To account for missing dates, 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 5.7).

Table 5.6. 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.

5.4.2 Calculation method

Each of the three components of timeliness will be stratified into five levels (Table 5.7), 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

were developed using quantiles of timeliness (in days) for each milestone observed for IHR notifiable events during 2014–2018 (baseline period).

Table 5.7. Key event milestones and their associated indicators

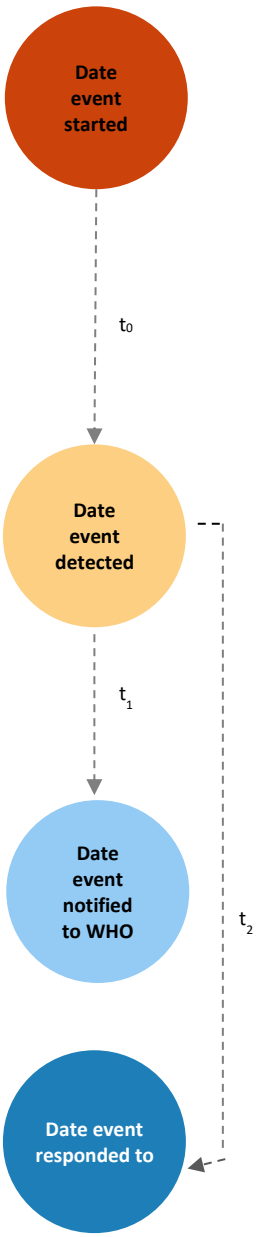
Date milestones	Ideal indicator	Examples of alternative proxy indicators
	Date of index case symptom onset	Symptom-onset date of first reported case (=initial case) First visit to health-care facility Suspected primary case Most likely exposure date (estimated) First exposure date (estimated) Latest 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

Table 5.8. Definition of levels for the three timeliness sub-indicators and the Detect and Respond indicator (thresholds may be revised)

Level	Timeliness sub-indicators range (detection, notification, and response) (days)	Detect and 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

The detect & respond indicator (timeliness) is calculated as the average of the three timeliness measures (Table 5.8), rescaled between 0 and 100.

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

Note that the factor of 20 above converts this indicator into the scale of 0 to 100. For reporting purposes, the detect & respond indicator will be converted into five levels (Table 5.8):

As an in initial step, baseline estimates (2014–2018) of the detect & respond indicator have been established, based on IHR-notifiable events.

5.4.3 Handling the indicator when countries start to gather data

For the detect and respond indicator to be effective, countries will need to gather regular data on their public health and IHR-notifiable events. This will allow baseline values to be calculated and change to be detected. Ideally countries will collect data for at least 5 events in a calendar year.

Due to the newness of this indicator, and the relatively limited number of IHR-notifiable events during the baseline period, a baseline value will not be calculated for many countries. To handle this, when countries first begin to report events to WHO (at least 5 per year, and including event onset, time of detection, time of reporting, and time of response) they will be assumed to have incremented the timeliness indicator by 2% ($1/10^{th}$ of a level). After this, further incremental progress in the indicator level will be measured directly. This approach means that countries without prior baseline data will not be penalized. Countries that improve reporting and timeliness for detection, notification, and response, will contribute positively to attaining the Health Emergency Protection Billion. If countries stop reporting, they will, however lose this increment.

5.4.4 Data sources and availability

The key data sources for IHR-notifiable and country-specific public-health-reportable events that occur in a given year at the country level are:

- 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). An EIS is only accessible to NFPs and UN partners.
- Event management system (EMS): WHO's central internal electronic system for entering, accessing and managing information for all potential and substantiated events. All event details, relevant communications, WHO assessments and decisions must be recorded in the EMS. The EMS will require adaptation for GPW13.

- Events recorded in a country's National Public Health systems and considered a public-health-reportable event.

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 to WHO and to make incremental progress on timeliness of detection, notification and response to events, regardless of baseline values.

5.4.5 Example country calculation

Sample calculations are provided to illustrate the calculation of the detect & respond indicator. In the first example (Table 5.9), 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 5.10). The third example illustrates how multiple events are used, with each event being separately graded and then an average taken (Table 5.11). All data provided in the country example tables are subject to change.

Table 5.9. Example country A (n=1): 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

Table 5.10. Example country B (n=1): 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			1

Table 5.11 Example Country C (n=3): Country with multiple dates with all (or most) of the dates reported Timeliness will be calculated for each event then the average will be used.

	Time	Median duration (days)	Sub-level	
	Detection (t0)	3	4	
	Notification (t1)	1	5	
	Response (t2)	30	3	
Event 1 timeliness level				4
	Detection (t0)	1	5	
	Notification (t1)	1	5	
	Response (t2)	0	5	
Event 2 timeliness level				5
	Detection (t0)	N/A	1	
	Notification (t1)	N/A	1	
	Response (t2)	N/A	1	
Event 3 timeliness level				1
Overall timeliness level				3

5.4.6 Limitations

Detect & respond timeliness data have not previously been gathered in a systematic manner, despite being a key measure of responsiveness in emergency situations. For the future, data collection will require the enhancement and systematic use of EMS and EIS, together with a system to record events reported under national public health systems

The number and nature of potential acute health events varies enormously between Member States, depending on, for example, their burden of diseases, access to health care safe water and sanitation, and gross domestic product. It is therefore planned to calculate this indicator using a rolling time-period (5 years). The very variable nature of events makes this indicator sensitive to a single event. This will be mitigated by including as many events as possible, including national health events, and by establishing a minimum number of events to be used for reporting (e.g. 5 events per year).

5.5 Combined emergency index

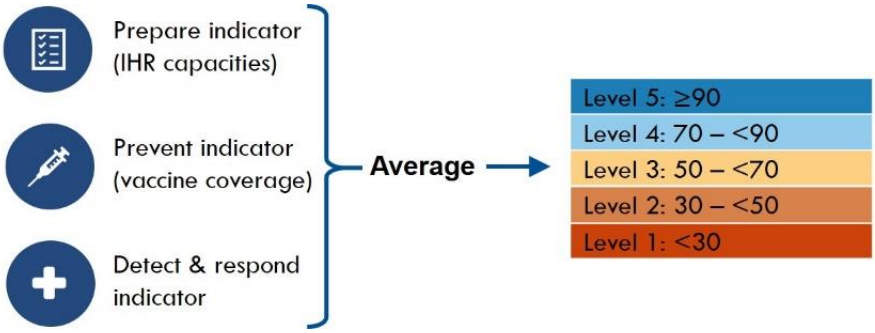
The Health Emergency Protection Index (HEPI) is calculated as the average value of the three tracer indicators: the emergency prepare, emergency prevent, and emergency detect & respond indicators. HEPI summarises a country's overall level of protection from health emergencies.

HEPI is calculated as the arithmetic mean of the indicators:

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

Countries will be categorized into five levels of HEPI (Fig. 5.5), with the objective that countries work towards moving up a level.

Fig. 5.5. Calculation of the Health Emergency Protection Index



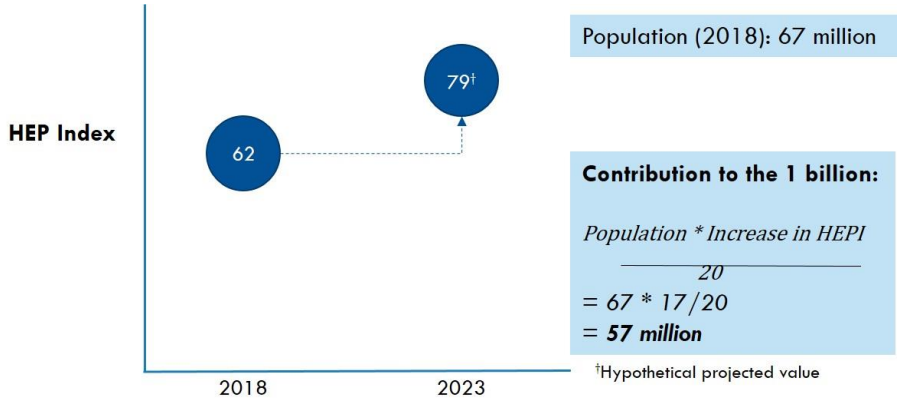
5.5.1 Calculating the country contributions to the HEP Billion

In order that progressive improvements in protection against health emergences can be recognized for all countries, incremental changes will be counted. This will be measured relative to a 20% benchmark, the equivalent of a full level change in the HEP index. For example, a country for which the HEPI has increased 20%, a full level, would contribute 100% of its population. For an increase of 10% it would contribute 50% of its population, and for an increase of 5% would contribute 25% of the population. Simplified calculation:

$$Contribution\ to\ HEP\ billion = \frac{Population * Increase\ in\ HEPI}{20}$$

All countries can thus contribute to the "1 billion better protected against health emergencies", provided they have demonstrated progress.

Fig. 5.6 Hypothetical country example contribution to HEP Billion



Final country calculations for contribution to the billion will use UNDP population estimates for the final year (2023) (see also Section 3.6).

$$Country\ contribution\ to\ HEP\ Billion = \frac{(Final\ HEPI - Baseline\ HEPI) * Population\ (2023)}{20}$$

In cases where the change in HEPI exceeds 20%, the contribution to the billion will be capped at 100%.

5.6 Equity for emergencies

Equity for emergencies will be assessed by examining between-country inequalities, for example by measuring the absolute and relative difference in terms of the Health Emergency Protection Index between low-resource settings and the global average or high-resource settings.

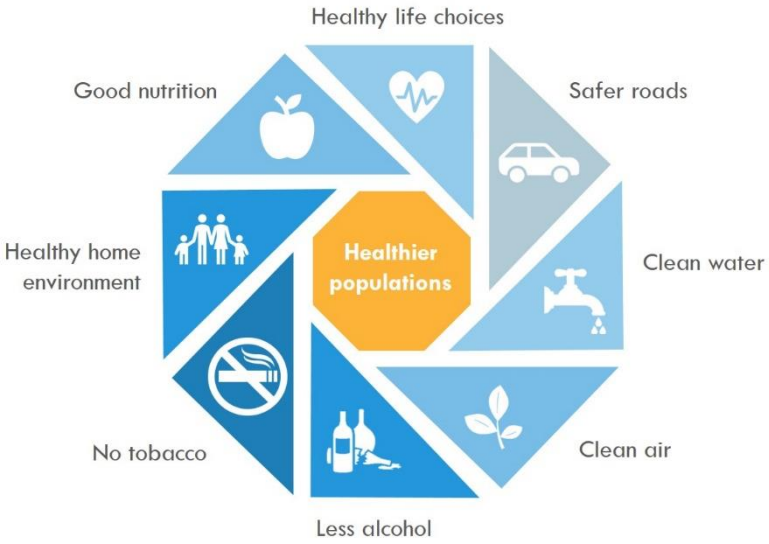
6 Healthier Population Billion

The Healthier Population (HP) 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 HP 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 (e.g. reduced use of alcohol and tobacco, better nutrition and healthier body weight). The billion largely focuses on factors for which key controls lie outside the health sector and not within the health care system. The key to achieving the HP Billion will be via multisectoral interventions driven by the health sector and influenced by policy, advocacy and regulation.

The Healthier Population Billion measures change based on those indicators from the GPW13 programme that relate to social, environmental and behavioural risks (Fig. 6.1). The HP Billion will measure the overall global impact, linked to these indicators, due to interventions from Member States, WHO and other interested parties.

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



The Healthier Lives Index (HLI) described below is the first time that WHO has created a combined 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 and to promote country autonomy. The method can be used even when some indicators are not available in a country.

6.1 Status of Healthier Population Billion methods

The Healthier Population Billion approach has undergone extensive consultation during late 2019, and adaptations to text and method have been made following these consultations. Not all details are finalized. Five indicators require transformation into prevalence and these transformations are being worked on. Some adjustment to the indicators included is possible – e.g. use of trans fats and suicide mortality. Changes to transformations and indicators affect contributions to the billion. Country examples are in preparation to show how the billion will look at a country level. Further details are not yet resolved, for example dealing with uncertainty. Several avenues have been explored (e.g. simple weighting) and further details are given in appendices.

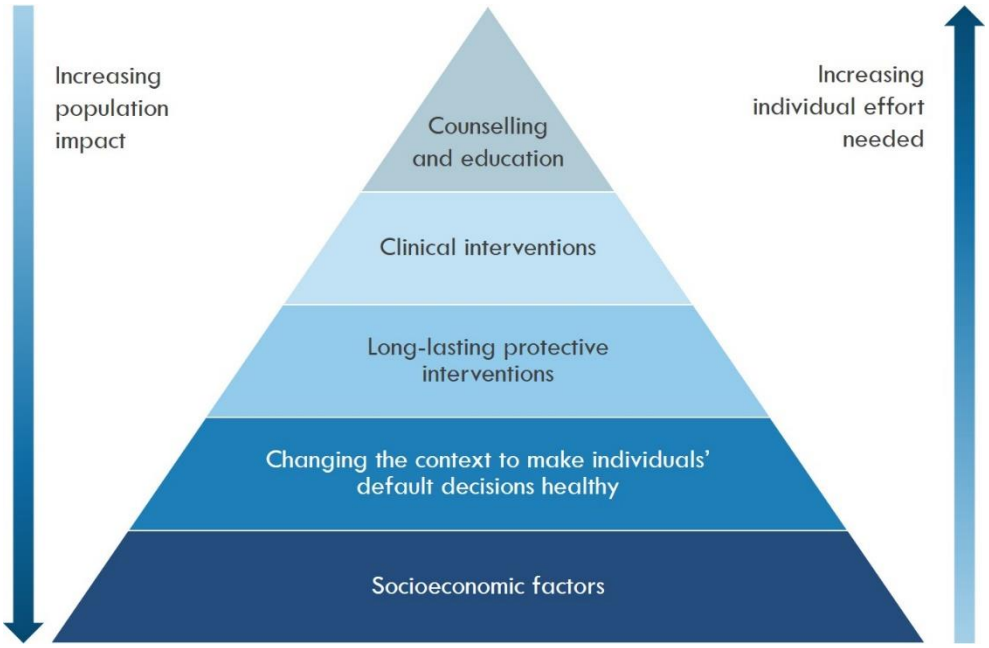
6.2 A concept framework for healthier populations

A useful conceptual framework to illustrate the areas targeted for the Healthier Population 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 this billion goal 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.

In addition to the choices of food products, factors such as the design of urban infrastructure can play an important role in influencing the choice to walk or cycle. 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 choices requires interventions that address the bottom layer of this pyramid: the socioeconomic factors. 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, and 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 (Frieden)



6.3 Indicators for measuring healthier populations

6.3.1 Type of indicators

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

Table 6.1. Indicators for measuring change in healthiness

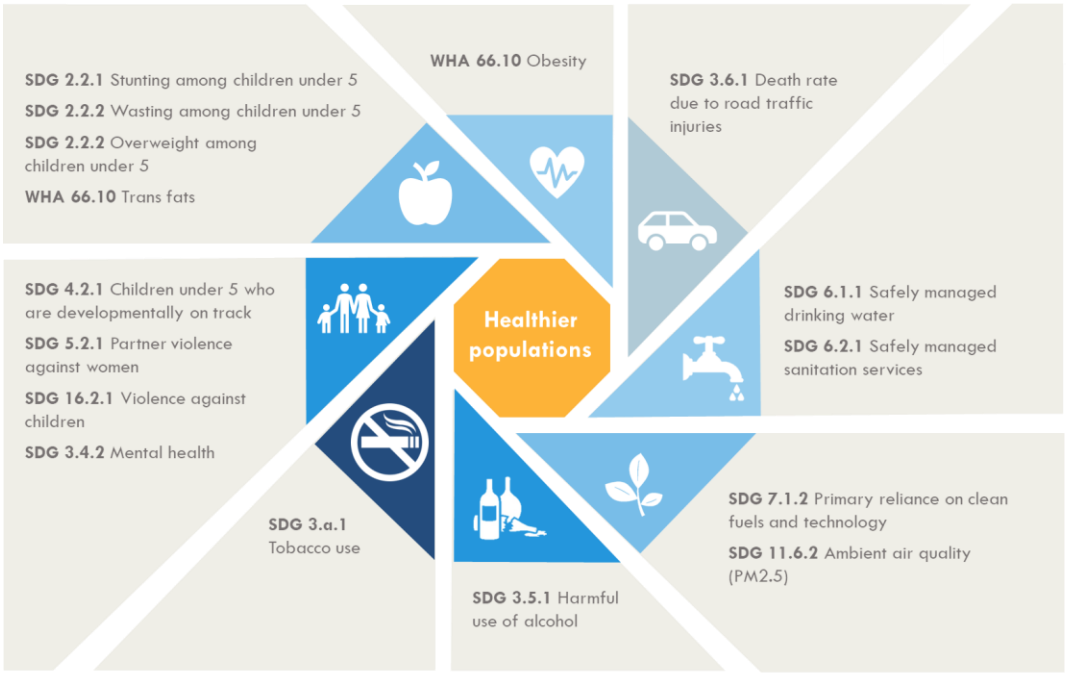
SDG/WHA	SDG/ WHA short name	Value to be used in Billion	Age range
SDG 3.a.1	Tobacco use	100 – x	15+
SDG 3.5.2	Alcohol (litres)	convert	15+
SDG 3.6.1	Road injuries/Deaths	convert	all
SDG 2.2.1	Stunting u5	100 – x	<5
SDG 2.2.2	Wasting/ Overweight u5	100 – x	<5
WHA66.10	Obesity	100 – x	5-19, 18+
SDG 11.6.2	Mean particulates (PM2.5)	convert	all
SDG 7.1.2	Clean fuels	x	all
SDG 6.1.1	Safely managed water	x	all
SDG 6.2.1	Safely managed sanitation	x	all
SDG 4.2.1	Developmentally on track u5	x	<5
SDG 5.2.1	Partner violence for women	100 – x	partnered women 15+
SDG 16.2.1	Violence against children	100 – x	<18
WHA 66.10	Trans fats	convert	all
SDG 3.4.1	Suicides	convert	all

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

- focus is largely outside health sector
- 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.

Most of the selected indicators measure **risk to health** (e.g. prevalence of tobacco use, (lack of) access to clean water). Such indicators are typically the outcome of policy and regulation and can be considered as a measure of the effectiveness of policy, legislation, education and regulation. The trans-fats indicator is an example of an indicator measuring policy or regulation (see also Section 6.3.4). Policy indicators are less directly translatable into healthier lives. Trans fats is the only policy indicator included in the GPW13 indicators. In including the trans-fats policy indicator, account has been taken of the expected impact on the population (see Appendix E.3).

Fig. 6.3. 16 Indicators selected for inclusion in the Healthier Lives Index



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 scales and require transformation to a scale of prevalence (see Section 6.3.3). Childhood wasting <5 and overweight <5 are both forms of unhealthy weight, as measured by ratio of height to weight, and will be combined to create a healthy child weight indicator.

6.3.3 Converting non-prevalence indicators

Five of the selected indicators are not measures of prevalence but are included in the HP Billion because each is a key contributor to global healthiness.

The indicators are:

- Alcohol, for which the SDG indicator is mean intake of alcohol in litres.
- Air pollution, for which the SDG indicator is median PM2.5.
- Road mortality, which is a measure of mortality and included as a proxy for road safety. Although in most cases measures of mortality have been excluded, an exception is made for this indicator because of the very high burden with which it is associated and the lack of an alternative measure of road safety.
- Trans fats, for which the indicator measures if best practice policy has been implemented.
- Suicide mortality, included in order that mental health features in the HP Billion. (Work is in progress to determine how best to do this.)

Given that that it is important that each of these issues is reflected in the HP Billion, and as countries do not wish to gather additional information, a compromise approach is proposed. 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 term "healthier" is a qualitative judgement, so it is difficult to be more rigorous than this.

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.3).

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 HP 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). Details of the transformation are presented in Appendix E.3

Road safety

The SDG indicator for road safety measures mortality. 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 HP 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 excludes 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. More details of the transformation are given in Appendix E.3.

Clean air

The SDG 11.6 indicator for air particulates measures the median concentration of PM2.5 in µg/m3. For counting towards the HP Billion, a reduction of PM2.5 by 50 µg/m3 is equated to 100% of the population being healthier. Smaller changes contribute to the HP Billion in a proportional manner. For example, improving the median PM2.5 by 5 µg/m3 would be counted as equivalent to 10% of the population being healthier. The benefit of better air quality is likely to be experienced as a significant proportion of the population gaining partial healthiness benefit (rather than just a few of the population experiencing a large change) (Cohen *et al.*, 2017). Further details, and alternative approaches that were considered are provided in Appendix E.3.

Trans fats

The trans fats indicator is a policy indicator that measures whether WHO best-practice guidelines for consumption of trans fats have been implemented. Implementation of best-practice policy can virtually eliminate excessive consumption of trans fats (Parziale and Ooms, 2019). Countries implementing best practice will be assumed to contribute x% of their population to the HP Billion. Here, x% is the estimated proportion of the world's population consuming trans fats above the recommended 1% of energy intake threshold in non-trans-fat-regulated Member States (currently set to 10%).

Mental health

Mental health is an important aspect of healthiness. Inclusion in the HP Billion requires a suitable transformation of SDG 3.4.2, mortality due to suicide, into a measure of prevalence of healthiness. The WHO World Mental Health Survey estimates that for each adult who dies of suicide there are more than 20 others who made one or more suicide attempts [add ref]. This factor will therefore be used to estimate the number of suicide attempts. The number of additionally healthier lives will be counted as the estimated number of people avoiding suicide or a suicide attempt. The approach is being tested and may possibly be refined to consider income group.

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 HP 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. [add refs]). 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 HP Billion. It is intended that information on policy implementation and legislation will be reported and tracked alongside the Healthier Lives Index. Countries will not be required to provide such data, but where available it will be presented.

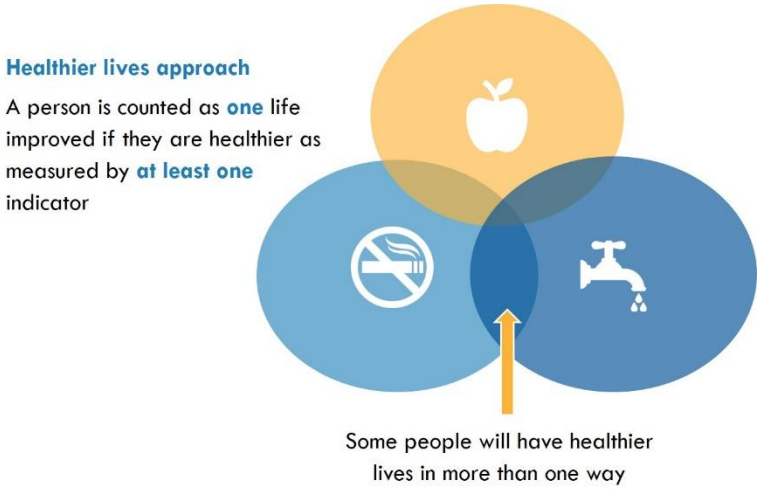
6.4 The healthier lives approach

6.4.1 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 hoped that it will be accessible to all countries. An important disadvantage of the approach is that disparate impacts on individuals, such as access to clean air, access to safe sanitation, avoiding partner violence, are given equal weight.

Fig. 6.4. The healthier lives approach



6.4.2 Healthier lives approach – a measure of change

The healthier lives approach is used to calculate an index of change, the Healthier Lives Index (HLI). The index measures the net number of people, at a population level, whose lives are newly healthier in some way. This could be due to parts of the population having new access to clean water, or due to a reduction in the prevalence of smoking, or due to more people accessing safer roads.

The HLI 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 some instances, a population may experience better conditions (better air quality, reduced alcohol consumption, reduced body weight from obese to overweight) but there may remain scope for further future improvements (excellent air quality, zero alcohol consumption, healthy weight). A "healthier life" is not necessarily 100% healthy with no room for improvement.

6.4.3 Calculating the healthier lives contributions

The healthier lives approach adds up lives by counting the population 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. population of children under 5) and,

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

For example, if the adult population is 1 million and the prevalence of clean water is 60% at the start of the period and 62% at the end of the period, then

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

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 HP Billion and ensures that the the contribution to the HP Billion can never exceed the country population. It is a simplified, first-level

correction that aims to address Member State concerns, 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.6.

Handling population growth

The HP 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 HEP billions, population growth is handled using a counterfactual approach (Section 3.6). This compares what might have happened if no 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 as the change in prevalence of tobacco use 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

6.4.4 Sharing out the Healthier Population Billion

For healthier populations, all countries are encouraged to make progress. It is proposed that this progress should be shared out evenly, in proportion to the population of each country. Several of the indicators, such as obesity, affect developed countries at least as much as developing countries, and small countries as much as larger countries. For the HP Billion to be achieved in a world of 8 billion people (by 2023), this would represent 1 in 8 people worldwide living healthier lives.

6.4.5 Dealing with uncertainty

It is intended that estimates of uncertainty will be calculated for the Healthier Population Billion contributions (in keeping with adhering to GATHER guidelines) (Stevens *et al.*, 2016). The approach to handling uncertainty is not yet determined.

6.4.6 Negative contributions

Negative contributions to the HLI can occur if an indicator prevalence has worsened 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 provide a breakdown of healthier lives to indicate improved and worsening situations (see Section 6.7).

6.5 Limitations of the healthier lives approach

The healthier lives approach is proposed as a first step in measuring changes in healthiness and is tied specifically to the GPW13 programme. The method, however, has several limitations. The GPW13 indicators are a non-optimal set of indicators for measuring change in overall population non-health-sector healthiness – they are not comprehensive of all environmental, behavioural and social risks affecting healthiness, and they do not cover all aspects of the life course equally. The indicators are unweighted, despite differences in relative health impacts. The measurement approach taken here is an initial, relatively simple, one in order to provide a practical way forward, given the constraints of the GPW13 programme and the requirement that the method can be assimilated by Member States. Further discussion of these matters may be found in Appendix B.1 and Appendix E.7.

The time-frame of GPW13 programme, in combination with lags in the timeliness of indicator estimates, and the time delay between an intervention and a result, will make calculation of change by 2023 a challenge.

Decreases in healthiness are expected for some indicators, e.g. obesity, but effective interventions that can halt or reverse change are not yet known. Projection/forecasting methods may need to be used, in order that the HP Billion can be estimated.

Healthier lives are currently calculated only where estimates are available. Missing data will mean that some newly healthier lives are not counted but will avoid counting unmeasured change. It is proposed to use the programme-specific methods for imputing and projecting indicator estimates (where available).

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 healthiness will develop further. This may inspire a more general and comprehensive index of healthiness. Whilst the current approach 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).

6.7 Testing the Healthier Population Billion using historical data

The Healthier Lives Index (HLI) measures change over a period. To test the performance of the HLI, the index has been 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 6.2, Fig. 6.5). No infilling has been performed and the values only sum change where it was measured.

Important things to note from this exercise:

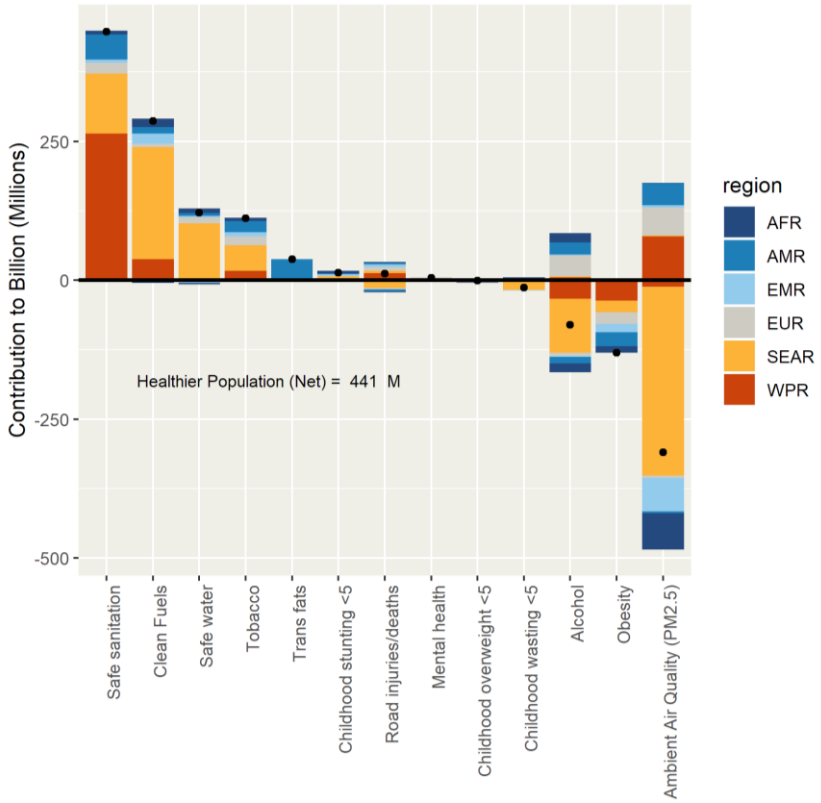
1. Figures are provisional and liable to change. This is particularly the case for indicators where a conversion to prevalence is needed and has not been finalized. The estimates could change considerably.
2. No infilling of missing data has been made, and additional contributions are expected (e.g. for water and sanitation). If new data from large countries is added the totals will be impacted, .e.g. without the hefty contribution from China for sanitation, the total would be much reduced.
3. The calculation uses a simplified estimate of change over 5 years. In the future, better methods of projection/trend estimation should be used.
4. For the historical 5-year period the HLI is estimated to be around 400 million, but with considerable uncertainty. It seems most likely that the HP Billion will require acceleration during GPW13.
5. 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 6.2. Estimated number of people with healthier lives, by indicator and region (millions)

SDG / WHO region	African Region	Region of the Americas	Eastern Mediterranean Region	European Region	South East Asian Region	West Pacific Region	World
Safe sanitation	7	44	6	19	108	264	447
Clean Fuels	11	12	18	6	202	38	286
Safe water	6	4	1	10	100	0	122
Tobacco	6	20	7	15	47	17	112
Trans fats	0	36	0	2	0	0	37
Childhood stunting <5	2	1	3	1	5	2	14
Road injuries/deaths	0	–1	4	5	–9	12	12
Mental health	0	–1	0	2	0	2	4
Childhood overweight <5	1	0	1	0	0	–3	-1
Childhood wasting <5	2	0	0	0	–16	1	-13
Alcohol	2	10	0	32	–95	–29	-80
Obesity	–12	–25	–15	–21	–21	–37	-131
Ambient air quality (PM2.5)	–65	36	–55	46	–339	67	-309
Total (corrected)	-38	124	-28	106	-32	309	441

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.

Fig. 6.5. Contributions to the Healthier Lives Index for historical 5-year period by indicator and region



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.

6.8 Country example calculation

This section provides an example calculation of the Healthier Population Billion. It should be noted that WHO intends to provide online tools that will allow countries to carry out these calculations. The details provided here are to aid understanding.

The indicator changes for the HP Billion are estimated using the most recent value and an earlier value around five years earlier. The method below has scope to be improved to use a more sophisticated estimation of change based on all available data. The population used is the population relevant to each indicator and, for this example, 2015 population estimates are used.

Transforming the data

All indicators are transformed so that 0 represents least healthy and 100 represents most healthy (Table 6.1). 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 detailed in Appendix E.3.

Table 6.3. Sample calculation of the healthier population contributions for country X

Indicator	Year start	Value start	Year end	Value end	Re-scaled start	Re-scaled end	Years	Prevalence change (5-year)	Relevant Population (M)	Healthier (M)
Safe sanitation	2012	62.4	2017	65.2	62.4	65.2	5	2.83	78.3	2.22
Tobacco	2010	31.7	2015	30	68.3	70	5	1.7	58.2	0.99
Alcohol	2010	2.2	2016	2	81.2	83	6	1.42	58.2	0.83
Childhood stunting <5	2008	12.5	2014	9.9	87.5	90.1	6	2.15	6.7	0.14
Trans fats	2013	0	2018	0	0	0	5	0	78.3	0
Childhood wasting <5	2008	1	2014	1.9	99	98.1	6	-0.72	6.7	-0.05
Childhood overweight <5	2008	9.7	2014	11.1	90.3	88.9	6	-1.15	6.7	-0.08
Obesity (5–19)	2011	9.4	2016	11.5	90.6	88.5	5	-2.1	20	-0.42
Road injuries/deaths	2011	6.8	2016	12.3	97.7	95.9	5	-1.85	78.3	-1.45
Obesity (adult)	2011	28.2	2016	32.2	71.8	67.8	5	-4	54.9	-2.2
Ambient air quality (PM2.5)	2011	34.4	2016	37.2	31.1	25.6	5	-5.56	78.3	-4.35

Notes. Data are available for 11 of the 17 possible indicators (two indicators are used for obesity for2 age ranges). Indicators without data for this country will simply not be counted into the HP Billion. The rescaled column shows the transformed values (see text). Prevalence change shows the 5-year change in the indicator for the transformed values. The Relevant Population is the population to which the indicators applies, e.g. the number of children under 5 for wasting. The Healthier column shows the number of additionally healthier people over the 5-year historical period.

For example, for alcohol, the initial value is 2.2 and the final value 2.0. Using the equations detailed in Appendix E.3:

$$Transformed\ alcohol\ = 100 - SDG\ *\ \left(5.96\ +\ 2.99\ *(1-f)\right)$$

where $$f\ =\ 2.2\ *(5.96)/\ (100\ -\ 2.2 * 2.99)\ = 0.140$$

So, the start value 2.2 is transformed to: $100 -\ 2.2\ *(5.96 + 2.99 * (1 - 0.14))\ =\ 81.2$ and the end value, 2.0, is transformed to 83.

Calculate change over five years

The change over 5 years is calculated from the change in transformed values. If the original values are not exactly 5 years apart then an adjustment is made for this. For example, for childhood stunting, the observations were for 2008 and 2014, a gap of 6 years, therefore:

$$Change\ over\ 5\ years\ =\ (90.07 - 87.49)\ *\ 5/6\ =\ 2.15$$

This is a relatively crude method to estimate change and should eventually be replaced with more sophisticated projection/trend estimation.

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:

$$Healthier\ lives\ due\ to\ reduced\ stunting\ =\ 6.7\ *\ -2.15/100\ =\ -0.14\ Million$$

In this case, childhood stunting has increased, and so there is a negative number of healthier lives.

Combining indicator changes, including adjustment for overlap

The adjustment for overlap between indicators assumes that there will be some random overlap between changes in indicators (Appendix E.3). An online tool will be provided for this calculation which estimates the number of people with newly healthier lives, and the number of people with newly negative lives (allowing for overlaps). The contribution to the 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. In this case, there has been a decline in healthier lives due to worsening air quality, road safety and obesity.

Table 6.4 Total contribution to HP Billion

Newly healthier lives	4.1 million
Newly unhealthier lives	–8.1 million
Contribution to billion = net healthier lives	**–4.0 million**
Final population	78 million
% population leading healthier lives	**–5.2%**

6.9 Equity for healthier populations

Equity for healthier populations will be assessed by examining between-country inequalities, for example by measuring the absolute and relative difference in terms of the Healthier Lives Index (HLI) between low-resource settings and the global average or high-resource settings.

7 Healthy Life Expectancy (HALE)

Healthy life expectancy (HALE) is an indicator that provides a summary measure of average levels of population health. HALE quantifies the expected remaining years of life in good health at a particular age.

HALE has been selected because it can be used to monitor the overall progress made in achieving the Triple Billion targets 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) [add ref]

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.

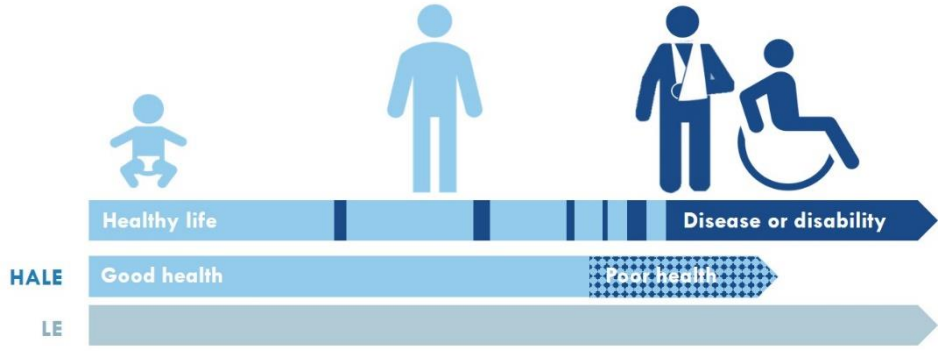
In the **GBD approach** the input data are:

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.

Fig. 7.1. Difference between life expectancy and healthy life expectancy



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 HP 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 initially be calculated at the country level and disaggregated by sex.

The equity target for HALE is to reduce absolute inequality between countries, and to reduce the absolute and relative differences between HALE in low-resource settings compared to global and/or high-resource settings.

In the future, it is hoped that in some settings sub-national estimates of HALE will also be possible. This will require disaggregation of disease burden sub-nationally. HALE may additionally be subdivided by life-course stage.

8 Equity

Equity is the absence of unfair and avoidable differences in health. Monitoring health inequalities, i.e. observable differences in health, is essential for achieving health equity. Health inequalities may exist between countries and between population subgroups within a country. The GPW13 aims to reduce both between- and within-country inequalities.

Inequalities will be monitored at all three levels of the GPW13 impact framework: the 46 outcome indicators and targets, the Triple Billion targets and HALE. Importantly, within-country inequality monitoring depends on the availability of real data. It is hard to measure and monitor within-country inequalities based on estimates.

For HALE and the Triple Billion targets, which are measured using composite indices, data availability is generally insufficient to allow for data disaggregation and within-country inequality monitoring. The focus will therefore be on monitoring between-country inequalities. Comparisons can be made based on country income, for example by comparing the situation in low-income countries with the global average. In addition, for countries where disaggregated data are available, case studies can be undertaken to monitor within-country inequalities.

For the 46 outcome indicators, the main aim will be to monitor within-country inequalities. Within-country inequality measurement is of importance as it is the most actionable on a country level. Disaggregation will be tailored to the indicator of interest for global-level monitoring and will ideally focus on the inequality dimension (axis of disaggregation) most relevant to each member state when it comes to national-level monitoring. Sex disaggregation should be undertaken, wherever relevant.

For reductions in inequality to be achieved, specific targets for priority subgroups will be used. These targets, when combined and applied across countries, will result in priority subgroups benefitting proportionally more from the Triple Billion targets. They will mean that the pace of improvement for an indicator is faster for a priority subgroup than at the national level and/or for a defined reference subgroup.

9 References

Asma, S. *et al.* (2019) 'Viewpoint Monitoring the health-related Sustainable Development Goals: lessons learned and recommendations for improved measurement', *The Lancet*, 6736(19), pp. 1–7. doi: 10.1016/S0140-6736(19)32523-1.

Barber, R. M. *et al.* (2017) 'Healthcare access and quality index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990-2015: A novel analysis from the global burden of disease study 2015', *The Lancet*, 390(10091), pp. 231–266. doi: 10.1016/S0140-6736(17)30818-8.

Cohen, A. J. *et al.* (2017) 'Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015', *The Lancet*. The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license, 389(10082), pp. 1907–1918. doi: 10.1016/S0140-6736(17)30505-6.

Dieleman, J. L. *et al.* (2018) 'Trends in future health financing and coverage: future health spending and universal health coverage in 188 countries, 2016–40', *The Lancet*, 391(10132), pp. 1783–1798. doi: 10.1016/S0140-6736(18)30697-4.

Forouzanfar, M. H. *et al.* (2016) 'Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015', *The Lancet*, 388(10053), pp. 1659–1724. doi: 10.1016/S0140-6736(16)31679-8.

Frieden, T. R. (2010) 'A framework for public health action: The health impact pyramid', *American Journal of Public Health*, 100(4), pp. 590–595. doi: 10.2105/AJPH.2009.185652.

Fullman, N. *et al.* (2017) 'Measuring progress and projecting attainment on the basis of past trends of the health-related Sustainable Development Goals in 188 countries: An analysis from the Global Burden of Disease Study 2016', *The Lancet*, 390(10100), pp. 1423–1459. doi: 10.1016/S0140-6736(17)32336-X.

Fullman, N. *et al.* (2018) 'Measuring performance on the Healthcare Access and Quality Index for 195 countries and territories and selected subnational locations: A systematic analysis from the Global Burden of Disease Study 2016', *The Lancet*, 391(10136), pp. 2236–2271. doi: 10.1016/S0140-6736(18)30994-2.

Fullman, N. and Lozano, R. (2018) 'Towards a meaningful measure of universal health coverage for the next billion', *The Lancet Global Health*. The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 licence, 6(2), pp. e122–e123. doi: 10.1016/S2214-109X(17)30487-4.

Fullman, N. and Lozano, R. (2020) 'Measurement matters: who and what counts on the road to universal health coverage', *The Lancet Global Health*. The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license, 8(1), pp. e2–e3. doi: 10.1016/S2214-109X(19)30499-1.

GTFCC (2017) 'Declaration to Ending Cholera', *Global Task Force on Cholera Control*, (October 2017), pp. 1–2. Available at: https://www.who.int/cholera/task_force/declaration-ending-cholera.pdf?ua=1.

Hay, S. I. *et al.* (2017) 'Global, regional, and national disability-adjusted life-years (DALYs) for 333 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016', *The Lancet*, 390(10100), pp. 1260–1344. doi: 10.1016/S0140-6736(17)32130-X.

Hogan, D. R. *et al.* (2018) 'Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services', *The Lancet Global Health*. The World Bank and World Health Organization, 6(2), pp. e152–e168. doi: 10.1016/S2214-109X(17)30472-2.

Hosseinpoor, A. R. *et al.* (2018) 'Measuring health inequalities in the context of sustainable development goals', *Bulletin of the World Health Organization*, 96(9), pp. 654–659. doi: 10.2471/BLT.18.210401.

IHR (2015) 'Report of the First Meeting of the Review Committee on the Role of the International Health Regulations (2005) in the Ebola Outbreak and Response', 68(August), pp. 1–11.

Kandel, N. *et al.* (2019) 'Improvement in annual reporting of self-assessments to the International Health Regulations (2005) – Amélioration des rapports annuels d'autoévaluation requis par le Règlement sanitaire international (2005)', *Wkly. epidemiol. rec*, 94(24 May 2019 [special issue]), pp. 2019–05.

Lancet Editorial (2019) 'Ensuring and measuring universality in UHC', *The Lancet*. Elsevier Ltd, 393(10166), p. 1. doi: 10.1016/S0140-6736(18)33257-4.

Lee, C. Y., Wu, J. S. and Liu, D. P. (2018) 'Challenges of measuring the Healthcare Access and Quality Index', *The Lancet*. Elsevier Ltd, 391(10119), p. 429. doi: 10.1016/S0140-6736(18)30146-6.

Lim, S. S. *et al*. (2016) 'Measuring the health-related Sustainable Development Goals in 188 countries: a baseline analysis from the Global Burden of Disease Study 2015', *The Lancet*, 388(10053), pp. 1813–1850. doi: 10.1016/S0140-6736(16)31467-2.

Magnusson, R. and Patterson, D. (2011) 'Role of law in global response to non-communicable diseases', *The Lancet*. Elsevier Ltd, 378(9794), pp. 859–860. doi: 10.1016/S0140-6736(11)60975-6.

Manthey, J. *et al*. (2019) 'Global alcohol exposure between 1990 and 2017 and forecasts until 2030: a modelling study', *The Lancet*, 393(10190), pp. 2493–2502. doi: 10.1016/S0140-6736(18)32744-2.

Ng, M. *et al*. (2014) 'Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013', *The Lancet*, 384(9945), pp. 766–781. doi: 10.1016/S0140-6736(14)60460-8.

Parziale, A. and Ooms, G. (2019) 'The global fight against trans-fat: The potential role of international trade and law', *Globalization and Health*. Globalization and Health, 15(1), pp. 1–8. doi: 10.1186/s12992-019-0488-4.

Stevens, G. A. *et al*. (2016) 'Guidelines for Accurate and Transparent Health Estimates Reporting: the GATHER statement', *The Lancet*, 388(10062), pp. e19–e23. doi: 10.1016/S0140-6736(16)30388-9.

Sullivan, D. F. (1971) 'A single index of mortality and morbidity.', *HSMHA health reports*, 86(4), pp. 347–354. doi: 10.2307/4594169.

UN Statistics Division (2018) *UN SDG 3.8.1. Universal Health Coverage - Metadata.*

UN Statistics Division (2019) *United Nations Global SDG Indicators Database*. Available at: https://unstats.un.org/sdgs/indicators/database/.

Wagstaff, A. and Neelsen, S. (2020) 'A comprehensive assessment of universal health coverage in 111 countries: a retrospective observational study', *The Lancet Global Health*. The World Bank. Published by Elsevier Ltd. This is an Open Access article under the CC BY 3.0 IGO license., 8(1), pp. e39–e49. doi: 10.1016/S2214-109X(19)30463-2.

WHO (1991) *UN general assembly resolution 44/225: Universal Health Coverage*. Geneva. doi: 10.1016/0308-597x(91)90085-p.

WHO (2018a) *13th General Programme of Work (GPW 13) WHO Impact Framework*. Available at: http://who.int/about/what-we-do/GPW_13_Impact_Framework_Targets_and_Indicators_Alignment.xlsx.

WHO (2018b) 'International Coordination Group on Vaccine Provision for Epidemic Meningitis: Report of the Annual Meeting, Geneva, 18 September 2018.', (September). Available at: https://apps.who.int/iris/bitstream/handle/10665/279828/WHO-WHE-IHM-2019.1-eng.pdf?ua=1.

WHO (2018c) *State Party Self-Assessment Annual Reporting Tool International Health Regulations*.

WHO (2019a) *13th General Programme of Work (GPW 13) WHO Impact Framework - Metadata*. Geneva.

WHO (2019b) *Global Health Observatory*.

WHO (2019c) 'Primary health care on the road to universal health coverage: 2019 monitoring report: Full Report'.

WHO (2019d) 'WHO Impact Framework Justification for adoption of the GPW 13 WHO Impact Framework', (May 2019), pp. 1–15. Available at: http://apps.who.int/gb/ebwha/pdf_files/WHA72/A72_5-en.pdf.

WHO (2019e) *World health statistics 2019: monitoring health for the SDGs, sustainable development goals.* Geneva.

WHO & The World Bank (2017a) *Service coverage within universal health coverage: how large is the gap ?* Geneva. Available at:

https://www.who.int/healthinfo/universal_health_coverage/report/uhc_report_2017_technical_note.pdf?ua=1.

WHO & The World Bank (2017b) *Tracking Universal Health Coverage: 2017 Global Monitoring Report*, *World Health Organisation*. doi: ISBN 978-92-4-151355-5.

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

Table A.1. Availability of estimates and trend data.

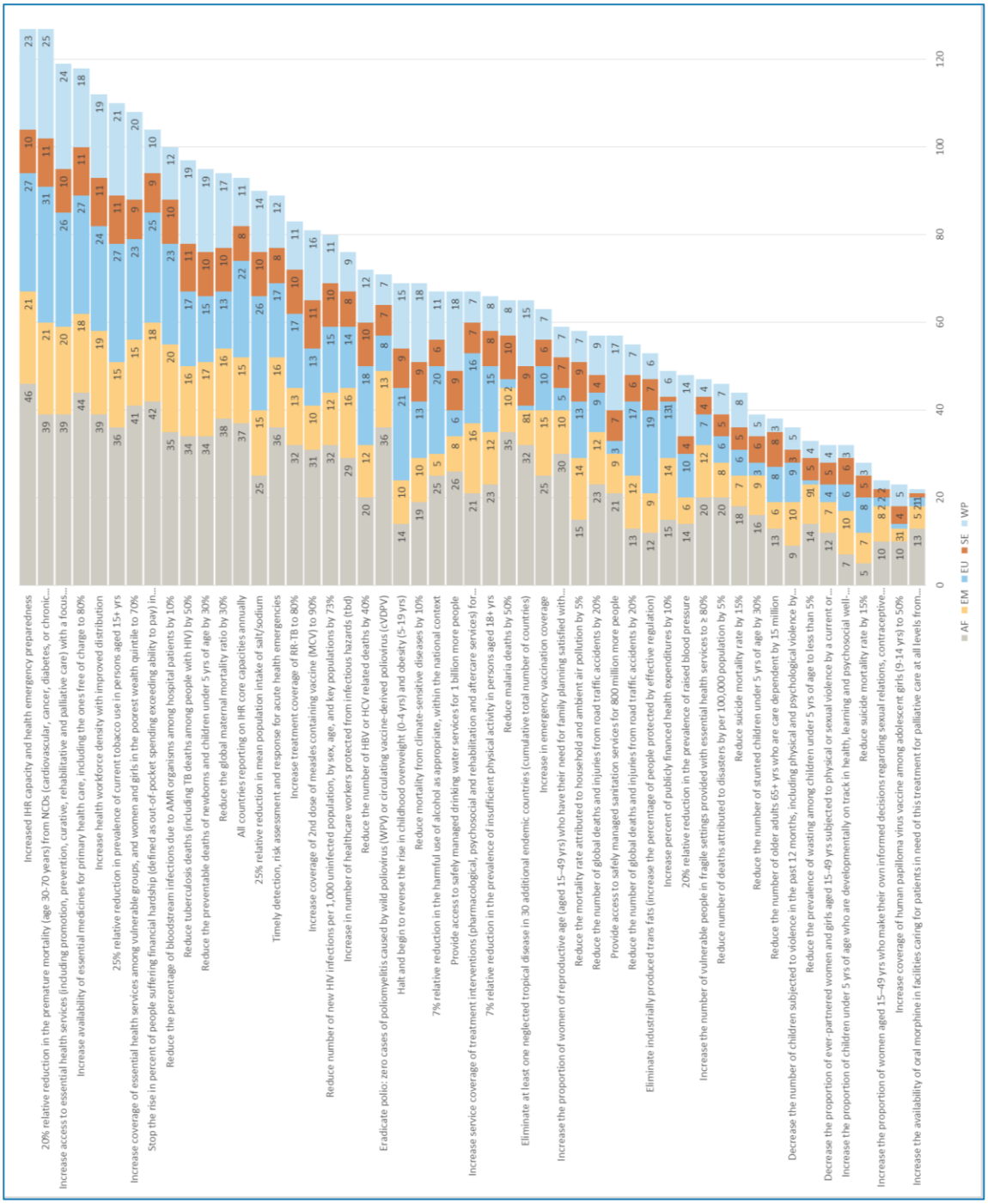
Outcome indicator	Number of countries with no data, 2000-18	Number of countries with >=1 data point 2015 or later	Number of countries with trend data
SDG 1.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	80	70	49
SDG 1.a.2 Proportion 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 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	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: Percentage of people protected by effective regulation on transfats	0	194	162
WHA68.3: Eradicate poliomyelitis	0	168	168

Appendix A.3 Country selection of GPW13 priorities

Fig. A.1. Member State priorities



In 2018, member states were asked to select their priorities amongst the then current GPW13 outcome indicators (this list of indicators has since been changed). The figure shows the number of countries by region prioritizing each of the available outcome indicators

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 Population 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 billion methods use a simple robust approach to population growth, which is to calculate the change in prevalence multiplied by the final population.

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

This approach assumes a counterfactual scenario. For example, without intervention, the counter factual scenario would be that additional population would have the same proportion of smokers or of obesity as the baseline population. This is a reasonable first 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 GPW13, but the simpler approach described above was preferred.

The approach assumes 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).

A generalisation of the equation above allows the additional population to be modelled as having a different prevalence to the initial population:

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

where *cf_prev* is the counterfactual prevalence for the case that the original population is augmented by new population but without additional intervention, and is given by:

$$cf\_prev_{i-start} = \frac{prev_{i-start} + g * prev_{i-g}}{1+g}$$

with g = the population growth over the period

$prev_{i-g}$ = the prevalence of healthy people for indicator *i* in the new population without intervention.

In the case where $prev_{i-g} = prev_{i-start}$ the generalised equation simplifies to the basic approach above.

This generalised approach is more flexible but also requires estimation of $prev_{i-g}$, the expected prevalence in the new population without intervention. Care is also needed because $prev_{i-g}$ may be

different for cases where there is growth or decline in the population. Where g is negative, it is proposed to set $prev_{i-g} = prev_{i-start}$.

The more generalized a method is, the more complex it is, and the more parameters require estimation. At present, the use of the simpler but robust approach (Section 3.6) is proposed.

Appendix B.2 General imitations 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 minimise 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 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. For example, on average there are data estimates for only x% of countries in the last y years, and underlying raw data values are absent in more that z% of cases. Furthermore, measurements are often only made every few years and there can be significant lags in time before estimates are 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.

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 HP Billion the indicators are unweighted, despite differences in relative health impacts. See Appendix E.5.

Limitations linked to overlaps

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

Appendix C Universal Health Coverage Index

Appendix C.1 Stages in UHC Billion development

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 pairs of countries the relative values of the SDG 3.8.1 index do not conform to expectations.

The phases of the UHC Billion have included:

- 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 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.
- An issue with use of SDG 3.8.1 in the Triple Billion because it does not directly translate to a population. Proposal to base UHC Billion on the average seven service coverage tracer indicators (which directly translate into population) but noting that the seven indicators lack any NCDs and the limited number of indicators means that overestimation of UHC service coverage is anticipated.
- Comments from countries and regions that it is confusing to have another index of service coverage and that SDG 3.8.1 is preferred.
- Preference by UHC working group to select SDG 3.8.1 over an average of seven tracer indicators.
- Consultation with ERG task force co-chair advising that:
  (a) It would be better to use the arithmetic average of the 14 tracer indicators rather than SDG 3.8.1 to avoid the pitfalls of the geometric averaging used in SDG 3.8.1
  (b) those tracer indicators that are proxies be rescaled to provide consistency, and that existing issues caused by current rescaling be avoided.

Appendix C.2 SDG 3.8.1 component indicators

Extract from SDG 3.8.1 metadata: list of component indicators (UN Statistics Division, 2018)

I. Reproductive, maternal, newborn and child health

1. Family planning: Percentage of women of reproductive age (15–49 years) who are married or in-union who have their need for family planning satisfied with modern methods (SDG indicator 3.7.1, metadata available here)
2. 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 or more times
3. Child immunization: Percentage of infants receiving three doses of diphtheria-tetanus-pertussis-containing vaccine
4. Child treatment: Percentage of children under 5 years of age with suspected pneumonia (cough and difficult breathing *not* due to a problem in the chest and a blocked nose) in the two weeks preceding the survey taken to an appropriate health facility or provider

II. Infectious diseases

5. Tuberculosis: Percentage of incident TB cases that are detected and successfully treated
6. HIV/AIDS: Percentage of people living with HIV currently receiving antiretroviral therapy

7. Malaria: Percentage of population in malaria-endemic areas who slept under an insecticide-treated net the previous night [only for countries with high malaria burden]
8. Water and sanitation: Percentage of households using improved sanitation facilities

III. Noncommunicable diseases

9. Hypertension: Age-standardized prevalence of non-raised blood pressure (systolic blood pressure <140 mm Hg or diastolic blood pressure <90 mm Hg) among adults aged 18 years and older
10. Diabetes: Age-standardized mean fasting plasma glucose (mmol/L) for adults aged 25 years and older
11. Tobacco: Age-standardized prevalence of adults ≥15 years not smoking tobacco in last 30 days (SDG indicator 3.a.1,)

IV. Service capacity and access

12. Hospital access: Hospital beds per capita, relative to a maximum threshold of 18 per 10,000 population
13. Health workforce: Health professionals (physicians, psychiatrists, and surgeons) per capita, relative to maximum thresholds for each cadre (part of SDG indicator 3.c.1)
14. Health security: International Health Regulations (IHR) core capacity index, which is the average percentage of attributes of 13 core capacities that have been attained (SDG indicator 3.d.1)

Appendix C.3 Data availability for SDG 3.8.1 component indicators

There are many gaps in primary data availability for the UHC SCI tracer indicators, particularly for recent years (2015–2017). Across UHC SCI tracer indicators, over a quarter of the latest country data points pre-date 2010.

Where primary data are missing, imputation methods have been applied. These include:

- Using a validated model to provide estimates. This is used for: met need for family planning (FP);[9] diphtheria-tetanus-pertussis, three doses (DTP3);[10] HIV (ART) coverage;[11] tuberculosis case detection and treatment (TB);[12] ITN use;[13] access to at least basic sanitation (WASH);[14] prevalence of non-elevated blood pressure (BP);[15] mean fasting plasma glucose (FPG);[16] 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. This is used for antenatal care, at least four visits (ANC4); care-seeking for suspected pneumonia (PNEU); hospital beds per 10,000 (HOSP); health worker density (HWD); and IHR scores.
- 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.

Appendix C.4 UHC and full service coverage

The WHO has estimated the number of people globally who are considered to have full UHC coverage (WHO, 2019c). This method uses estimates of average service coverage and then uses data on maternal and child health intervention to convert average coverage to full coverage. The conversion examines what fraction of interventions each mother–child pair received – the "co-coverage". This is then used to evaluate approximately how many people have access to ≥85% of essential services. Details of the UHC report method are provided in a technical note (WHO & The World Bank, 2017a). The approach uses eight of the SDG 3.8.1 indicators but adds four additional tracer indicators to calculate the average service coverage. Household survey data are then used to determine co-coverage (i.e. who has 85% of services needed) by performing a series of regressions relating co-coverage to average UHC service coverage. At present, there is very limited data on co-coverage and it covers only some services. 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 coverage and the 85% coverage approach?

[All numbers provisional and to be updated when UHC method is finalised].

Both average and 85% coverage approaches are both valid approaches for counting how many people have UHC – although the concept and interpretation is a little different. Average coverage provides a simpler, more robust, more transparent approach, better suited to use by Member States.

The UHC 2019 report estimates that at current rates the increase in population with UHC service coverage, 2018 to 2023, would be somewhere between 400 and 600 million people. Using the average-service-coverage approach proposed for the UHC Billion, the likely increase in coverage would be around 600 million i.e. similar but probably a little greater than the UHC report method. However, these figures consider service coverage only. The UHC combined index is expected to change slower than this because of the impact of financial hardship, perhaps around half this value.

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

Appendix C.5 Measuring UHC service coverage – future directions

Extract from UHC 2019 report: Box 1.3. Measuring UHC service coverage: current limitations and future directions:

> UHC is meant to ensure that people receive the essential health services they need, with adequate quality to be effective, and to do so without incurring financial hardship. The inclusionary nature of UHC and its emphasis on providing quality care across a wide set of services – promotive, preventive, curative, rehabilitative, and palliative health services across the life course – poses unique challenges for monitoring UHC progress in policy-relevant, actionable ways. No measure of UHC service coverage will be perfect, particularly in the absence of routine and representative data systems that simultaneously capture intervention need, receipt, and effectiveness across health service domains and for all populations. As a result, UHC monitoring must recognize the current limitations and identify approaches for continuous improvement in the future – all with the overarching goal of providing the best possible data and evidence base for achieving UHC worldwide.
>
> Since its introduction in the 2017 Global Monitoring Report, the UHC SCI offers several improvements such as increasing country-year coverage of primary data and producing a time series for tracking trends over time. Many of its current limitations, particularly country-indicator coverage in the most recent years, stem from longstanding gaps in broader data systems and/or lags in primary data publication. Household surveys are vital components to a country's overarching health data ecosystem, alongside well-functioning civil registration and vital statistics systems and routine, representative administrative data platforms. And they are often the only available data sources to monitor trends in equity and provide more disaggregated data. However, especially due to the inherent periodicity of household surveys, they provide valuable complementary information to civil registration and vital statistics and other data sources within national health information systems, such as disease registries, vaccination records, and health facility surveys.
>
> The SDGs explicitly call for investing in and strengthening national data systems, which directly support UHC monitoring and can thus foster greater accountability and action for improving service coverage. Other limitations, such as the use of health system inputs (such as the density of hospital beds) and prevalence-based measures like non-tobacco use to approximate service availability, also stem from

a global paucity of data on more direct measures of different types of service coverage. Although the use of proxy measures is often necessary, it is important to continually revisit how well various proxy indicators can actually capture progress on health service coverage across settings – and whether they may inadvertently reflect factors outside health services.

Achieving UHC not only involves ensuring access and receipt of essential health services needed by people – it also requires that those services are of sufficient quality to be effective and thus provide the health gains associated with them. Understanding whether and how much people are actually benefiting from the interventions they receive is critical for addressing any gaps in service provision, and more broadly, overall accountability of health systems to the populations they serve. From vaccination and HIV treatment to hypertension, numerous studies show that focusing on coverage alone risks painting an overly positive picture of intervention impact and programme success; for instance, while about 30% of people in 44 low- and middle-income countries received treatment for hypertension, only 10% achieved control. To truly deliver on the promise of UHC – to improve health outcomes throughout the life course – tracking health service effectiveness alongside the receipt of needed services must be prioritized.

We need to understand whether the interventions that the health system delivers have their desired effect in improving the health of the population. For some conditions such as hypertension and diabetes, measuring treatment and control to assess effective coverage is relatively straightforward. For other conditions proxy measures are frequently required. The premise of such proxy measures, that capture outcomes, is that if effective interventions of sufficient quality are received in a timely manner, some negative outcomes should not occur. Moving from measures of service coverage to an overarching measure of effective coverage that captures interventions across levels of care (primary, secondary and tertiary) and range of services (promotive, preventive, curative, rehabilitative and palliative) is a priority.

Evaluating how well different indicators of effective service coverage, both direct and proxy measures, represent health needs across the life course is an important next step for monitoring UHC service coverage at both national and global levels. Globally, technical groups and collaborations such as the Countdown to 2030 for Women's Children's and Adolescent's Health are considering ways to address long-standing challenges in measuring effective coverage and applications for measuring progress on UHC. Member States endorse this priority and WHO aims to support country efforts to strengthen data systems and improve methods for monitoring effective coverage. Building on this information by tracking the full cascade of care, health systems could then be able to track where changes are needed, identify bottlenecks, implement solutions, and measure progress on an ongoing basis.

Appendix C.6 A UHC index of effective service coverage

Work is underway to explore use of a new index of UHC which would have the aims of:

- measuring *effective* coverage of treatment – taking care of service quality (via proxies if need be)
- covering the major health interventions that people need at different stages of the life course in different settings (see box)
- weighting contributions to the index by potential health gain (DALYs)
- suitable for estimation of contributions to the UHC Billion
- limiting the reporting burden but encouraging a forward look at data needs.

Type of care:	**Life course:**
Promotion	reproductive and newborn,
Prevention	under 5,
Treatment: communicable, maternal, perinatal, nutritional	5–19,
Treatment: non-communicable disease and injuries	20–64
Rehabilitation	65+
Palliative	

Precise details of the new index are not yet available and it is intended that new index of UHC will be tested in pilot countries as a first step.

Access: the ability to use services including:

- physical accessibility
- financial affordability
- social and cultural acceptability.

Coverage: the proportion of people that receive the intervention/s they need.

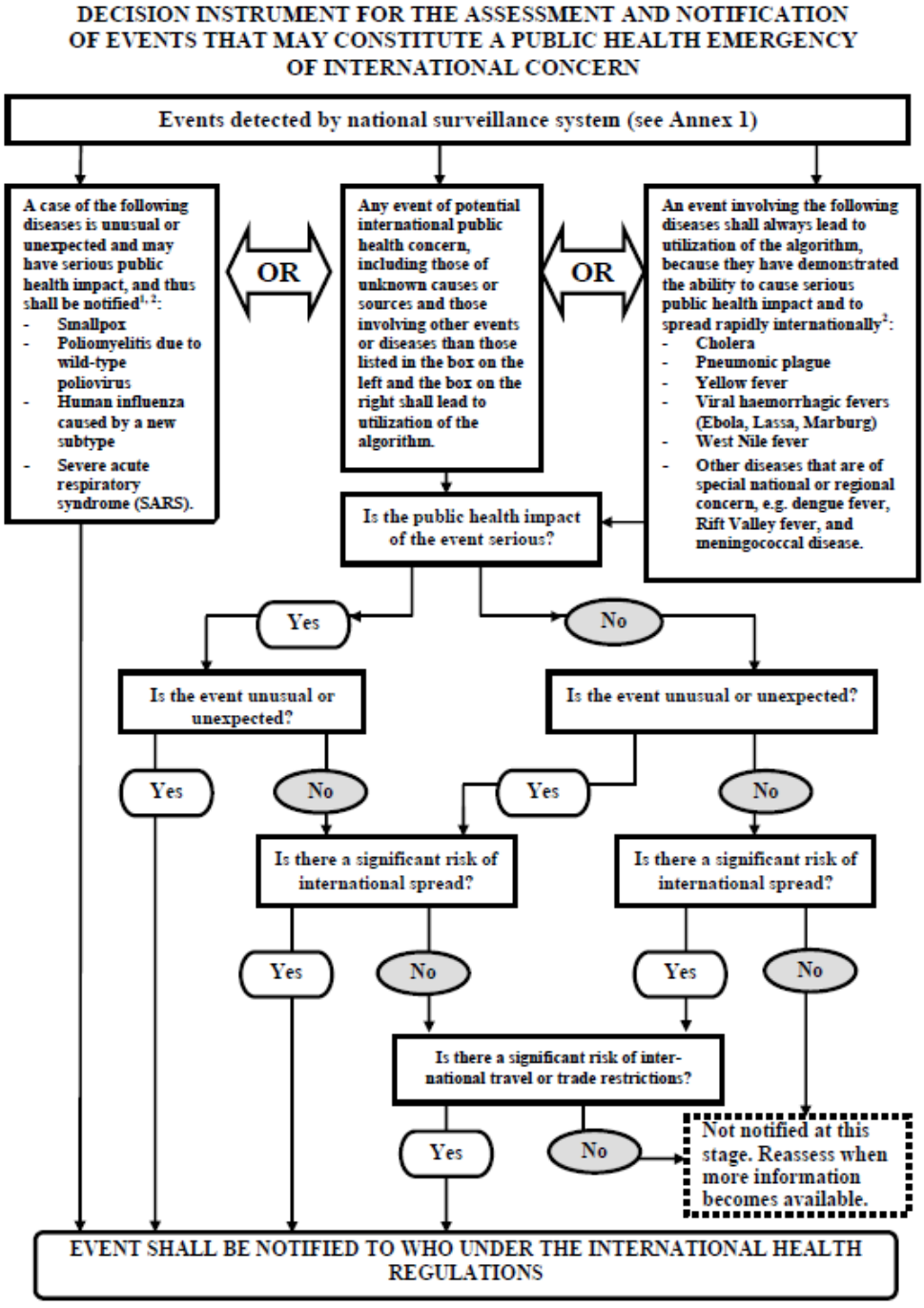
Effective coverage of a service or intervention: the fraction of potential health gain that can be delivered by the health system through an intervention that is actually delivered.

Effective coverage of the entire health system: the fraction of the total potential health gain that the health system could deliver to a population that is actually delivered.

Quality: whether the people who need the interventions obtain them in a timely manner and at a desired level of quality (i.e., are they delivered safely, with effectiveness and with responsiveness, in an efficient manner).

Appendix D Health Emergency Protection Billion

Appendix D.1 Emergencies detection decision instrument



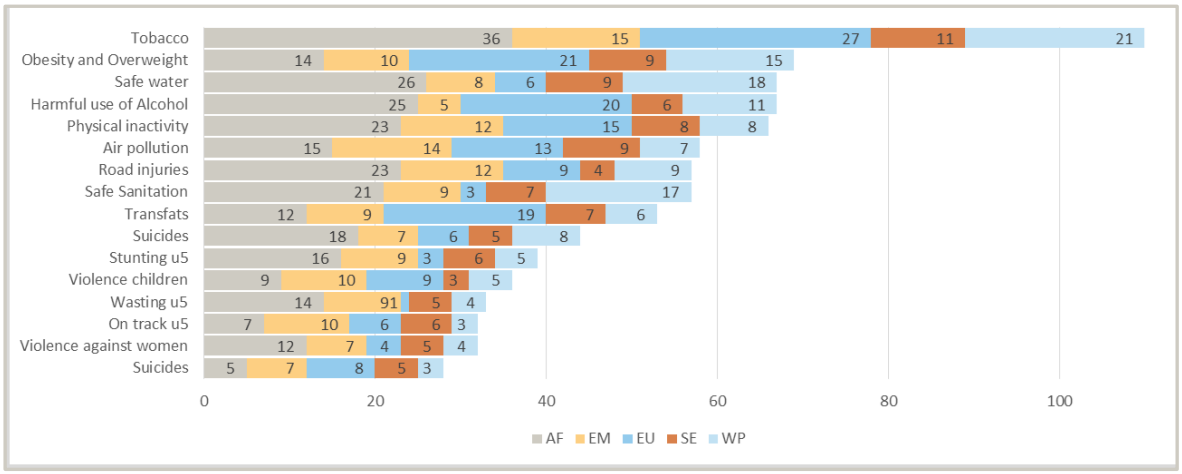
[1] As per WHO case definitions.
[2] The disease list shall be used only for the purposes of these Regulations.

Appendix E Healthier Population Billion

Appendix E.1 Country selection of GPW13 priorities relating to healthier populations

In 2018, Member States were asked to select their priorities amongst the then-current GPW13 outcome indicators (this list of indicators has since been modified – so not all indicators used in the current HP Billion were present at the time of this exercise). The figure below shows the number of countries by region selecting each of the available HP-related impact framework outcome indicators.

Fig. E.1. Member State priorities.



Appendix E.2 Choice of indicators for HP Billion

Table E.1 lists the potential indicators that were considered for inclusion in the HP Billion – these are all the GPW13 indicators that have some focus beyond the health sector. The indicators not selected were excluded for the following reasons:

- 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. sexually informed 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 HP Index.

Table E.1. 14 indicators considered for HP Billion.

		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.3 Transformation details for non-prevalence indicators

For the transformations needed for the non-prevalence healthier populations indicators 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
- allows a standard approach across all member states
- do not require Member States to collect other data.

In several cases, 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 alcohol-related SDG 3.5.2 indicator is total alcohol per capita (15+ years) consumption (APC) in litres of pure alcohol per calendar year. To make use of this SDG in the HP Billion, the goal is to translate the

change in total APC into a proportion of the population that can be considered healthier (in terms of alcohol consumption).

To calibrate the transformation, use is made of existing modelled estimates of drinking behaviours at country populations levels (Manthey *et al.*, 2019): these are the prevalence of heavy episodic drinkers, and the prevalence of abstainers (15+). Populations are deemed healthier if they reduce heavy episodic drinking and increase the number of abstainers – both implying a reduced alcohol consumption.

The relationships between 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.

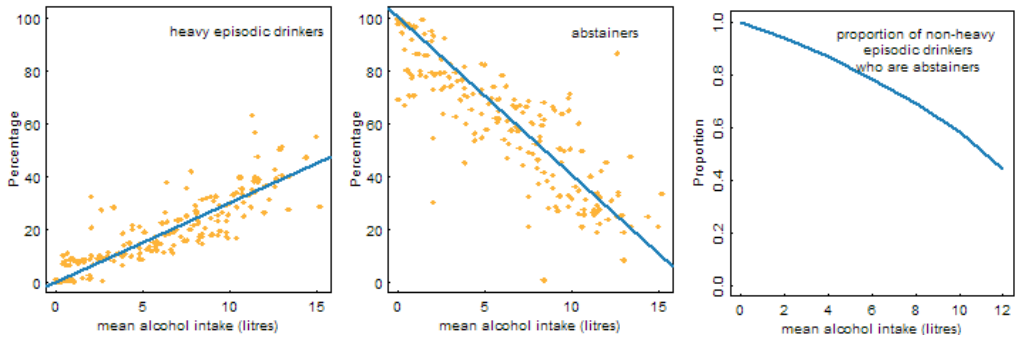
*Proportion of population who are healthier for alcohol = Change in total APC * (alpha + beta * (1- f))*

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 drinkers, 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. 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

The SDG indicator for road safety measures mortality. For the HP Billion a measure is required that expresses the proportion of population experiencing safer roads. As a first step, the SDG mortality rate may be used to approximately estimate the number of road injuries and road deaths. The additional population avoiding road injury or death will then be considered to be "healthier". This is likely to be an underestimate of benefit because it excludes the important secondary effects of safer roads.

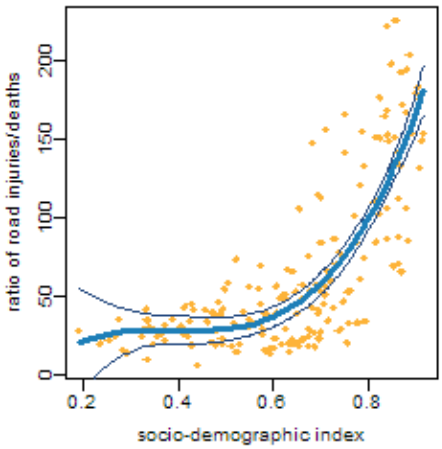
The probability of death from road injuries is dependent on many factors including health care and other services in a country. Fig E.3 illustrates the relationship between the ratio of road injuries to road deaths as a function of social demographic index (sdi). Sdi is a measure of the development level of a country, based on average income per person, educational attainment, and total fertility rate (data from IHME, Lim *et al.*, 2016). The number of road injuries is estimated based on a simplified relationship linking road mortality, road injuries and country sdi.

The relationship seen in Fig E.3 can be 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. This is approximated by a fitted cubic relationship involving SDG 3.6.1 and sdi. The sdi value used in this transformation will be fixed at the baseline year 2018.

The fitted cubic equation has the following coefficients

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

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



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

Clean air

The SDG 11.6 indicator for air particulates measures the median concentration of PM2.5 in 10 µg/m^3. In terms of the HP Billion, we consider that a reduction in PM2.5 of 50 µg/m^3 equates to 100% of the population being healthier. Smaller changes will contribute to the HP Billion in a proportional manner. For example, improving the median PM2.5 by 5 µg/m3 would be counted as equivalent to 5/50 *100 =10% of the population being healthier. Use of this approach using historical data results in a net total of around 320 million lives having become less healthy over the most recent five years.

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 benefitting 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 HP Billion. Neither approach captures a worsening global air quality. The proportional approach outlined above is preferred.

Trans fats

There is evidence that if best practice policy for elimination of trans fats is fully implemented in a member state then consumption of trans fats above WHO recommended levels is reduced to very low levels (Parziale and Ooms, 2019).

In general, details on trans fats consumption at a Member State level is limited. In view of this, the contribution to the HP Billion for Member States that have implemented best practice policies will be a fixed percentage of the population equal to the estimated global proportion of the world's population consuming trans fats above the recommended <1% of total energy intake threshold. Work is on-going to determine the best estimate. (Current calculations assume that on average 10% of the population exceeds thresholds in non-regulated Member States.)

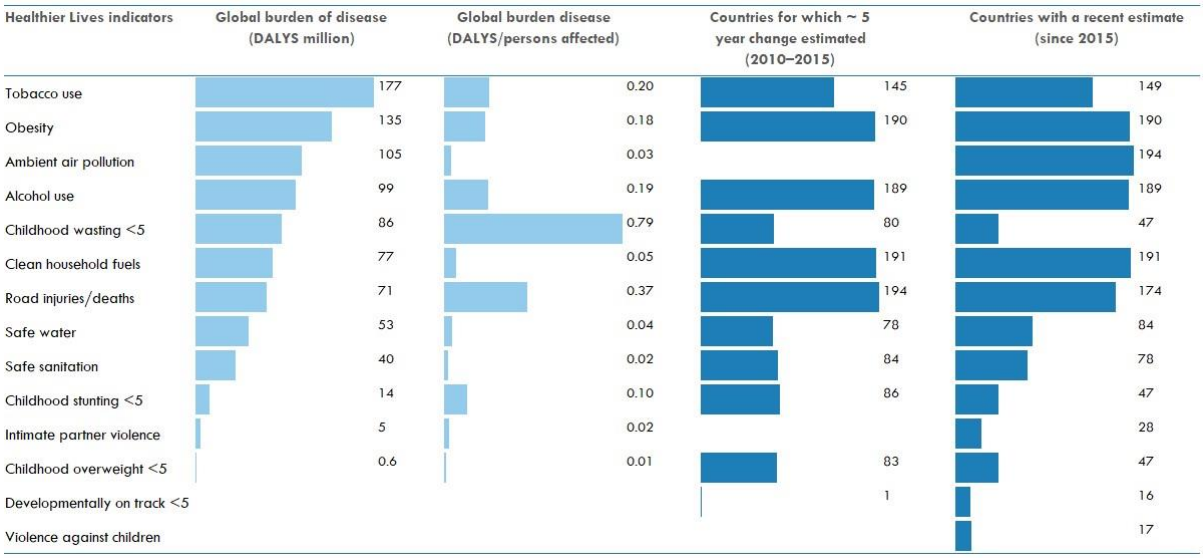
Mental health

Mental health will be included by estimating the number of (avoided) suicide attempts. The WHO World Mental Health Survey estimates that for each adult who dies of suicide there are more than 20 others who made one or more suicide attempts [add ref]. This factor will therefore be used to convert the suicide rate into an estimate of suicide attempts, and the numbers of suicides attempts avoided can then be included into the HP Billion.

Appendix E.4 Weightings in the HP Billion

A key limitation of the method used to calculate the HP 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.4 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.4. Global burden of disease and current data availability for indicators in the HP Billion



Notes: DALYs are from IHME GBD 2016 (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 6.7) and (b) indicators for which recent estimates are available. Data from GHO and UN SDG databases. [Table to be updated]

Appendix E.5 Possible methods for measuring HP Billion

Criteria for choice of method

The following criteria have been used in selecting the method for counting the HP 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, whereas implementing a policy at population level may 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. 6.4) (NB: this was formerly termed the lives touched approach in earlier documents.)

Alternative methods have been considered, notably 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 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 Healthier Lives Index (or perhaps 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. This addresses an obvious shortcoming of the healthier lives approach in that all indicators are treated as having equal impact on healthiness. The use of DALYS averted was proposed as a possible measure of health gain.

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 to the "billion persons" heuristic. Furthermore, DALYs averted may not provide the ideal weighting scheme for measuring change in healthiness. Firstly, care would be needed in how DALYs are applied to age groups (we would probably need to use the total DALYs averted across the full age spectrum). For example, changes in overweight U5s 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 U5 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, for example 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.

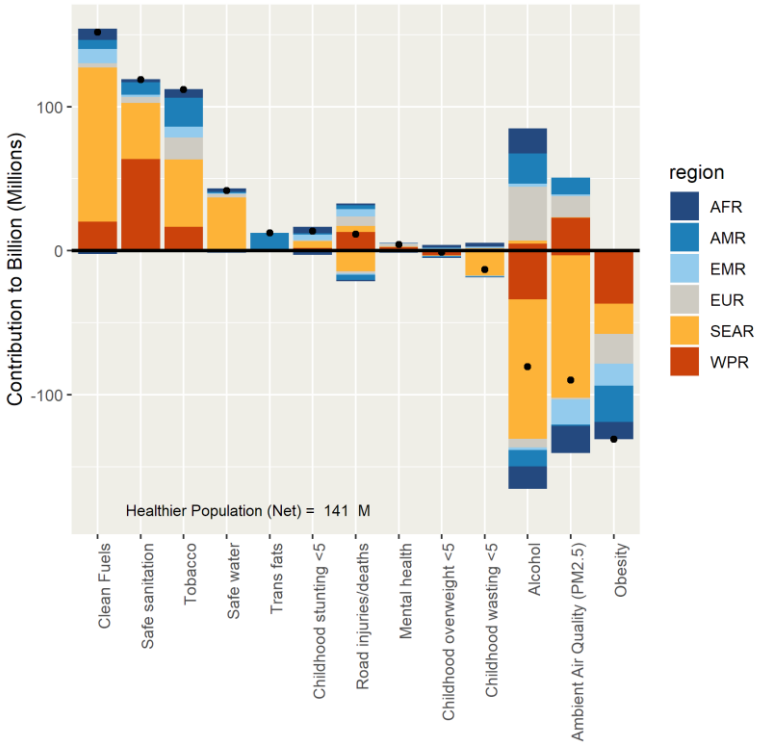
Simplified weightings

This approach involves using a simple weighting scheme to count the contributions to the billion in which each indicator will be given a fixed weight between 0 and 1. 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. For example, if a policy indicator was included without transformation, the impact per person would be much lower.

During consultation there were several suggestions that simplified weighting should be investigated further. A simplified fixed weighting scheme was tested on the data 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 be healthier. 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 HP Billion to around 140 million (Fig. E.5).

Fig. E.5. Contributions to the HP Billion using a simplified weighting scheme. Reduced contributions from clean fuels, ambient air quality, sanitation and water mean the overall contribution to the HP Billion is reduced.



The simplified weighting scheme has issues in that the choice of weightings is somewhat arbitrary. It will also make it much more challenging to reach the HP Billion. However, it has the potential to allow indicators with lesser health benefits to be added, and is a simpler alternative to DALYs averted. It is not planned to use weightings for the GPW13 billion.

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 be akin to the Universal Health Coverage index and would apply to a point in time (and thus not be limited to measurement of change). It would require a more complex approach and would require significant methodological developments.

Appendix E.6 Details of the correction for double counting

The double-counting correction is used when adding up contributions to the HP 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).

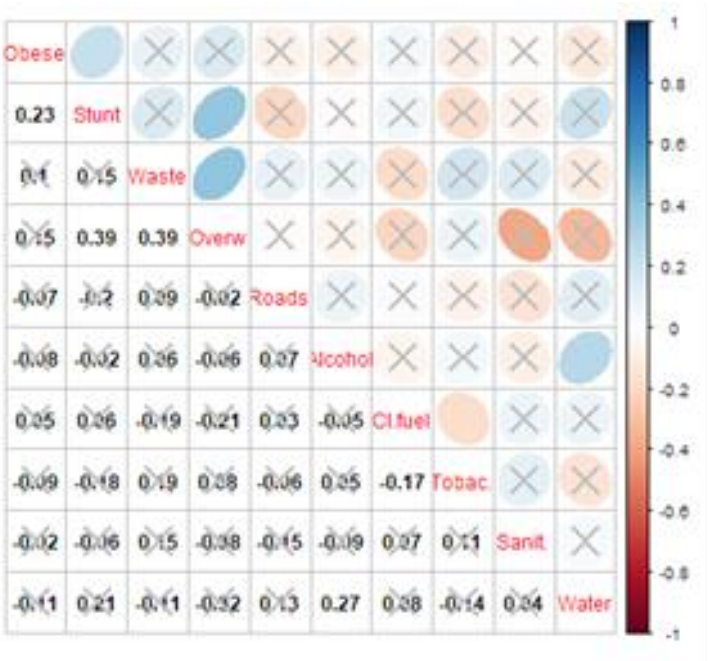
To illustrate the approach, consider the extreme case in which 100% of a population (newly) gets both clean air and clean water. If these two contributions were counted separately and without a correction, into the billion, then 200% of the population could be counted as healthier. This is not desirable. The correction for double counting proposed here will recognize the overlap between the two indicators and ensure that at a country level it is not possible for >100% of the population to contribute to the billion. The correction will reduce, but not eliminate, overcounting – so that if there are strong correlations (e.g. everyone who gets clean air also gets clean water) then the correction will not account for this.

Now, consider if 50% of the population newly gets clean air, and 50% clean water. We cannot know if this is 100% getting one thing (air or water), or 50% getting two things (air and water), or somewhere in the middle. The simplest statistical assumption would be that 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 that means 75% of the population get 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.

A more sophisticated and accurate approach would be to be account directly for the correlations in the populations benefitting from each indicator, e.g. joint distribution estimation. However, this would need much more detailed data than is currently available on a global level. Nevertheless, the assumption used here is an approximation. Many 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 which 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 shows maximum observed correlations for changes in indicators are <0.4 (See Fig. E.6. 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.)

Fig. E.6. Correlations in changes in observed indicators for historical data (2010- 2015 approx.).



The total contribution to the billion, correcting for double counting, is the difference between the proportion of the population that is are 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. <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 where 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 health risks. 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.

Appendix E.7 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 reasonable first attempt at this – able 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. Known issues (and some response to these) include:

1. The framework for the HP Billion is built on indicators that were selected for the GPW13 programme. This a non-optimal set of indicators for measuring change in overall population healthiness – the indicators are not comprehensive of all environmental, behavioral and social risks affecting healthiness. The healthier lives index proposed here will be specific to the GPW13 programme. In the future a more general index and framework for healthiness could be envisaged, with a broader coverage of sectors and factors. See Table E.2 for candidate additional indicators.
2. 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.

3. 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.
4. The method weights all indicators equally. Although a change in each indicator marks an important step in healthiness, this is not ideal.
5. The method simplifies many underlying relevant factors, such as population growth, and could be outperformed by more comprehensive approaches. Nevertheless, a simple method is preferred for practical reasons. Uptake of the methods at country level and by the WHA executive board is required.
6. 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 reduces the impact of double counting but does not account for within-population correlations. More comprehensive corrections may also be possible.
7. Handling population growth. A robust first approximation is used. It assumes that the additional population, without intervention, "inherits" the same prevalence as the current population. It neglects differences between indicators in the interplay between population growth and the impact on indicator values.
8. 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). Conversion into a measure of prevalence is needed for inclusion of an indicator into the method. A discussion and rationale as to the choices made is provided in Section 6.3.3.
9. Noise in the data due to sample size and measurement errors, especially those spread over time, could cause noise in the index. Smoothing and use of consistent estimates will be used when available.
10. 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 data could make an important difference to estimated contributions to the HP Billion.
11. The time-frame of the GPW13 programme, in combination with lags in the timeliness of indicator estimates, will make calculation of change by 2023 a challenge. Unless the timeliness of data improves, projection and forecasting may be required. This will reduce the level of "measurement" of the HP Billion. Interventions put in place during GPW13 may not produce effects quickly enough to be measured by 2023.
12. Based on current data and trends the HP Billion is unlikely to be achieved. It may however, encourage action in several important areas.

The indicators shown in Table E.2 may be relevant for future versions of an index to measure healthier populations. Physical inactivity and long working hours indicators are shown in blue, as suitable data are known to be available for these indicators.

Table E.2. Sectors and indicators that could be considered missing from the Healthier Lives Index

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	
Chemicals	Poisoning
Older people	Accessibility/safety
Gender equality	

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.

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.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

#	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 1 000 population	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	Unknown1
			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	Variable2
			3. Education	Variable2
			4. Economic status	Variable2
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	Percentage of people protected by effective regulation on trans fats	Not applicable	Not applicable
46	WHA66.10	Prevalence of obesity	1. Education	Variable2
			2. Economic status	Variable2
			3. Sex	Variable2
			4.	

[1] The priority subgroup is currently not known due to a lack of evidence.
[2] The priority subgroup varies from country to country.