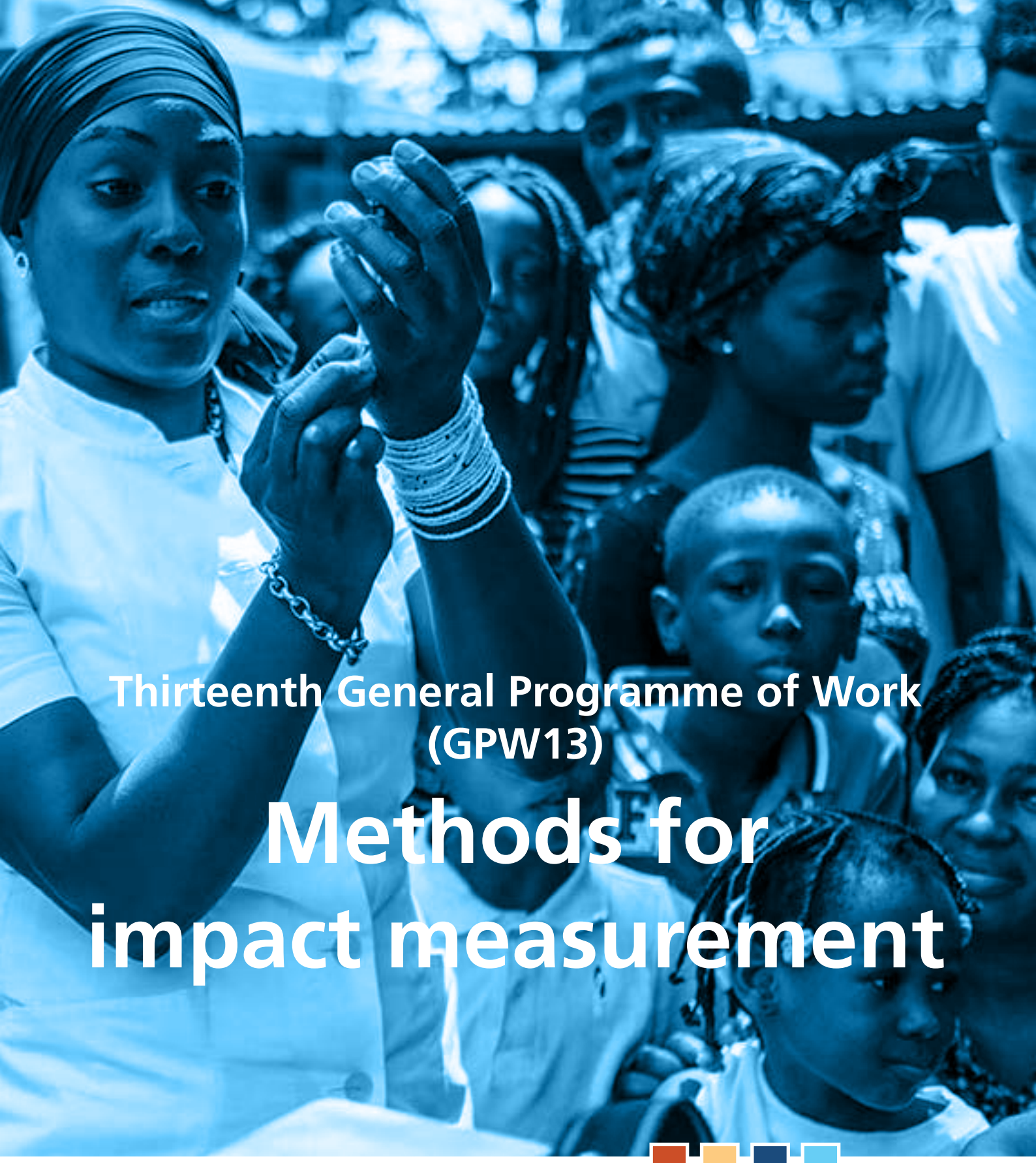

Thirteenth General Programme of Work
(GPW13)

Methods for impact measurement

World Health Organization

Version 2.1

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Thirteenth General Programme of Work (GPW13): methods for impact measurement

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Foreword

In May 2018, WHO ushered in a new era of transformation based on three grounding principles: to promote health, keep the world safe, and serve the vulnerable. Reflecting these values, it is the goal of the Thirteenth General Programme of Work (GPW13) to make a measurable impact on the health of billions of people over the next five years.

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

The WHO impact measurement will guide and inform the efforts of the Secretariat, Member States and partners to measure our progress during GPW13 and substantially improve global progress towards achievement of the Sustainable Development Goals (SDGs). It uses methods that are accessible to all Member States and aims to analyse and address inequalities within and between countries and regions. It is aligned with the SDGs to unite countries across global targets and is adaptable to each country's national priorities for improving the health of its people. Ultimately, GPW13 emphasizes achieving measurable impact at the country level, with Member States supported by WHO to accelerate progress.

In the final months of this report's development, the world was confronted with the COVID-19 pandemic. This unprecedented event has exposed weaknesses in many health, data and information systems and caused disruptions across many sectors and countries. The pandemic underlines the importance of preparedness for emergencies and emphasizes the interconnectedness of the Triple Billion targets, such as access to essential health services, health workforce capacity, and attention to comorbidities, mental health, violence and WASH. Now, more than ever, the world needs to work together, not only to respond to COVID-19 but to build back better and ensure we emerge with stronger, more resilient health systems.

As we implement the Thirteenth General Programme of Work, there is an urgent need for timely, reliable, accessible and actionable data to improve population health. To achieve the ambitious SDG health targets in our current, increasingly challenging situation, we must be creative and collaborative in order to do more with our available resources.

The measurement methods outlined in this report lays the foundation for countries to deliver on the SDGs, the Triple Billion targets and national priorities by setting goals, tracking progress, and problem-solving, while constantly learning and sharing best practices. Progress depends on comprehensive country data and measurement systems to ensure policies, programmes and resources are deployed in the right place and at the right time to have a lasting impact. There are significant data gaps in many parts of the world that cause uncertainty and mask the struggles of vulnerable populations. WHO and partners are supporting comprehensive programmes to strengthen data and the capacity of health information systems, in countries and globally, so that nobody is left behind.

The report reflects the work of the WHO Secretariat, as well as that of Member States, partners and many internal and external experts, including the WHO Expert Reference Group and its Task Force on GPW13. Member States have worked to hone the methods and to test their feasibility. We envision an ongoing partnership with Member States to implement the measurement methods and achieve our collective ambition to make a significant impact on the health and well-being of billions of people by 2023 and beyond.

Dr Tedros Adhanom Ghebreyesus
Director-General, World Health Organization

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Abbreviations

APC	alcohol per capita consumption
ASC	average service coverage
CRD	chronic respiratory disease
CRVS	civil registration and vital statistics
DALY	disability-adjusted life year
DTP3	diphtheria–tetanus–pertussis-containing vaccine
EIS	event information site
EMS	event management system
GATHER	Guidelines for Accurate and Transparent Health Estimates Reporting
GBD	Global Burden of Diseases, Injuries, and Risk Factors Study
GHE	Global Health Estimates
GPW	General Programme of Work
GTFCC	Global Task Force on Cholera Control
HALE	healthy life expectancy
HEP	health emergencies protection
HEPI	Health Emergencies Protection Index
HPOP	healthier populations
ICD	International Classification of Diseases
ICG	International Coordinating Group on Vaccine Provision
IHME	Institute for Health Metrics and Evaluation
IHR	International Health Regulations
ITN	insecticide-treated net
JEE	joint external evaluation
JRF	Joint Reporting Form (WHO/UNICEF)
MCV1	measles-containing vaccine (first dose)
MCV2	measles-containing vaccine (second dose)
NCD	noncommunicable disease
NFP	national focal point
NTD	neglected tropical disease
OCV	oral cholera vaccine
PCV3	pneumococcal conjugate vaccine
Pol3	polio vaccine
SCORE	survey, count, optimize, review, enable
SDG	Sustainable Development Goal
SDI	Socio-demographic Index
SPAR	State Party Self-assessment Annual Reporting
TFA	trans fatty acids
UHC	universal health coverage
WASH	water, sanitation and hygiene
WHA	World Health Assembly
WHS+	World Health Survey Plus
YLD	years of healthy life lost to disability

Executive summary

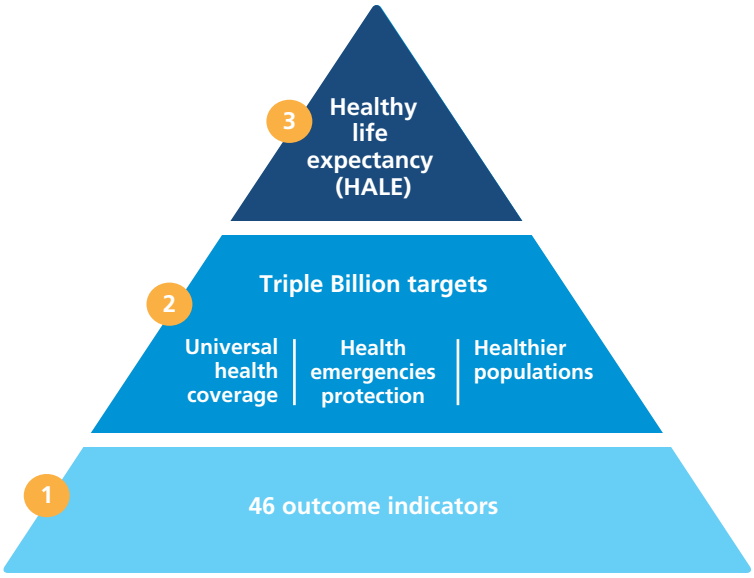
The purpose of this document is to describe the methods to be used to measure the impact of the World Health Organization's Thirteenth General Programme of Work, 2019–2023 (GPW13).

The ambition of the GPW13 is to improve the health of billions of people in the next five years. The WHO impact measurement is a vital part of GPW13. It measures progress at three levels:

1. Forty-six health-related outcome indicators and their global targets for 2023.
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.

The impact measurement shown below commits to monitoring inequality and improving equity in health at all levels.

WHO impact measurement



Outcome indicators

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

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

WHO will work with countries to address significant gaps in data collection. For around one

third of countries there is no recent primary or underlying data for over half of the SDG health-related indicators. Addressing these data gaps and supporting countries to make progress in data collection is a priority for WHO (though beyond the scope of this report).

The Triple Billions

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

Key reasons for counting the Triple Billions include:

- advocating for ambitious improvement in world health
- triggering action for impact
- highlighting data gaps that must be addressed
- measuring the change that results
- making a start on increasing accountability via measurement.

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

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

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

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

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

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

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

The Universal Health Coverage Billion

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

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

The two elements are combined into a single measure to estimate the number of additional people with access to essential services and not suffering financial hardship.

Considerable acceleration will be necessary if the target of 1 billion people receiving needed health services and not incurring financial hardship is to be achieved. If current trends continue at a steady rate, preliminary estimates suggest that the equivalent of up to around 300 million more people will benefit from UHC by 2023. (Around 350 million will benefit from added service coverage, but up to around 60 million additional people may experience financial hardship.) A further 700 million people must be reached to achieve the UHC Billion.

The Health Emergencies Protection Billion

The Health Emergencies Protection Billion (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
- emergency prevent indicator
- emergency detect & respond indicator.

The emergency **prepare** indicator 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) tool.

The emergency **prevent** indicator measures efforts to prevent health emergencies via

vaccination. Reaching high vaccination coverage in at-risk groups for vaccine-preventable infectious pathogens is key 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 the coverage of routine and campaign immunization programmes for diseases linked with epidemics and pandemics. It includes:

- three priority infectious hazards: yellow fever, meningitis and cholera (relevant to a country); and
- measles and polio (to emphasize the importance of routine immunization programmes).

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

The emergency **detect & respond** indicator measures whether public health emergencies are detected, notified and responded to in a timely fashion. The indicator focuses on time to detect, time to notify, and time to respond. This is a new indicator of key importance for improving emergency response. Data have been gathered retrospectively from events reported to WHO under IHR regulations. Data for additional serious health emergencies will be needed for this timeliness indicator.

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

The Healthier Populations Billion

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

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

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

As with the other Triple Billion targets, considerable acceleration and improvements will be required if the Healthier Populations Billion is to be achieved, particularly for indicators where decreases in healthiness are anticipated. If current progress is maintained, the number of additional people leading healthier lives could be around 650 million, i.e. some way short of a billion. The Healthier Populations Billion is expected to include a mix of positive contributions, whereby healthiness is improved (e.g. increased sanitation, cleaner household fuels) and negative contributions for indicators that are currently getting worse, and for which the first goal will be to halt the deterioration (e.g. in obesity, air pollution, alcohol intake).

Healthy life expectancy

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

Equity

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

GPW13 and COVID-19

This report was written during the early stages of the COVID-19 pandemic. All three of WHO's Triple Billion targets (and the data sets and data systems they rely on) are highly relevant to the pandemic and point to the interconnectedness of health outcomes and their determinants, and the need for multisectoral action during infectious disease outbreaks. The HEP Billion, in particular, can help measure gaps in pandemic preparedness and response, and can help to guide efforts to close those gaps.

COVID-19 has already changed the lives of many people around the world, and its long-term effects will reach far and wide. It is a stark reminder of the key importance that health, and health systems, play in all countries and communities. COVID-19 has shown up the weaknesses in systems in many countries, of all income levels, and underscores the importance of building resilient systems that can both cope with an outbreak, and continue to provide essential services. The pandemic has highlighted gaps in data and measurement methods, and this is an opportunity to learn quickly and tailor metrics so as to better understand impact and guide action. WHO will continue to review and adapt the Triple Billions to ensure they are fully relevant to the current situation.

1 Introduction

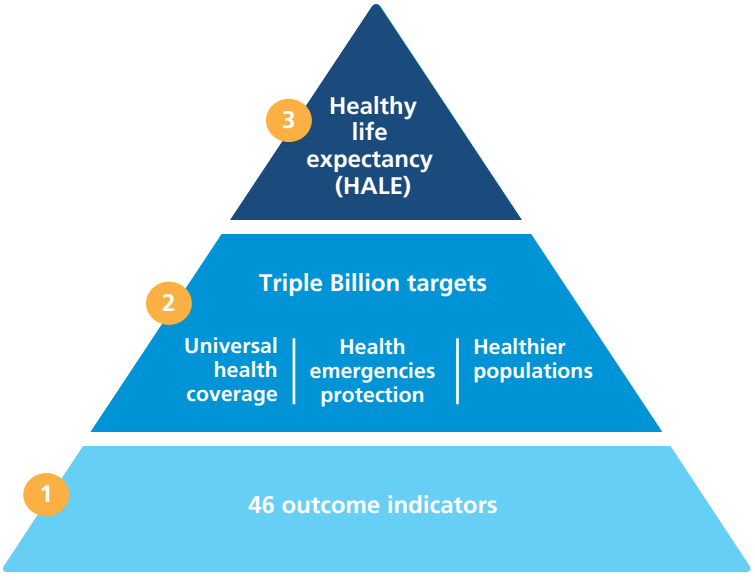
In May 2018, the World Health Assembly approved WHO's Thirteenth General Programme of Work (GPW13) (WHO, 2018c), which focuses on delivering measurable health impacts for people at the country level.

To support its GPW13 ambitions, WHO has created the WHO impact measurement (Fig. 1.1), a system designed to measure health impact in a way that is accountable. It is a part of the WHO results framework, to be presented to Member States in November 2020. The measurement forms the third chapter in a trilogy that started with the approval of the GPW13 strategy (May 2018), followed by approval of the programme budget for 2020/21 (May 2019).

The aims of the impact measurement 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 WHO impact measurement



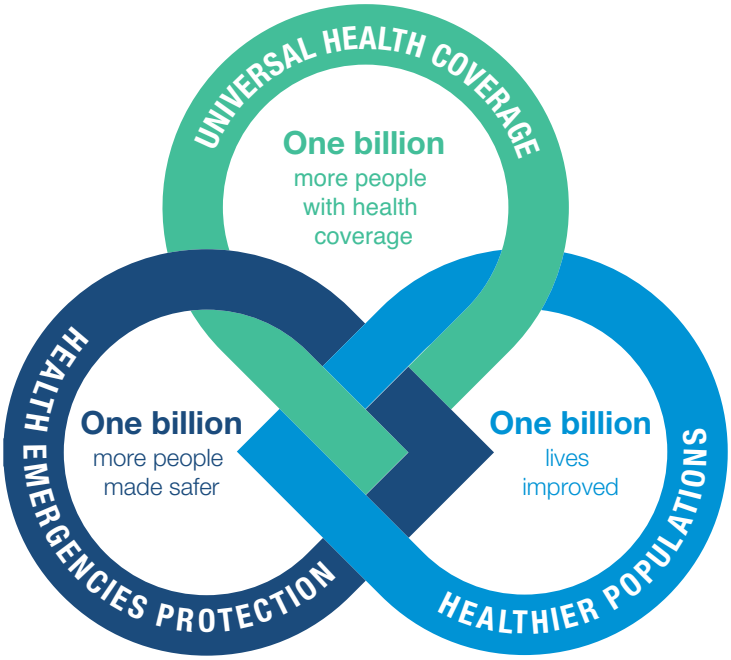
The impact measurement measures progress on three levels:

1. **Forty-six outcome indicators** which cover a range of health issues and provide a set of measurement indicators that will be used to measure the outcomes in the GPW13 programme budget (39 of which are identical to the SDGs).
2. **The Triple Billion targets:**
    - 1 billion more people benefiting from universal health coverage (UHC)
    - 1 billion more people better protected from health emergencies
    - 1 billion more people enjoying better health and well-being.

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

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

Fig. 1.2 The overlapping Triple Billion targets



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

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

1.1 Delivering the Triple Billions

WHO Director-General, Dr Tedros Adhanom Ghebreyesus, reminded WHO in 2019 that the Triple Billion targets are "about changing the DNA of the organization to deliver a measurable impact in the lives of the people we serve". The GPW13 and the Triple Billion 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 delivery of the work 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 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 prioritizes relentless focus on impact, setting targets and tracking progress, and problem-solving each indicator when issues arise.

1.2 Scope of this report

This document describes the methods for use in the GPW13 impact measurement. It discusses each of the three levels of the measurement, focusing particularly on the methodology for each of the Triple Billions and how indices and component indices will be calculated. It provides example calculations and considers both the global and country level. Whilst the report details how the billions are to be calculated, there remain related aspects that are not yet defined; for example, details of how uncertainty will be estimated and how data gaps will be infilled.

1.3 The consultation process

The methods for calculating the GPW13 Triple Billions have been developed through an extensive consultative process involving Member States, WHO country and regional office and programme staff, and technical experts both within and external to WHO:

- creation of an Expert Reference Group and Task Force to advise on methods (December 2017)
- technical consultation (October 2018)
- online Member State consultations (November 2018–January 2019)
- presentation of draft impact measurement to Member States (February 2019 and May 2019)
- consultations with the health emergencies working group (2018–2019)
- creation of healthier populations secretariat working group and subgroups (May 2019)
- internal consultation with WHO technical programmes (September 2019)
- informal review and discussions with key experts (September 2019)
- consultation with WHO technical programmes and regional offices on inequality monitoring (December 2018–November 2019)
- regional consultations/committees (September–November 2019)
- first global technical consultation (Member States, technical experts, regional and country offices) (October 2019)
- creation of Universal Health Coverage Billion technical working group (November 2019)
- informal Member State consultations (November 2019)
- WHO South-East Asia Region GPW13 methods meeting (Delhi, November 2019)
- discussion by Reference Group for Health Statistics (December 2019)
- presentation to Executive Board and Member States (February 2020)
- piloting of methods in selected countries (March–April 2020)
- second global technical consultation (April 2020).

Comments and feedback received have been key to the development process and to the final form of the methods and text.

1.4 GPW13 and COVID-19

The COVID-19 pandemic, although at the time of writing in its early stages, has already changed the lives of many people of the world, and its long-term effects will reach far and wide. All three of WHO's Triple Billion targets – and the data sets and data systems they rely on – are highly relevant. The Universal Health Coverage Billion (UHC Billion) considers, amongst other things, the health workforce, access to hospital beds and access to vaccines, diagnostics and treatments. The Health Emergencies Protection Billion (HEP Billion) evaluates preparedness, prevention, detection and response to health emergencies. It will help measure gaps in pandemic preparedness and response and guide closing these gaps. The Healthier Populations Billion (HPOP Billion) encourages and supports people to be able to lead healthy lives that reduce the risk of acquiring noncommunicable diseases that can make people more susceptible to COVID-19, and to have access to clean water and to safe sanitation, both of which are key resources in disease control and prevention.

Components of each of the billions will contribute to determining how the pandemic evolves and the severity of its impact. However, the pandemic is likely to highlight opportunities to adjust indicators and methods in the future (WHO, 2020a). This is particularly true for the Health Emergencies Protection Billion (see Section 5.5). For each of the Triple Billions, WHO will continue to review and, if needed, amend the approach taken to ensure their continuing relevance within the context of COVID-19.

The pandemic has impacted daily life, and local and global economies, especially where large-scale "lockdowns" have been used, and where health systems are struggling to continue to provide essential services such as routine immunization. Now, more than ever, there is a need to fast-forward progress in health care and to build resilient health systems.

2 Outcome indicators

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

2.1 Definition

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

The outcome indicators have been developed by WHO technical programmes. They were approved by WHA72 in 2019 after extensive consultation with Member States and review by partners (WHO, 2019d). Progress measured against these outcome indicators 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 been selected from existing SDG indicators, with a few additional emerging health topics:

- Thirty-nine of the 46 indicators are taken from the SDGs (26 derive from SDG 3; 13 from other SDG categories).
- Seven non-SDG indicators address priorities identified by Member States: antimicrobial resistance, polio, noncommunicable diseases (hypertension, obesity, trans fats policy) and health emergencies (vaccine coverage for epidemic prone diseases, provision of essential services to vulnerable populations).

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 in the Triple Billions

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

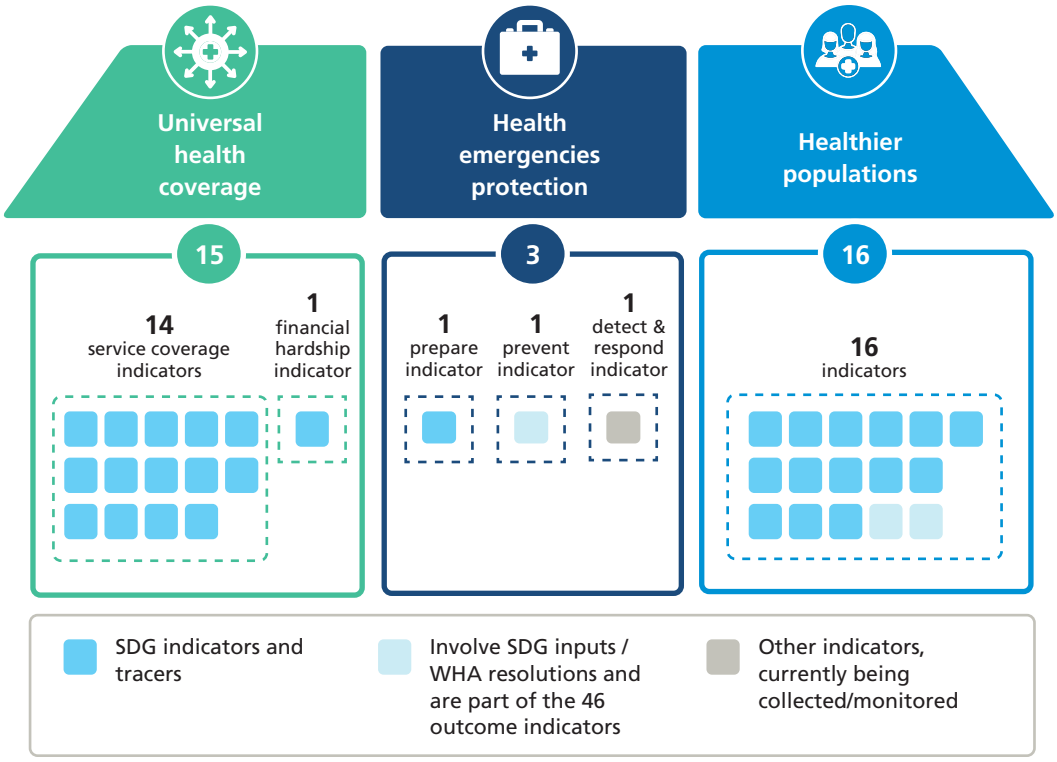
The calculation of the UHC Billion is based on the outcome indicators SDG 3.8.1 UHC service coverage index and SDG 3.8.2 UHC financial hardship. SDG 3.8.1 has 14 tracer indicators and six of these are either outcome indicators or are closely associated with outcome indicators. For example, tuberculosis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

For the calculation of the Health Emergencies Protection (HEP) Billion, two of the six health emergencies outcome indicators are used.

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

The Triple Billions are primarily constructed from SDG indicators (and SDG 3.8.1 tracer indicators) with a very small number of additions (Fig. 2.1).

Fig. 2.1 Indicators in the Triple Billion indices



2.3 Indicator availability and methods

Information about the availability of data values or estimates for the 46 outcome indicators can be found in Annex 1: Table A1.1). The data are compiled from two key sources of data, for the year 2000 onwards. Data for the health-related SDGs/GPW13 indicators are primarily extracted from WHO's Global Health Observatory (WHO, 2019a). In cases where data are not available from this source or where data are outside of SDG 3, data are taken from the UN Global SDG Indicators Database (UN Statistics Division, 2019). This database contains country-reported data or official estimates agreed with countries.

Three aspects of indicator data availability are presented in Table A2.1:

- the number of countries with no data for 2000–2018
- the number of countries with at least one data point from 2015 or later
- the number of countries with trend data (at least two data points, with the latest data from 2015 or later).

A key issue is that while estimates for indicators may be available, they are not always derived from recent primary data. *World health statistics 2019* (WHO, 2019e) reported that for about one third of countries, over half of the health-related SDG indicators had no recent primary or underlying data (this included data on sex disaggregation; see Fig. 2.2). One in seven indicator country values included had no underlying data since 2000. Low-income and lower-middle-income countries in particular lacked primary or underlying data. For many indicators, no recent sex-disaggregated data are available. Even though almost one in five of the health-related SDG indicators depends 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, 2017b).

Table 2.1 Outcome indicators and their role in the Triple Billion methodology

● included in billion calculation ○ relevant to the billion topic area

SDG/WHA number	Indicator	UHC	HEP	HPOP
SDG 1.5.1	Number of persons affected by disasters (per 100 000 population)		○	
SDG 1.a.2[a]	Domestic general government health expenditure (GGHE-D) (% of general government expenditure (GGE))	○		
SDG 2.2.1	Prevalence of stunting in children under 5 years (%)			●
SDG 2.2.2	Prevalence of wasting in children under 5 years (%)			●
SDG 2.2.2	Prevalence of overweight in children under 5 years (%)			●
SDG 3.1.1	Maternal mortality ratio (per 100 000 live births)	○		
SDG 3.1.2	Proportion of births attended by skilled health personnel (%)	○		
SDG 3.2.1	Under 5 mortality rate (per 1000 live births)	○		
SDG 3.2.2	Neonatal mortality rate (per 1000 live births)	○		
SDG 3.3.1	Number of new HIV infections (per 1000 uninfected population)	○		
SDG 3.3.2	Tuberculosis incidence (per 100 000 population)	○		
SDG 3.3.3	Malaria incidence (per 1000 population at risk)	○		
SDG 3.3.4	Hepatitis B incidence (measured by surface antigen (HBsAg) prevalence among children under 5 years) (per 100 000 population)	○		
SDG 3.3.5	Number of people requiring interventions against neglected tropical diseases	○		
SDG 3.4.1	Probability of dying from any of cardiovascular disease, cancer, diabetes, chronic respiratory disease (aged 30–70) (%)	○		
SDG 3.4.2	Suicide mortality rate (per 100 000 population)			●
SDG 3.5.1	Coverage of treatment interventions for substance use disorders (%)	○		
SDG 3.5.2	Total alcohol per capita consumption in adults aged ≥15 (litres of pure alcohol)			●
SDG 3.6.1	Road traffic mortality rate (per 100 000 population)			●
SDG 3.7.1	Proportion of women (aged 15–49) having need for family planning satisfied with modern methods (%)	●		
SDG 3.8.1	UHC service coverage index	●		
SDG 3.8.2	Proportion of population with household expenditures on health >10% of total household expenditure or income (%)	●		
SDG 3.9.1	Mortality rate attributed to air pollution (per 100 000 population)			○
SDG 3.9.2	Mortality rate attributed to exposure to unsafe WASH services (per 100 000 population)	○		
SDG 3.9.3	Mortality rate from unintentional poisoning (per 100 000 population)			○
SDG 3.a.1[b]	Prevalence of tobacco use in adults aged ≥15 (%)	●		●
SDG 3.b.1	Proportion of population covered by all vaccines included in national programmes (DTP3, MCV2, PCV3) (%)	●	○	

Table 2.1 Continued

SDG/WHA number	Indicator	UHC	HEP	HPOP
SDG 3.b.3	Proportion of health facilities with essential medicines available and affordable on a sustainable basis (%)	○		
SDG 3.c.1	Density of health workers (doctors; nurse and midwives; pharmacists; dentists per 10 000 population)	●		
SDG 3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness	●	●	
SDG 3.d.2	Proportion of bloodstream infections due to antimicrobial resistant organisms (%)	○		
SDG 4.2.1	Proportion of children under 5 years developmentally on track (health, learning and psychosocial well-being) (%)			●
SDG 5.2.1	Proportion of women (aged 15–49) subjected to violence by current or former intimate partner (%)			●
SDG 5.6.1	Proportion of women (aged 15–49) who make their own 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 safely managed sanitation services and hand-washing facility (%)			●
SDG 7.1.2	Proportion of population with primary reliance on clean fuels (%)			●
SDG 11.6.2	Annual mean concentrations of fine particulate matter (PM2.5) in urban areas (μg/m^3)			●
SDG 16.2.1	Proportion of children (aged 1–17) experiencing physical or psychological aggression (%)			●
Health Emergencies	Vaccine coverage for epidemic prone diseases		●	
Health Emergencies	Proportion of vulnerable people in fragile settings provided with essential health services (%)		○	
WHA66.10	Prevalence of raised blood pressure in adults aged ≥18	●		
WHA66.10	Best practice policy implemented for industrially produced trans fatty acids (TFA) (Y/N)			●
WHA66.10	Prevalence of obesity (%)			●
WHA68.3	Number of cases of poliomyelitis caused by wild poliovirus		○	
WHA68.7	Patterns of antibiotic consumption at national level	○		

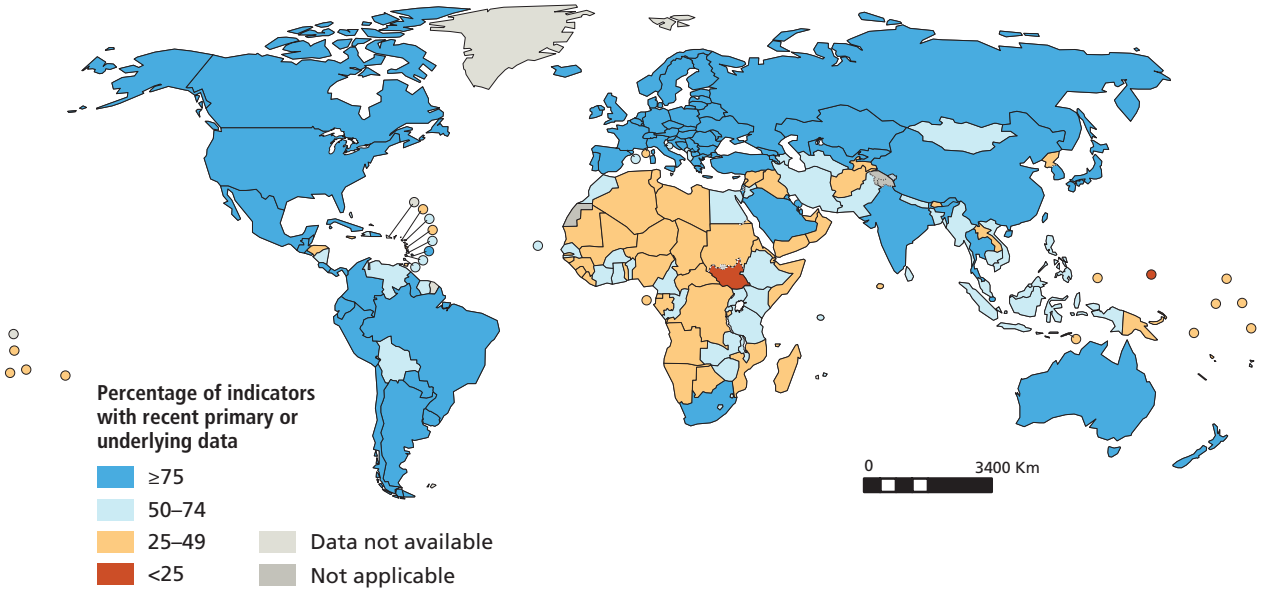
DTP3 – three doses diphtheria–tetanus–pertussis-containing vaccine; MCV2 – two doses measles-containing vaccine; PCV3 – three doses pneumococcal conjugate vaccine.

[a] *SDG 1.a.2 includes several indicators. Only the one relating to health expenditure is used in GPW13.*

[b] *For the HPOP Billion non-age-standardized data are used.*

Note: Some outcome indicators are used/relevant to more than one of the Triple Billion targets. The UHC Billion is derived from SDG 3.8.1 and SDG 3.8.2. SDG 3.8.1 has 14 tracer indicators (listed in Annex 4.1). Six of these are also GPW13 outcome indicators, included in the UHC Billion.

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



Source: World health statistics (WHO, 2019e).

Many of the outcome indicators and the methodologies used for counting each of the Triple Billions depend on the availability of accurate cause-of-death data, as well as data from household surveys and disease registries. The methods, data sources, frequency of data collection and other relevant information on each of the 46 outcome indicators are provided in the associated metadata (WHO, 2020c).

2.4 Supporting and strengthening country measurement capacity

This report focuses on the GPW13 methods – and these depend on robust country data and country measurement systems. There are large gaps in SDG data availability in many parts of the world. Reliable, timely, affordable, country-owned and accessible data are needed.

Strengthening data systems for health in countries is a core requirement for progress in health outcomes. WHO works with countries towards this goal through country cooperation strategies (WHO, 2020d). The monitoring of health-related SDGs can require around 12 data systems to be functioning in each country. These may include surveillance systems (i.e. household surveys, laboratory surveillance), civil registration and vital statistics (CRVS) systems, administrative data, national health accounts, national health surveys and other sources of health data.

As the COVID-19 emergency has illustrated, a functioning health data system must be flexible enough to adapt to unexpected situations and provide timely and accurate data to inform decisions. It is important to develop integrated data systems to maintain health statistics that produce key metrics to inform policy and actions.

This section summarizes how WHO, along with its partners, is supporting countries to address data gaps through interconnected and integrated information systems for health and improved measurement capacities. These efforts will enable progress towards the SDGs and the Triple Billion targets.

2.4.1 Support for civil registration and vital statistics

Public health decision-making depends on accurate statistics on births and deaths, including cause of death. This is best collected through a CRVS system. Despite the importance of CRVS data, fewer than one third of countries have high quality data on cause of death (WHO, 2019e). The recent rapid advancement of digital technologies provides unprecedented opportunities to accelerate improvement in CRVS systems worldwide. There is no single blueprint for establishing and maintaining such systems – each country faces a different set of challenges, and strategies must be tailored accordingly.

In consultation with partners, WHO has defined a Strategic Workplan for CRVS for 2020–2023 that aims to empower Member States to more effectively mobilize their health sector to lead or contribute to efforts to strengthen CRVS systems, ensuring maximum benefit from routine data systems for policy and development. Within this, WHO is providing direct technical assistance to countries, capacity building at the regional level to support all Member States, and an intensive in-service fellowship accessible by all countries. The approaches can be adapted according to country needs, priorities and capacity.

2.4.2 Support for administrative and health services and facility data

Administrative, routine health services and facility data are generated through several data subsystems, including routine health information systems (RHIS), disease registries, health facility surveys, and other logistics and health workforce information systems. The value of the data, however, is often hampered by disconnected systems, lack of standardization, poor quality data and limited analytical capacity.

WHO offers a suite of integrated tools and technical assistance packages to address many of these issues. It provides measurement tools to set standards, monitor and analyse information. Specialized modules (e.g. HIV, TB, malaria, neglected tropical diseases, road safety, noncommunicable diseases, vaccination) have been developed and can be configured into any digital and health information system (e.g. District Health Information Software (DHIS2) (DHIS2, 2020) and country-specific systems). The Data Quality Review Toolkit improves the quality of RHIS data using standardized data-quality metrics and tools (WHO, 2017a). Standardized health facility survey modules assess the extent to which health facilities adhere to the service standards needed to provide quality health care.

2.4.3 Support for improved survey data

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

The World Health Survey Plus (WHS+) (WHO, 2020f) is a multitopic, multiplatform, multimodal survey. It addresses critical data gaps and is designed to be tailored to country needs. For example, it is hoped that WHS+ can be used to improve understanding of linkages between financial hardship and service coverage at the household level, as was done using a recent household survey in Tunisia (Institut National de la Santé de République Tunisienne, 2019).

2.4.4 Support for review and assessment of existing data sources

In order to address and improve data gaps, it is important to understand the status of a country's health information systems. Using the SCORE (survey, count, optimize, review, enable) technical package for health data, countries can identify strengths and weaknesses and identify gaps in country health information systems (WHO, 2019c). SCORE facilitates tracking of progress towards the SDGs, and monitors and measures the maturity of health information systems, support interventions, and provide guidance on best practice measurement methods, standards and tools.

2.4.5 Support for improved collaboration

Collaboration across government ministries and institutions, including ministries of health and finance, national statistics offices, offices of the registrar general and academia, is necessary to strengthen country data capacity. Data use for policy design and implementation is much more likely when local governments, academia and civil society fully understand and own every step of the measurement process, including data processing and data synthesis. It will be necessary to address process gaps collaboratively, for example where data exist but are not accessible or have very delayed availability.

One area of concern is the ability to obtain more timely information on financial hardship. For this it is critical for national ministries of health to collaborate more closely with national statistical offices and ministries of finance and economy in the design, analysis and scheduling of household surveys.

2.5 Strengthening world health data capacity

In addition to targeted country support, WHO is working at the global level to:

- Develop standards and best practices for data collection, data processing and synthesis. This includes: following UN open data standards; making data accessible using a coherent system for data sharing, collection, storage, analysis and use; promoting the Guidelines for Accurate and Transparent Health Estimates Reporting (GATHER) (Stevens et al., 2016); and advancing population health metrics, digital technologies and adhering to methodological standards through the WHO Reference Group on Health Statistics and the Digital Health Technical Advisory Group.
- Create and improve international data classification standards, including the International Classification of Diseases (ICD). ICD-11 is a digital platform that will facilitate easier reporting of timely and accurate cause-of-death and morbidity data (WHO, 2020b).
- Provide training and mentoring to strengthen country capacity. This will include statistical methods, epidemiology, quality assurance, analysis of big data, modelling and forecasting, inequality monitoring, and effective ways to communicate and use data to drive policy impact.
- Create a one-stop-shop, the World Health Data Platform (WHO, 2020e) that presents health statistics from the Global Health Observatory (home to data for over 1000 indicators), regional and country observatories, the Triple Billion dashboards, health-related SDG indicators, and reference data and metadata sets (WHO, 2019a).
- Foster global, regional and collaborative networks and technical hubs such as the Health Data Collaborative, the SDG Global Action Plan, interagency groups, academic networks, and other partnerships such as the UN Statistical Commission, the Global Partnership for Sustainable Development Data, OECD and the World Bank, to better align investments to improve measurement and health information systems.

2.6 Equity and the outcome indicators

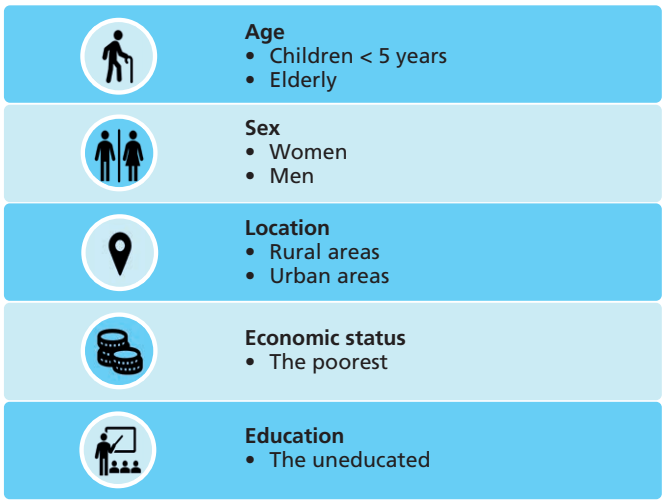
A key objective of the 46 outcome indicators is to proportionally benefit priority population subgroups and reduce within-country inequalities – differences in health that exist between population subgroups within a country.

To monitor within-country inequalities:

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

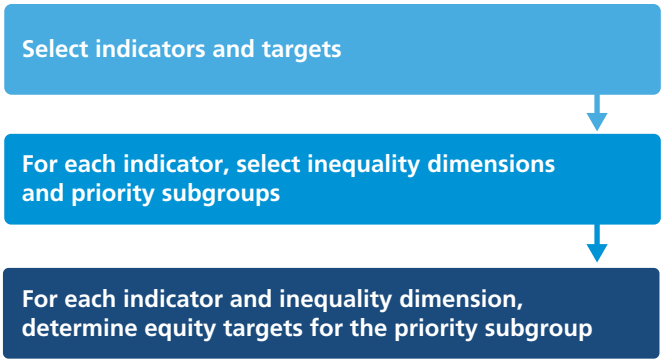
The situation in the priority subgroup(s) will be monitored alongside the national average to show how the priority subgroups are performing compared to the population overall. Equity targets may be identified for the priority subgroups to ensure accelerated gains in health for these subgroups and an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

Fig. 2.3 Example dimensions of inequality and priority subgroups



Within-country inequalities will be monitored at global, regional, national and subnational levels. Annex 2 describes the methods employed for global-level monitoring. Similar methods may be used for monitoring at the regional, national and subnational level, with consideration given to the specific context and priorities within different WHO regions and Member States. Fig. 2.4 illustrates the process of implementing inequality monitoring for outcome indicators at regional, national and subnational levels.

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



The selection of inequality dimensions and priority subgroups for monitoring will depend on a number of country-specific factors, including availability of disaggregated data. Some of the issues which impact on the selection of inequality dimensions and priority subgroups are briefly discussed below.

2.6.1 Inequality dimensions

Disaggregation may not be possible for all indicators. Some indicators may only be monitored at the national level. For example, indicator SDG 1.a.2 "Domestic general government health expenditure (GGHE-D)" is a national-level indicator that cannot be disaggregated.

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

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

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

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

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

2.6.2 Priority subgroups

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

For the same inequality dimension, the priority subgroup may be different for different indicators. For example, while for most indicators disaggregated by economic status, the poorest quintile is the priority subgroup, the richest quintile may be the priority subgroup for some indicators (WHO, 2019a, Health Equity Monitor).

Where more than one priority subgroup can be identified, a top-priority group should be identified for the purpose of monitoring. For example, for indicator SDG 3.d.2 "Proportion of bloodstream infections due to antimicrobial resistant organisms" disaggregated by age, both the under 5s and those aged 65 and over may be priority subgroups, but for the purpose of monitoring, children <5 years may be selected as the top-priority subgroup.

3 Triple Billion concept

The ambition of the GPW13 is to improve the health of billions of people by 2023. Within this context, the Triple Billion approach provides a measurement strategy for WHO, with a focus on the execution and delivery of ambitious improvements in the health of the world's populations.

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

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

3.1 Why count the Triple Billions?

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

Key reasons for counting the Triple Billions include:

- advocating for ambitious improvement in world health
- triggering action for impact
- highlighting data gaps that must be addressed
- measuring the change that results
- making a start on increasing accountability via measurement.

3.2 How to count the Triple Billions

The choice of the methods used to count each billion follows extensive debate and consultation (Section 1.3). It incorporates suggestions of experts and the comments and requirements of Member States.

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

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

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

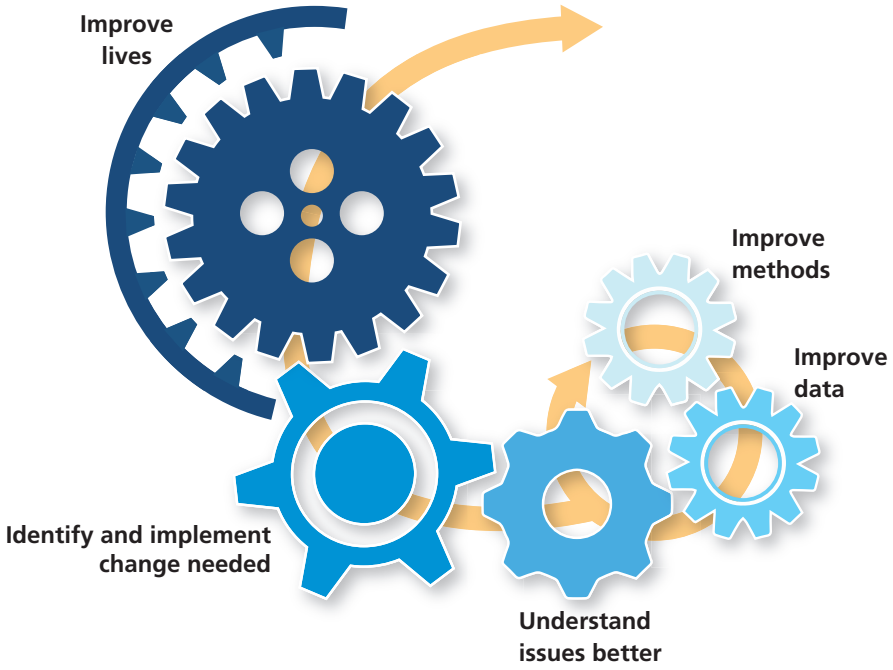
- the different country and regional contexts
- the time frame of the GPW13 programme and the need to progress rapidly into implementation.

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

3.3 The Triple Billions as a driver of change

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

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



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

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

3.4 Accounting for country size

GPW13 is concerned with all populations and with countries of all sizes. Inevitably, big countries that improve population health have the capacity to contribute large numbers of people to

the Triple Billion targets. However, changes in countries with small populations are just as important to secure. Contributions to the Triple Billions will be reported at country level both as a percentage of the population and as the total number of people. The contribution to the billion expressed as a population percentage is independent of country size: the life of each individual person is weighted equally.

3.5 Interpreting the Triple Billions as populations

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

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

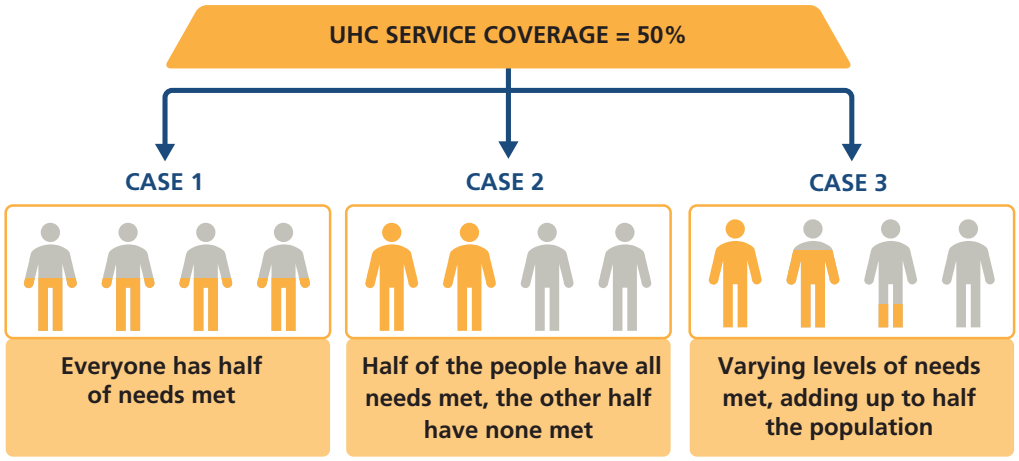
Case 1: all people have half (50%) of the services they need.

Case 2: 50% of people have all services they need; the rest have no coverage.

Case 3: there is a mix of service coverage levels averaging to 50% at the population level.

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

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



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

3.6 Handling population growth

The Triple Billions must count lives that benefit from interventions, and not just additional lives due to population growth. To avoid complexities linked to population growth, the final country population (2023) will be used in the Triple Billion calculations. All 2023 population values used in this report derive from the Population Division of the United Nations (UN) Department of Economic and Social Affairs (UN DESA, 2019). Typically, the number of people benefiting will be estimated by multiplying the final 2023 population by the estimated 5-year change in the indices or indicators. For example, if use of tobacco has declined from 17% to 15% over 5 years in a country, then this would be interpreted as 2% of the 2023 country population being additionally free from tobacco use.

The approach provides a robust method of calculation and avoids complexity. Alternative and more general forms of handling population growth were considered but are not recommended for use in the Triple Billions (see also Annex 3).

3.7 Identifying country shares of the Triple Billions

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

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

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

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

3.8 Planned refinements to the Triple Billion methods

This report details the calculation methods that will be used to estimate each of the Triple Billions. However, there are important components of the calculations that will need to be refined. These include methods for projection or extrapolation of data (since there is typically a significant time lag for data to become available and this will make calculation of change by 2023 a challenge). It is intended that GATHER guidelines (Stevens et al., 2016) will be adhered

to. Estimates of uncertainty will be calculated for each indicator as well as the resulting billions and combined in a method that will be described at a later stage. The approach to handling uncertainty is not yet determined.

3.9 Equity and the Triple Billion targets

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

3.10 The Triple Billions and primary health care

Strong primary health care is foundational to creating resilient health systems which meet every person's health needs across the life course. Primary health care underpins all three billions, by:

- ensuring care and provision of essential services, even during emergencies;
- preventing emergencies through successful vaccination programmes and rapid detection and response capacity (as the first point of care); and
- promoting healthier lives and preventing illness.

Through the Astana Declaration, WHO and its Member States have emphasized the importance of primary health care and committed to strengthening it across the world. An operational framework has been developed and various approaches to measuring primary health care are under review by WHO. Delivery of the Triple Billion targets will require strengthening of the underlying health system through monitoring and supporting primary health care across the world.

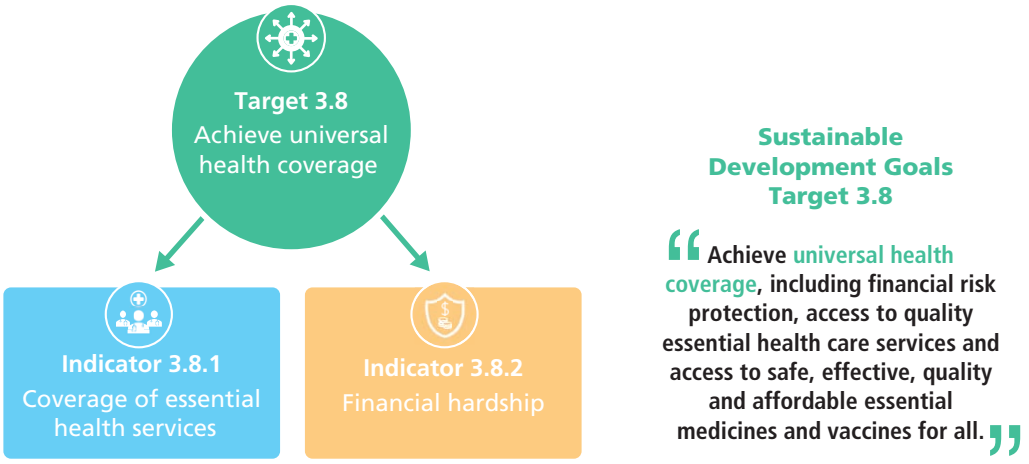
4 Universal Health Coverage Billion

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

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

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

Fig. 4.1 Universal health coverage within the Sustainable Development Goals



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

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

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

4.1 Average service coverage

The average service coverage (ASC) component of the UHC Billion estimates the average proportion of essential services that are provided to a population. It can be viewed as an estimate of the probability (as a percentage) that a person receives the health service(s) they need. The average service coverage is adapted from the SDG 3.8.1 UHC service coverage index.

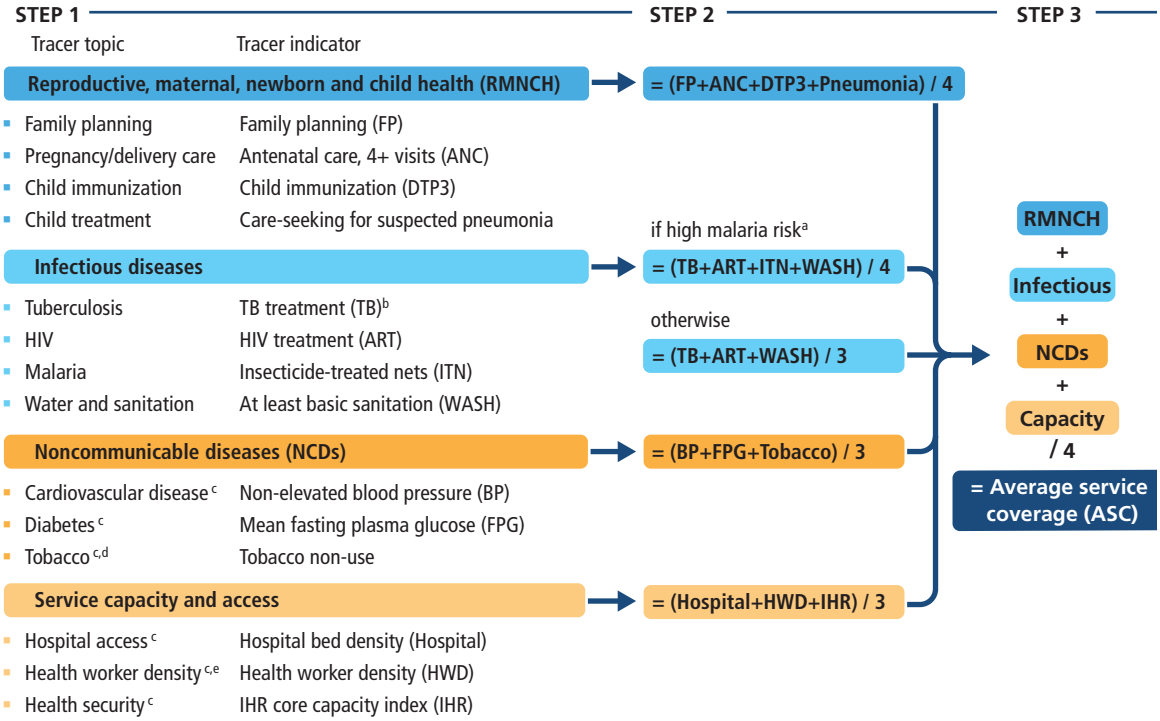
4.1.1 Background to SDG 3.8.1 UHC service coverage index

The SDG 3.8.1 UHC service coverage index provides an index of coverage of essential health services (WHO & World Bank, 2017; Hogan et al., 2018; WHO, 2019b). It measures the coverage of tracer indicators in four essential health service areas: reproductive, maternal, newborn and child health; infectious diseases; noncommunicable diseases; and service capacity and access. It is constructed from geometric means of the 14 tracer indicators – means are calculated first within each of the four areas, and then across the four category-specific in order to obtain the final summary index. The 14 indicators are not meant to represent a complete or exhaustive list of health services and interventions required to deliver UHC in a given country, nor do they measure the health impact of these services. However, they provide a strong signal of the coverage of health services needed by most populations across sociodemographic settings. The 14 indicators include eight direct measures of service coverage and six measures that are proxies for service coverage (some of which are rescaled; Annex 4.1). The resulting index is a performance metric (scaled from 0 to 100).

4.1.2 Average service coverage calculation

The average service coverage (ASC) component of the UHC Billion uses the indicators and methodology of SDG 3.8.1 as its basis, with some important alterations. It is estimated as the nested arithmetic average of 14 tracer indicators (Fig. 4.2). Indicators are averaged within each of four categories (step 2), and then across these categories (step 3).

Fig. 4.2 Calculating average service coverage (ASC) for the UHC Billion



[a] *Countries with high risk of malaria; includes those with moderate-to-high transmission in sub-Saharan Africa where use of long-lasting insecticidal nets is the core vector control intervention, and where all populations at risk are provided with the intervention. See also Annex 4.1.*

[b] *Indicator is adjusted (relative to SDG 3.8.1) to use treatment coverage (a subcomponent of the SDG 3.8.1 tracer indicator).*

[c] *Proxy indicator.*

[d] *Indicator rescaling is slightly adjusted (relative to SDG 3.8.1).*

[e] *Indicator is adjusted to refer to physicians, nurses and midwives.*

The key adaptation in using ASC is the use of arithmetic averaging in place of geometric averaging. Arithmetic averaging makes conversion to a population more plausible (see Annex 4.2). It is needed because the geometric averaging used in the SDG 3.8.1 index means that, by design, it is not a directly scalable measure of service coverage (e.g. if the value of the index were to increase by 20% this would not mean that service coverage had increased by 20%). Arithmetic averaging also avoids issues that occur with the geometric mean when one or two indicators have values that are very different from the rest.

Nested averaging is maintained, following the SDG 3.8.1 monitoring report methodologies (WHO 2019b, WHO & World Bank 2017). It provides an even weighting between the four categories of coverage. It means that although different indicators have different weightings in the average, the balance between the categories does not change (for example, the infectious disease category maintains the same weight whether or not insecticide-treated nets (ITN) data are relevant/available for a country).

Three further refinements to the use of the SDG 3.8.1 tracer indicators are included for GPW13 (Table 4.1; Annex 4.1). The TB indicator is simplified to treatment coverage (one of the subcomponents of SDG 3.8.1: TB effective treatment coverage) to avoid issues when drug-resistant TB is present. An improvement to the health worker density (HWD) indicator to measure doctors, nurses and midwives allows better use of recent SDG datasets on health workforces (see Annex 4.1 for details).

Table 4.1 Adapting the SDG 3.8.1 UHC service coverage index for use in the UHC Billion

Methodology	SDG 3.8.1	GPW13	Reason
Averaging	Nested geometric	Nested arithmetic	Allows conversion to population Avoids issues that occur with zero values or when one indicator value is very different to the rest (Annex 4.2)
Component indicators	14 tracer indicators	14 tracer indicators: the tobacco, TB and health worker density indicators are adjusted relative to SDG 3.8.1	Uses improved health worker data Simplified TB indicator Ensures progress in tobacco is included for all countries

4.2 Financial hardship

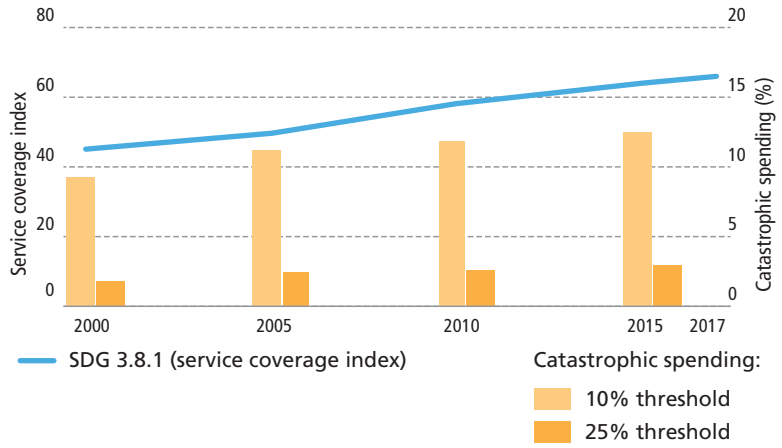
For the UHC Billion, financial hardship will be measured using SDG 3.8.2. In the following paragraphs, the term financial hardship is used to indicate financial hardship as measured by the SDG 3.8.2 measure of catastrophic spending with a 10% threshold, i.e. the proportion of the population with out-of-pocket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

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

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

Over 900 million people are estimated to incur catastrophic health spending, as tracked by SDG indicator 3.8.2 at the 10% threshold; over time global catastrophic spending has got worse (Fig. 4.3) (WHO, 2019b). An important WHO goal is to stop the rise in the percentage of people suffering financial hardship in accessing health services. This will be tracked over time, within and across countries.

Fig. 4.3 Worsening catastrophic spending against improving SDG 3.8.1 service coverage



Source: UN Global SDG Database, as of January 2020.

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

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

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

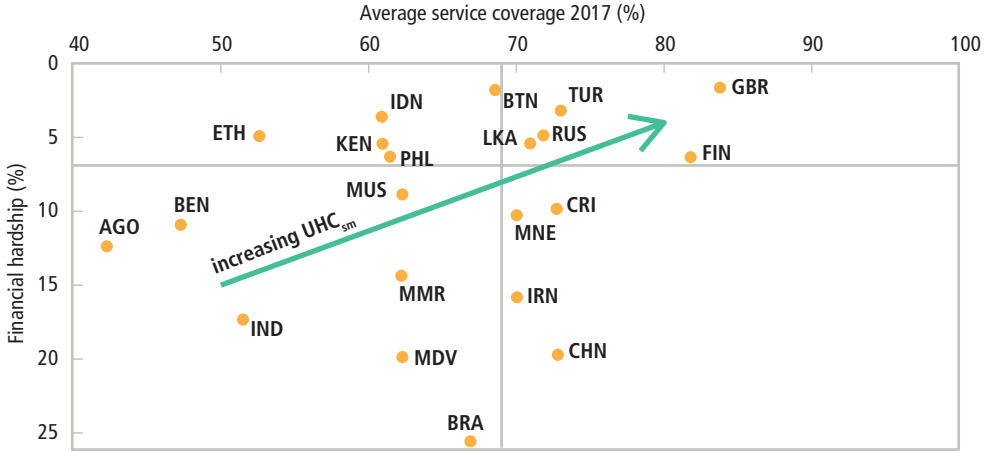
4.3 Calculating the UHC Billion

The UHC Billion estimates improvements at the population level, combining measures of service coverage and financial hardship to estimate the probability that a person receives the health service(s) they need and does not experience health-related financial hardship. The change in those proportions is then counted into the UHC Billion using a population equivalence (see Section 3.5).

4.3.1 UHC requires service coverage without financial hardship

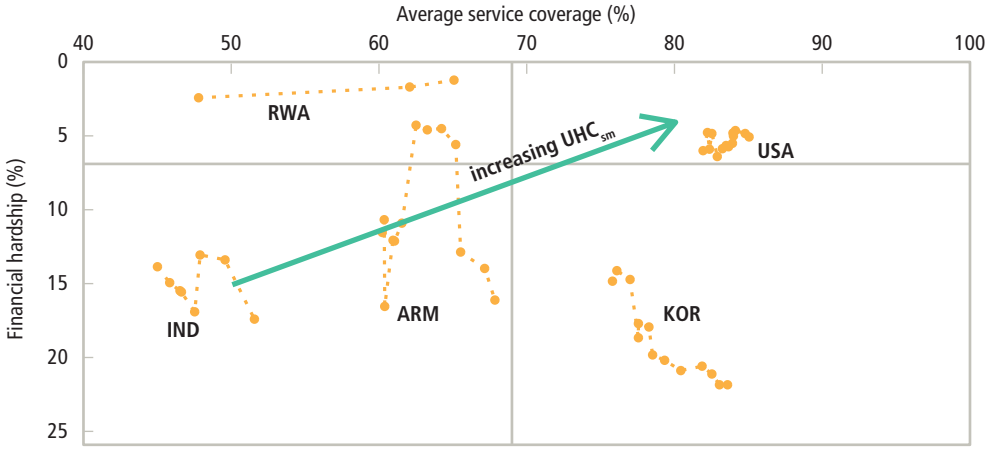
UHC requires people to get the services they need without suffering financial hardship. To achieve the UHC Billion, countries will need to focus on both UHC components and track their evolution over time. At present, countries are at different stages in terms of service coverage and financial hardship, and these can evolve in very different ways over time (Fig. 4.4; Fig. 4.5) (WHO, 2019b).

Fig. 4.4 Different stages of service coverage and financial hardship for selected countries



Source: UN Global SDG Database as of January 2020 and provisional data for ASC.
Note: Financial hardship axis is measured as catastrophic spending at the 10% level for the latest available year. Average service coverage values are for 2017. Quadrants are divided by the global median values for ASC in 2017 and latest available year for financial hardship.

Fig. 4.5 Evolution of service coverage and financial hardship in selected countries



Source: UN Global SDG Database, as of January 2020.
Note: Financial hardship is measured as catastrophic spending at the 10% level. Countries were chosen to show evolution across or within quadrants to demonstrate all countries can make some progress.

4.3.2 Combining service coverage and financial hardship

To count the UHC Billion, the two components of UHC are combined into a single measure (see also Sections 4.4, 4.5 and Annex 4.4).

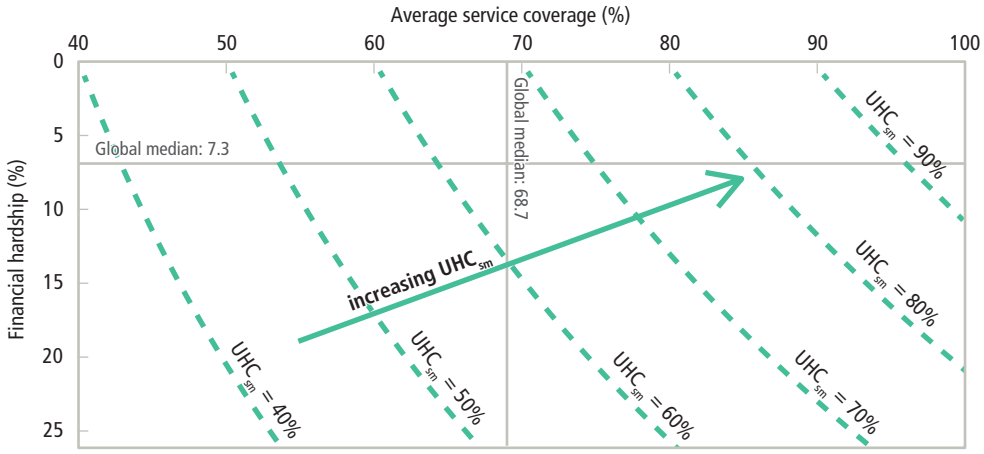
The UHC single measure (UHC_{sm}) estimates the probability (expressed as a percentage) that a person receives the health service(s) they need and does not experience health-related financial hardship:

$$UHC_{sm} = ASC \times (100 - financial\ hardship)/100$$

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

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

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



Note: Contours show the values of the UHC single measure; the higher the value the better.

The basis for combining service coverage and financial hardship into the UHC Billion is a proportional approach. The proportional approach estimates the probability of a person receiving the health service(s) they need and of not experiencing health-related financial hardship. For the UHC single measure to equal 100%, a population must receive all the health services they need and experience no financial hardship. If service coverage is 60% and there is no financial hardship, then UHC_{sm} will also be 60%. The greater the proportion of the population with financial hardship then the lower the percentage of the population counted into the UHC Billion. For example, if service coverage is 60% – which can be interpreted as the (average) probability of a person receiving the health service(s) they need – and financial hardship is 12% – which can be interpreted as the (average) probability of suffering financial hardship as defined by SDG indicator 3.8.2 – then:

$$UHC_{sm} = 60 \times (100 - 12)/100 = 53$$

In other words, under the assumption of independence, the single measure can be interpreted as the probability of a person receiving the health service(s) they need and not experiencing health-related financial hardship being 53%.

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

4.3.3 Calculating contributions to the UHC Billion

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

$$change\ in\ UHC_{sm} = UHC_{sm-2023} - UHC_{sm-2018}$$

The 2018 value is the baseline (reference) year against which the change during GPW13 is measured. To convert this into a number of people for counting contributions to the UHC Billion, the change in the UHC single measure is multiplied by the final population:

$$contribution\ to\ UHC\ Billion = change\ in\ UHC_{sm} \times population_{2023}/100$$

This approach counts an equivalent population (Section 3.5). It handles population growth, as described in Section 3.6, to make the UHC Billion robust to its effects.

4.3.4 Example country calculation

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

Step 1: calculate average service coverage (ASC) from the SDG 3.8.1 tracer indicators

Step 2: combine this with financial hardship to compute the UHC single measure

Step 3: compute changes in the UHC single measure over 5 years and convert to an equivalent population to estimate the contribution to the UHC Billion.

Step 1: Calculate arithmetic average service coverage (ASC)

Table 4.2 shows an example of the calculation of average service coverage for the start and end of a 5-year period, calculated as the nested arithmetic average across each category and its indicators in each year. In this example, ASC increases from 48 to 53 over 5 years.

Step 2: Compute the UHC single measure

The UHC single measure is calculated by combining the ASC and financial hardship. The value of the UHC_{sm} is 44% in 2018 and 50% in 2023, a change of 6 percentage points (Table 4.2).

Table 4.2 Example country calculation for the UHC Billion

Tracer indicator	2018 %	Average 2018	2023 %	Average 2023
Family planning	54		61	
Antenatal care 4+ visits	32		32	
Child immunization	62		73	
Care-seeking for suspected pneumonia	28		31	
		44		49
TB treatment	45		64	
HIV treatment	60		61	
Insecticide-treated nets	38		45	
At least basic sanitation	6		7	
		37		44
Non-elevated blood pressure	41		58	
Mean fasting blood glucose	100		100	
Tobacco non-use	92		93	
		78		84
Hospital bed density	15		18	
Health worker density	4		5	
IHR core capacity index	77		79	
		32		34
Average service coverage		**48**		**53**
Financial hardship (SDG 3.8.2, 10% threshold)		**8**		**5**
UHC single measure	48 x (100 – 8)/100 = **44**		53 x (100 – 5)/100 = **50**	
Change in UHC single measure		–		**6**

Step 3: Calculate the contribution to the UHC Billion

The calculation of the contribution to the UHC Billion combines the change in UHC_{sm} with the final population. For the period 2018 to 2023, this works as shown in Table 4.3. Note that the contribution to the UHC Billion is not the direct sum of the separate changes in service coverage and in financial hardship.

Table 4.3 Example country calculation of the contribution to the UHC Billion

Improvement in service coverage	5%
Improvement in catastrophic health spending	3%
Change in UHC_{sm}	6%
Population 2023	106 million
Additional population (equivalent) with improved service coverage	106 x 5/100 = 5.3 million
Additional population without catastrophic health spending	106 x 3/100 = 3.2 million
Contribution to UHC Billion	106 x 6/100 = 6.4 million

4.3.5 Identifying country shares

The UHC Billion will be achieved as the result of action across the globe, and for this acceleration will be required (Annex 4.5). As with each of the other Triple Billions, all countries are encouraged to make progress – there is always room for improvement. At the same time, in the quest for better equality in the world, it is right that those countries with lowest UHC are given the support and encouragement needed to work towards closing the existing global gap.

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

4.4 Limitations of the UHC Billion calculations

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

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

Further details are provided in Annex 4.4.

Note that the method used to combine service coverage and financial hardship is intended for

use when calculating the UHC Billion. It has been constructed solely for this purpose. It does not replace or amend any part of the existing SDG 3.8 monitoring framework.

4.5 UHC for the future

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

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

4.5.1 SDG 3.8.1 evolution

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

4.5.2 Measuring effective service coverage

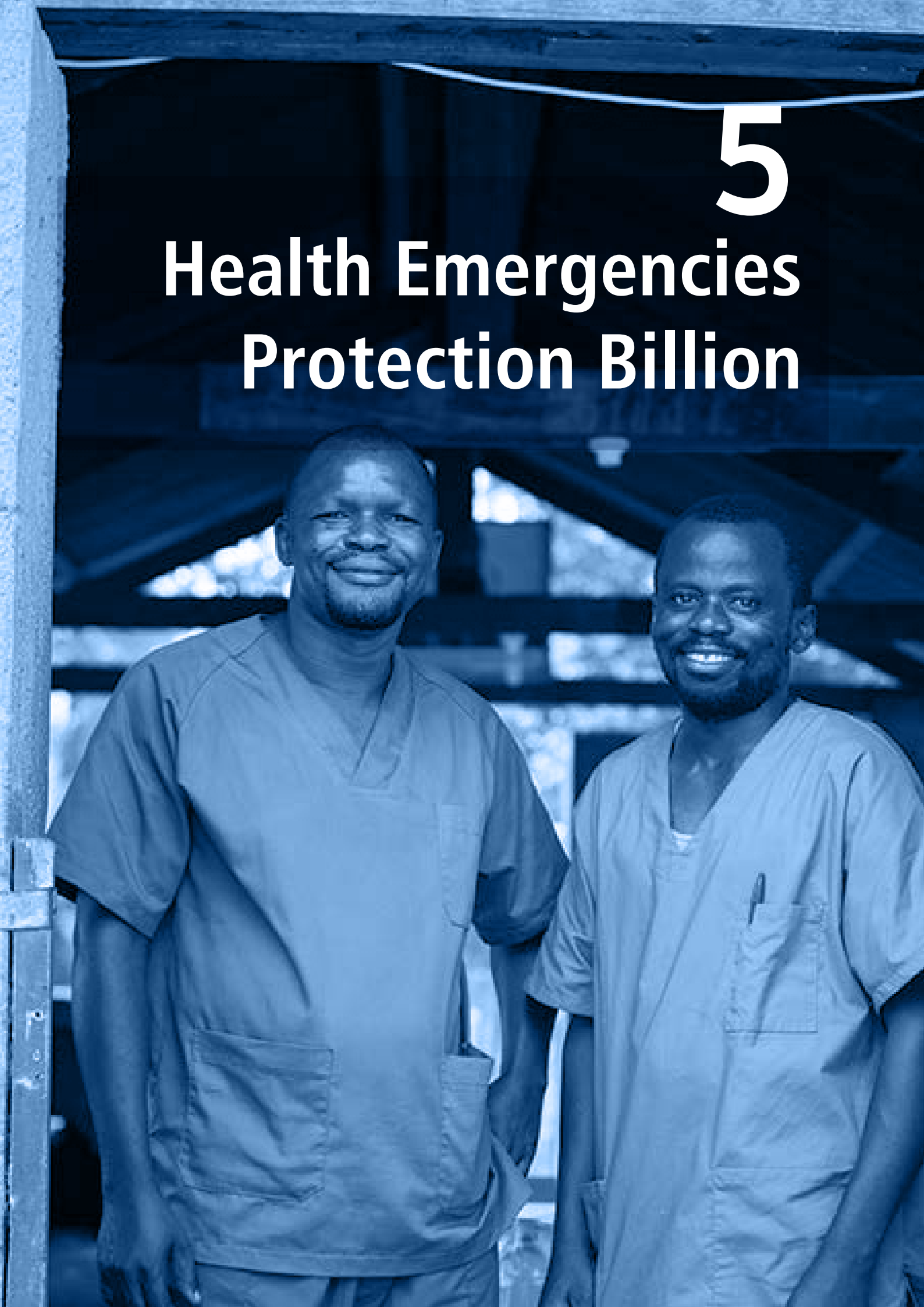
SDG 3.8.1 measures service coverage but does not allow for the quality or effectiveness of treatments, or for accessibility of care. Nor does it include any weighting that could account for differences in health gains that accrue from different health interventions. In the future, UHC measurement is expected to benefit from improved indicators and methods (Fullman et al., 2017, 2018; Hogan et al., 2018; Lee, Wu and Liu, 2018; Ng et al., 2014; Fullman and Lozano, 2018, 2020; Wagstaff and Neelsen, 2020).

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:

- focus on quality of treatment coverage, in keeping with the definition of UHC
- adjust for the varying epidemiological burden in countries
- weight treatments by health gain.

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

5 Health Emergencies Protection Billion

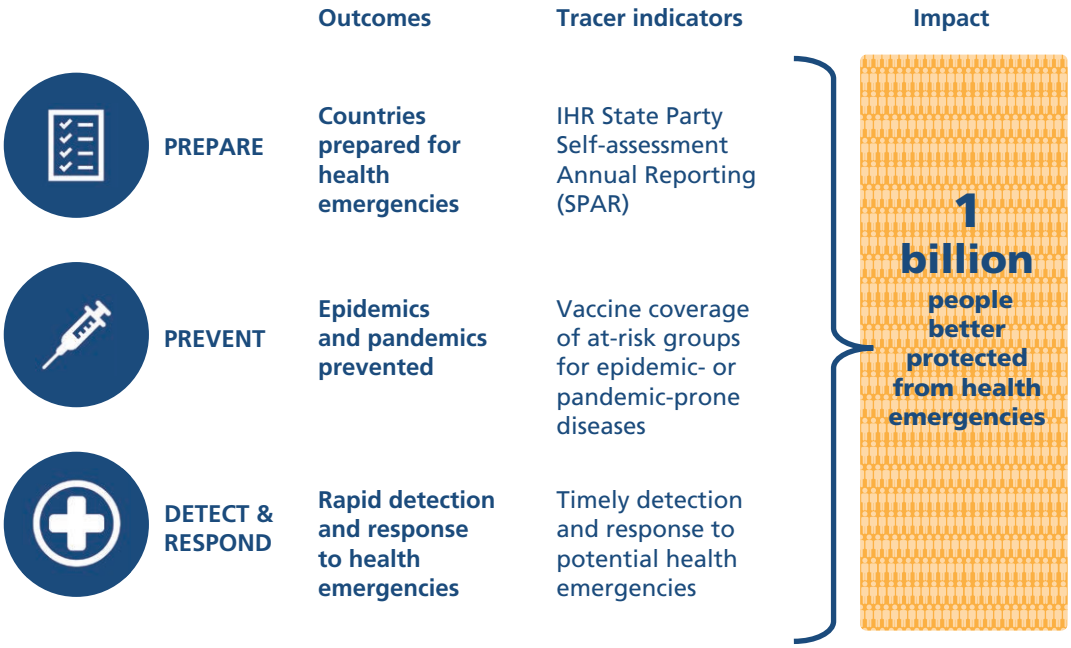


The aim of the Health Emergencies Protection Billion target is for 1 billion more people to be better protected from health emergencies.

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

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

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



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

5.1 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 IHR capacities for surveillance and response (WHO, 2016b). States that are party to the 2005 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 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 to 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 now reported using the IHR State Party Self-assessment Annual Reporting (SPAR) tool, which became available in June 2018 (WHO, 2018b).

5.1.1 Calculation method

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

$$Prepare\ indicator = \sum_{i=1}^{13} IHR\ capacity_i \Big/ 13$$

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

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

Over the past eight years, all 196 Member States have reported on the 13 IHR core capacities at least once. As of August 2019, data from 182 countries were available for the most recent reporting year (WHO, 2018b).

The emergency prepare indicator allows countries to be stratified into five levels of preparedness (Table 5.2; Fig. 5.2), enabling prioritization of where preparedness efforts are most needed. Country progress will be measured by the increase in the prepare indicator value (0–100).

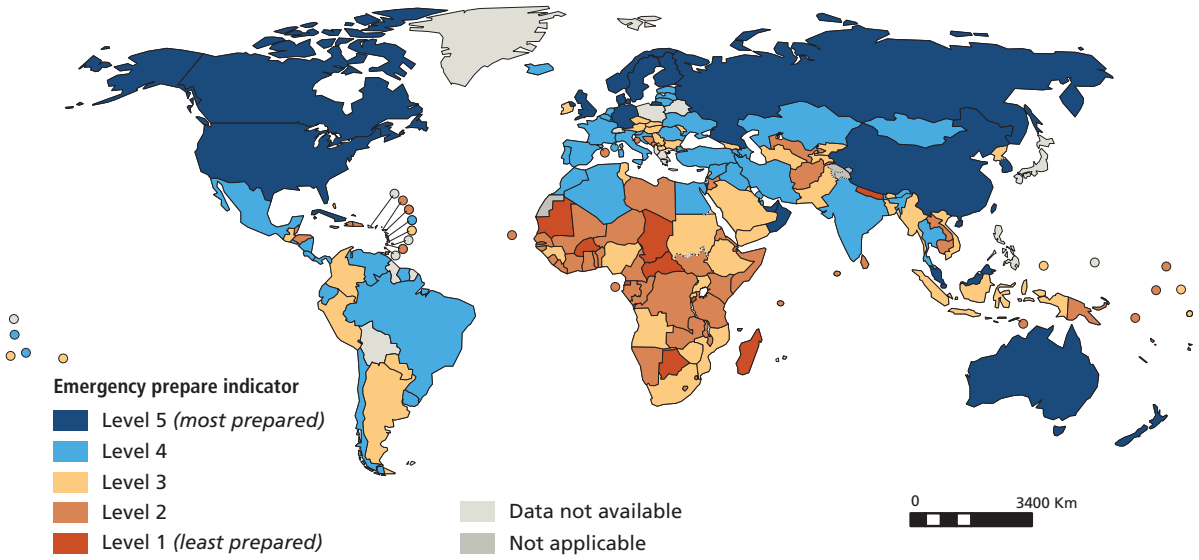
Table 5.2 Emergency prepare indicator categories, based on 2018 SPAR data

Level (average IHR capacity score)	Number of Member States	Cumulative population (millions)
Level 5 (≥90) (most prepared)	19	2231
Level 4 (70 – 89)	47	2579
Level 3 (50 – 69)	50	1685
Level 2 (30 – 49)	56	627
Level 1 (<30) (least prepared)	10	114
Data pending	14	316
Total	**196**	**7552**

Source: 2018 SPAR data (WHO, 2018b).

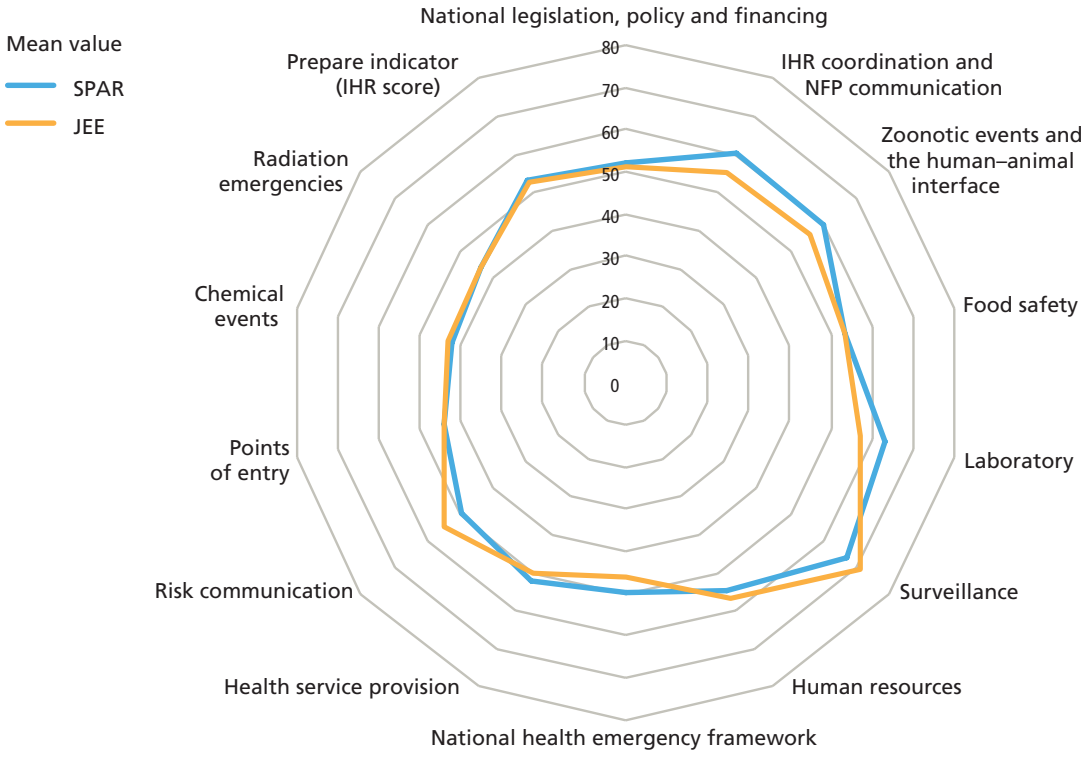
Note: 196 Member States report on IHR.

Fig. 5.2 Emergency prepare indicator, based on 2018 SPAR data



Self-reported measures can often suffer from bias. In the case of IHR capacities, voluntary external evaluations such as the joint external evaluation (JEE) are used to assess this bias. Initial results show much closer agreement between the new SPAR self-assessment tool and the JEE results than had been achieved under the previous SPAR reporting system, with a correlation coefficient of 0.87 (January 2019, 63 countries) and no significant differences between the average scores for each of the technical areas (Fig 5.3). For the emergency prepare indicator, unadjusted SPAR values will be used. Bias will, however, continue to be assessed by comparing with JEE results.

Fig. 5.3 Comparison of global SPAR and JEE IHR scores



Source: Kandel et al., 2019

5.1.2 Example country calculation

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

5.2 The emergency prevent indicator

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

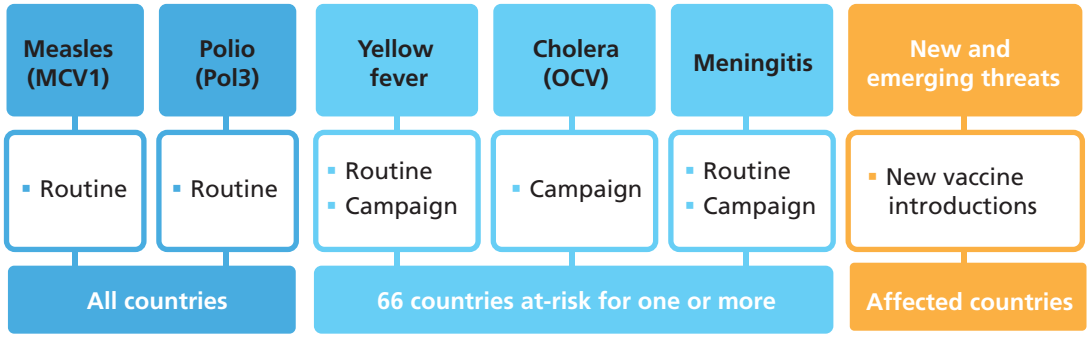
The emergency prevent indicator incorporates both routine and campaign vaccination against epidemic- and pandemic-prone diseases. It focuses on three priority infectious hazards: yellow fever, meningitis and cholera, all three being priority diseases calling for elimination or reduction through the implementation of global strategies in WHO's Health Emergencies Programme. As not all Member States are at risk of these diseases, routine vaccination against measles and polio is also included to allow estimates for all Member States and to highlight the importance of a functioning immunization programme for infectious disease prevention. Note that there is no cholera vaccination currently recommended as part of the routine vaccination schedule.

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 prevent indicator for affected countries. In these contingency scenarios, Member States 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 their prevent indicator for that year. For example, the Ebola vaccine will be included once data have been collated; if a COVID-19 vaccine were to become available, the number of people vaccinated against COVID-19 would also be included.

The index will be measured as the average coverage of relevant vaccines (see Figure 5.4), i.e. vaccines that protect against measles, polio and any of the listed three diseases for which countries are at risk:

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

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



5.2.1 Calculation method

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

$$emergency\ prevent\ indicator = \frac{\sum_v coverage_v \times relevant\ population_v}{\sum_v relevant\ population_v}$$

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 population of surviving infants (to age 1 year). For campaigns, this is the target population. In the case of campaigns (emergency or any supplementary immunization campaigns), the target population and the coverage are calculated as a rolling/cumulative value and include people who have been vaccinated in earlier years.

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 (Table 5.3). For at-risk Member States where data are available for emergency or any supplementary immunization campaigns, the mean campaign coverage estimate is used in the calculation method in addition to all available routine data for yellow fever and meningitis, when applicable. (For cholera there is no routine vaccination.) For all countries, including those not at risk for one or more of the three pathogens, all available measles and polio routine data are used.

Table 5.3 Member States at risk for yellow fever, cholera and meningitis in 2018

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

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

5.2.2 Data sources and availability

The main sources of vaccination coverage data are:

- coverage estimates for routine vaccination (yellow fever, measles, polio) from WHO/UNICEF Estimates of National Immunization Coverage (WUENIC); measles (MCV1) and polio (Pol3) 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 meningitis) (WHO, 2018a);
- additional meningitis and yellow fever immunization campaign coverage estimates from the WHO/UNICEF JRF; and
- mass preventive oral cholera vaccine (OCV) campaign coverages from the Global Task Force on Cholera Control (GTFCC).

5.2.3 Limitations

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

Data are not always complete regarding the evaluation of whether sufficient vaccine doses for immunity have been administered or not. For measles, MCV1 coverage is used as a proxy for well-functioning immunization programmes. However, global recommendations advise that two doses of measles-containing vaccine are needed for measles-vaccine effectiveness. For cholera, data are for the first dose of OCV. The data captured in the prevent indicator are intended as proxies for the overall effectiveness of vaccination systems rather than a direct measure of full vaccine protection.

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

5.2.4 Example country calculation

A sample calculation of the prevent indicator is provided in Table 5.4 for a country at risk for yellow fever, cholera and meningitis. 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 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. For 2018, the ratio is 0.74 and the prevent indicator value is 74%.

Table 5.4 Example country calculation of the emergency prevent indicator

Country category: At risk for yellow fever, cholera and meningitis				
Vaccine	**Type**	**Coverage** (%)	**Relevant population** (millions)	**Vaccinated** (millions)
Measles	routine	65	6.98[a]	4.54
Yellow fever	routine	65	6.98[a]	4.54
Meningitis A	routine	0[b]	6.98[a]	0
Polio	routine	57	6.98[a]	3.98
Yellow fever	2018 campaign	94	33.63	31.61
	2017 campaign	87	3.29	2.87
Meningitis	2017 campaign	86	2.34	2.01
	2016 campaign	87	0.20	0.17
	2015 campaign	66	0.52	0.34
Cholera	2017 campaign	104	1.71	1.78
Total			**69.6**	**51.8**
Prevent indicator				**74%**

[a] *Surviving infants, 2018.*

[b] *Introduction of meningitis A vaccination scheduled for 2019.*

5.2.5 Initial global results

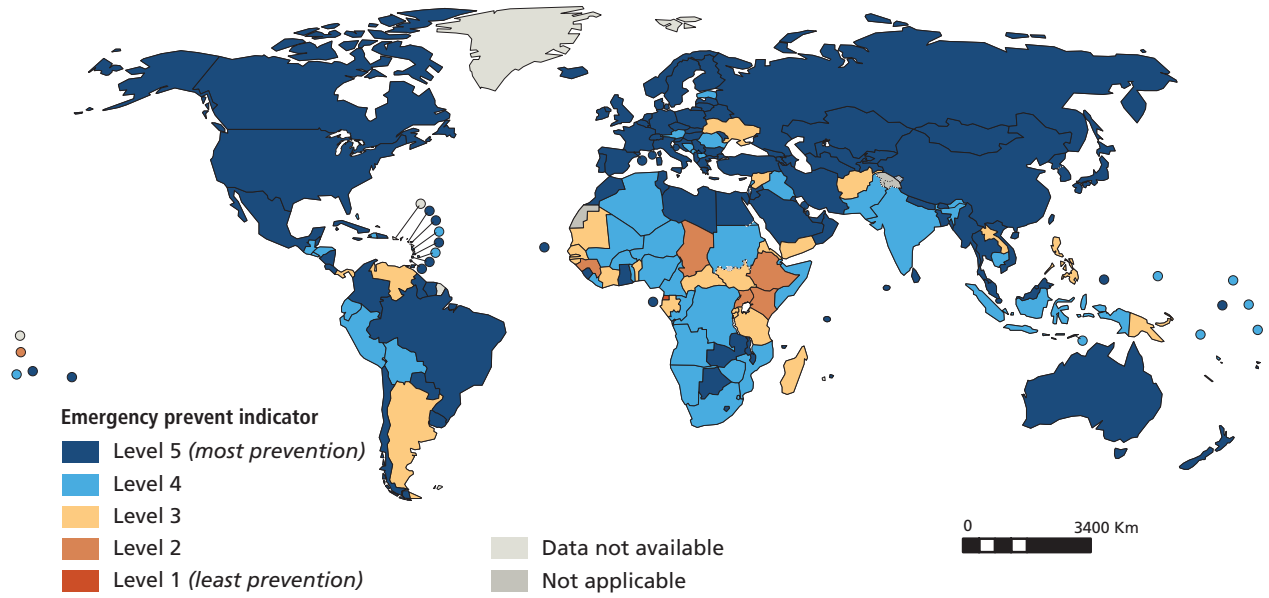
The 2018 emergency prevent indicator was estimated in October 2019 for 194 Member States and was based on incomplete data (Fig. 5.5, Table 5.5).

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

Table 5.5 Emergency prevent indicator levels for all Member States and at-risk Member States for 2018

Category	**Number of Member States**	**Total population** (millions)	**Number of at-risk Member States**	**Total at-risk states population** (millions)
Level 5 (≥90) (most prevention)	114	4181	17	778
Level 4 (70 – 89)	49	2659	23	2194
Level 3 (50 – 69)	24	515	20	420
Level 2 (30 – 49)	6	231	5	231
Level 1 (<30) (least prevention)	1	1	1	1
Total	**194**	**7587**	**66**	**3624**

Fig. 5.5 Emergency prevent indicator, 2018



5.3 The emergency detect & respond indicator

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

5.3.1 Concept

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

- IHR-notifiable events: These are events, notifiable to WHO, that have already been determined by Member States to be serious, unusual or unexpected, or that pose a risk of international spread, or risk of restrictions to international travel or trade. These hazards may be biological (zoonotic, food safety and other infectious hazards), chemical, radiological or nuclear. These events generally meet at least two of the four criteria outlined in IHR (2005) Annex 2) (exceptionally they may meet only one). (See Annex 5.1 for further details.)
- Events with serious public health impact not notified under IHR (2005). These are a broader category of events and are not notifiable to WHO. They can include infectious pathogens, natural disasters, incidents among vulnerable persons, or chemical or radiological emergencies (Table 5.6). Serious public health events are defined in alignment with IHR (2005, Annex 2) based on the following detail:
  - whether the number of cases and/or number of deaths for this type of event is large for the given place, time or population;
  - whether the event has the potential to have a high public health impact (including treatment failure, antimicrobial resistance, vulnerable population, concomitant other factors like natural disasters or armed conflict); and

- whether external assistance is needed to detect, investigate, respond and control the current event, or prevent new cases.

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

Table 5.6 IHR (2005) specification of a serious health event

Is the public health impact of the event serious?	**Is the public health impact of the event serious?**
	1. Is the number of cases and/or number of deaths for this type of event large for the given place, time or population?
	2. Has the event the potential to have a high public health impact? The following are examples of circumstances that contribute to high public health impact: • event caused by a pathogen with high potential to cause an epidemic (infectiousness of the agent, high case fatality, multiple transmission routes or healthy carrier) • indication of treatment failure (new or emerging antibiotic resistance, vaccine failure, antidote resistance or failure) • event represents a significant public health risk even if no or very few human cases have yet been identified • cases reported among health staff • the population at risk is especially vulnerable (e.g. refugees, low level of immunization, children, elderly, low immunity, undernourished) • concomitant factors that may hinder or delay the public health response (e.g. natural catastrophes, armed conflicts, unfavourable weather conditions, multiple foci in the State Party) • event in an area with high population density • spread of toxic, infectious or otherwise hazardous materials that may be occurring naturally or otherwise that has contaminated or has the potential to contaminate a population and/or a large geographical area.
	3. Is external assistance needed to detect, investigate, respond and control the current event, or prevent new cases? The following are examples of when assistance may be required: • inadequate human, financial, material or technical resources – in particular: o insufficient laboratory or epidemiological capacity to investigate the event (equipment, personnel, financial resources) o insufficient antidotes, drugs and/or vaccine and/or protective equipment, decontamination equipment, or supportive equipment to cover estimated needs o existing surveillance system is inadequate to detect new cases in a timely manner.
	Is the public health impact of the event serious? **Answer "yes" if you have answered "yes" to questions 1, 2 or 3 above.**

Source: IHR (2005) (WHO, 2016b).

The detect & respond indicator will focus on three key aspects of timeliness:

- time to detect (t_0)
- time to notify (t_1)
- time to respond (t_2).

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

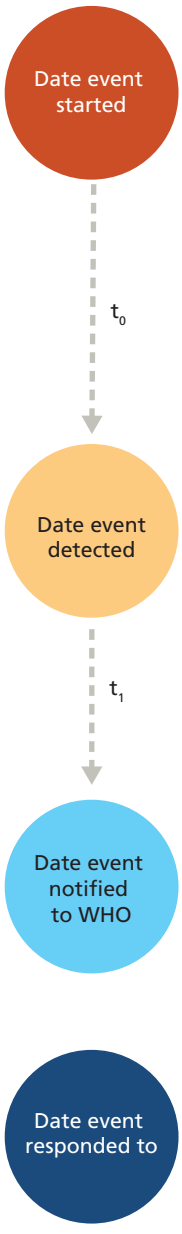
Event notification, and time to notify, only apply to IHR-notifiable events, which are reported to WHO. For the remaining events, the time to notification will not be applicable and the detect & respond indicator will be measured using the time to detection and the time taken to respond only.

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

Table 5.7 Definitions of event milestones used to measure timeliness

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

Table 5.8 Key event milestones and associated measures

Event milestones	Ideal measures	Examples of alternative proxy measures
	Date of index case symptom onset	Symptom-onset date of first reported case (=initial case) First visit to health care facility Date of 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 press release date Rapid diagnostic test date First time diagnosed as suspected case Date other external party reported to ministry of health Date outbreak declared Date local health authority reported to ministry of health Date of preliminary laboratory test Communication from laboratory to ministry of health 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 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 activated Expert group established

5.3.2 Calculation method

Each of the three components of timeliness are stratified into five levels (Table 5.9), with Level 5 being the shortest delay and Level 2 the longest delay. Level 1 is used to indicate that no data were recorded for the event and is aimed at encouraging collection of date data in order to measure timeliness. Threshold levels have been developed using quantiles of timeliness (in days) for each milestone observed for IHR notifiable events (where available) during 2014–2018.

The event timeliness is the average of the levels of the event timeliness components, rescaled to a value between 0 and 100.

$$event\ timeliness\ =\ average\ of\ timeliness\ levels \times 20$$

For IHR events, this will be the average of three levels. For other events, where time to notify is not relevant, it will be the average of the time to detect and the time to respond levels.

The detect & respond indicator value used for counting the HEP Billion will be the average of the event timeliness values over the last 5 years:

$$detect\ \&\ respond\ indicator = average\ of\ event\ timeliness\ values$$

The detect & respond indicator may also be represented as a level (Table 5.9).

Table 5.9 Definition of timeliness levels and detect & respond indicator values

Timeliness thresholds (days)	**Level**	**Detect & respond indicator value**
≤1	Level 5 (most responsive)	≥ 90
2–7	Level 4	70 – 89
8–14	Level 3	50 – 69
>14	Level 2	30 – 49
no date reported	Level 1 (least responsive)	<30

5.3.3 Example country calculation

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

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

	Time	**Duration** (days)	**Sublevel**
	Detect (t_0)	31	2
	Notify (t_1)	67	2
	Respond (t_2)	57	2
Event timeliness			**2 (40%)**

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

	Time	Duration (days)	Sublevel
	Detect (t_0)	N/A	1
	Notify (t_1)	33	2
	Respond (t_2)	447	2
Event timeliness			**2 (33%)**

Table 5.12 Example of country with three events

	Time	Duration (days)	Sublevel
Event 1	Detect (t_0)	3	4
	Notify (t_1)	1	5
	Respond (t_2)	50	2
Event timeliness			4 (73%)
Event 2	Detect (t_0)	1	5
	Notify (t_1)	N/A	
	Respond (t_2)	2	4
Event timeliness			5 (90%)
Event 3	Detect (t_0)	N/A	1
	Notify (t_1)	N/A	1
	Respond (t_2)	N/A	1
Event timeliness			1 (20%)
Detect & respond			3 (61%)

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

5.3.4 Data sources

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

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

The collection of timeliness measures will likely need to be arrived at in a phased manner. Data strengthening needs include encouraging countries to report significant public health events

and to share this information with WHO. The goal will be twofold, to extend reporting and to make incremental progress on timeliness of detection, notification and response to events.

5.3.5 Limitations

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

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

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

5.3.6 Initial contributions

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

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

Table 5.13 Initial contribution of the detect & respond indicator to the Health Emergencies Protection Billion

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

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

- raise awareness of the importance of timeliness and improve systems for timely detection, notification and response;
- encourage all countries to report timeliness measures for IHR and national emergency events; and
- advance new protocols and systems that support countries to record timeliness data for a wider range of health events.

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

5.4 Combined emergency index

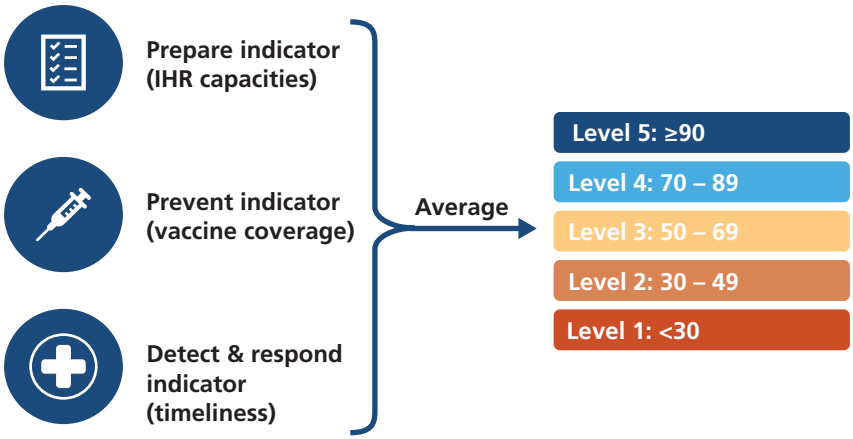
The Health Emergencies Protection Index (HEPI) is calculated as the arithmetic mean of the three tracer indicators: the emergency prepare, emergency prevent, and emergency detect & respond indicators:

$$HEPI = \frac{(prepare + prevent + detect\ \&\ respond)}{3}$$

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

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

Fig. 5.6 Calculation of the Health Emergencies Protection Index



5.4.1 Calculating contributions to the HEP Billion

The contribution to the HEP Billion will be counted by adding up the changes linked to each of the three component indicators, expressed as a proportion of the population.

For the prepare and prevent indicators, the contribution to the billion will be measured by the percentage change in the indicator value over the period from 2018 to 2023 multiplied by the 2023 population (see also Section 3.6):

$$prevent\ indicator\ contribution\ to\ HEP\ Billion = \frac{change\ in\ prevent}{100} \times population_{2023}$$

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

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

$$contribution\ to\ HEP\ Billion\ = \frac{(increase\ in\ HEPI \times 3)}{100} \times population_{2023}$$

For example, a country that has increased its HEPI by 5% would contribute 15% of its population.

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

$$country\ contribution\ to\ HEP\ Billion = \left(\frac{change\ in\ prepare}{100} + \frac{change\ in\ prevent}{100} + \frac{detect\ \&\ respond\ initial\ contribution}{100}\right) \times population_{2023}$$

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

The overall HEP Billion goal is for the equivalent of 1 billion people to be better protected out of a population of around 8 billion (projected population in 2023). This equates to around one in eight people being better protected (i.e. 12.5% of the global population) and a 4.2% average increase in each of the three tracer indicators. Note, however, that health emergencies protection is based on the strength of national (and subnational) preparedness, prevention, and detection and response systems, which cannot be translated to the individual level. Thus, a 10% increase in HEPI is more likely to mean that most of the population is 10% better protected rather than that 10% of the population move from no protection to perfect protection.

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

5.4.2 Example country calculation

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

Table 5.14 Example country contribution to the Health Emergencies Protection Billion

Indicator	Baseline value 2018	End value 2023	Change	Contribution to HEP Billion (millions)
Prepare	51%	56%	5%	0.05 x 33.4=1.167
Prevent	74%	76%	2%	0.02 x 33.4 = 0.67
Detect & respond	–	64%[a]	3%[a]	0.03 x 33.4 = 1.00
HEPI	–	65% (average of indicators)		
Total contribution			**10%**	**(0.05 + 0.02 + 0.03) x 33.4 = 3.34**

[a] *Average for 2019–2023, initial score.*

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

5.4.3 Identifying country shares

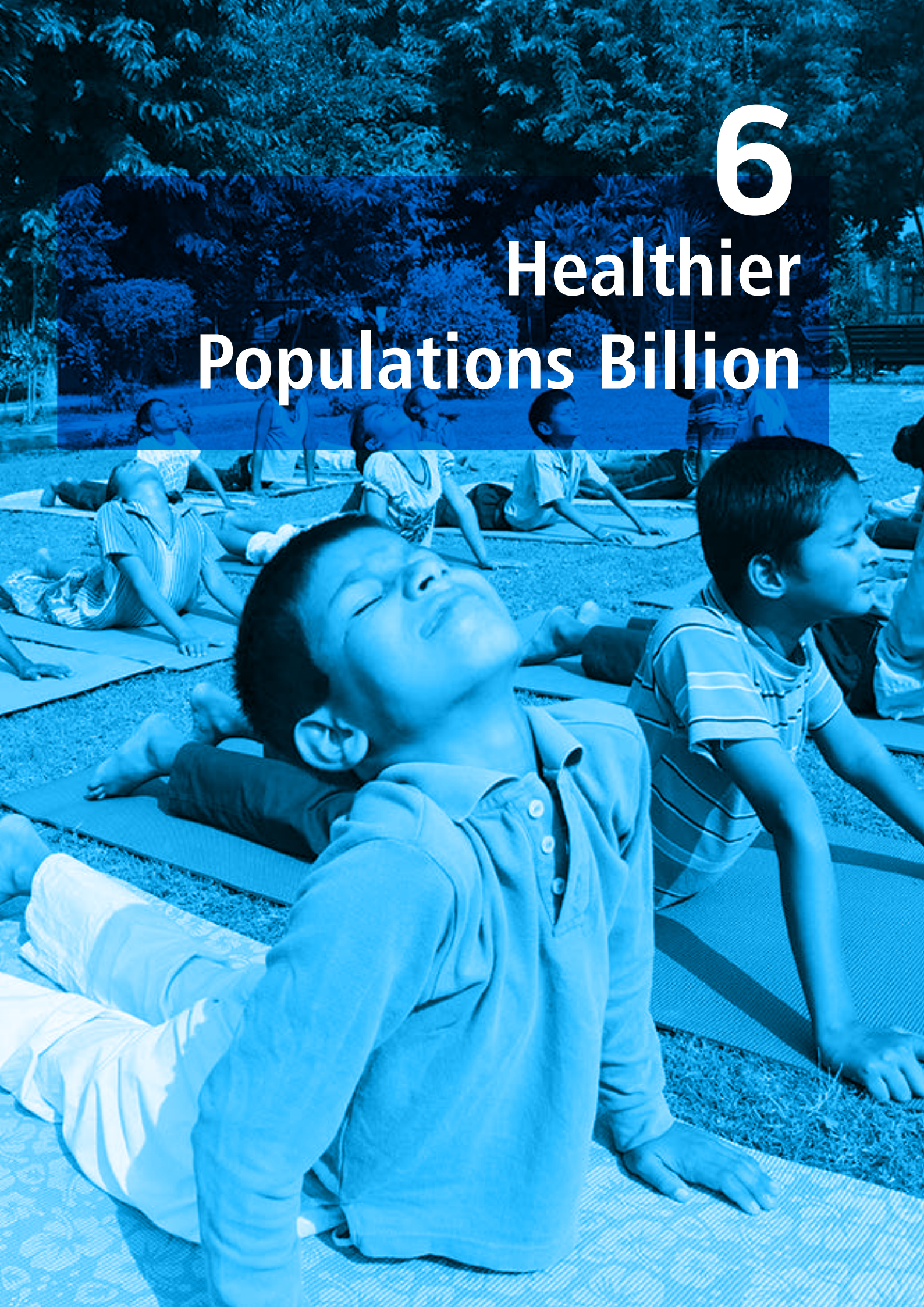
The HEP Billion will be achieved as the result of action across the globe and is expected to require acceleration at country level (Annex 5.2). All countries are encouraged to make progress and to increment their level of protection – there is always room for improvement, as seen, for example, in levels of preparedness for the COVID-19 pandemic. At the same time, in the quest for better equality in the world, it is right that those countries with poorer protection against emergencies are given the support and encouragement needed to work towards closing the existing differences.

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

5.5 Health emergencies protection for the future

COVID-19 offers an early and demanding test for the HEP Billion both in terms of measurement and its utility to guide response. It is likely that some lessons will be learnt, and that experience gained with COVID-19 may allow fine-tuning of the indicators and the index used in the computation of the HEP Billion. It is important to note that the HEP Billion was created to focus on all health emergencies, and not just infectious disease outbreaks. Each of the three indicators and their subcomponents are relevant to all health emergencies – most of them are equally important to COVID-19. The prevent component is designed to accommodate new and emerging threats such as COVID-19.

COVID-19 is showing us in real time how vital it is to detect and report early in order to respond effectively. Countries that conducted large-scale testing and contact-tracing early in the pandemic seem to have slowed the spread of the disease so far. The detect & respond indicator has scope to reflect this as we learn from COVID-19 and define best practices for response, as outlined in WHO's strategic preparedness and response plan for COVID-19 (WHO, 2020a).



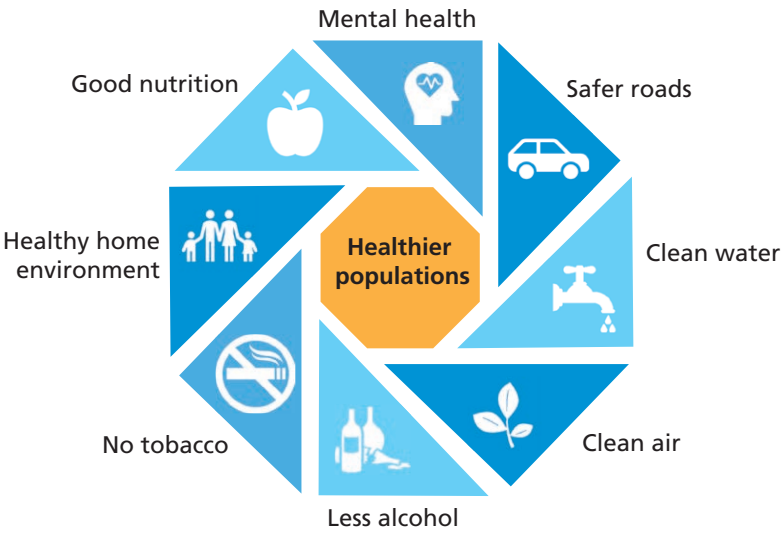
6 Healthier Populations Billion

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

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

The HPOP Billion counts the number of people who have benefited in one or more ways from changes related to environmental, behavioural and socially linked health risk factors (Fig. 6.1). The measurement is based on 16 of the GPW13 outcome indicators, which cover clean air, safe water, sanitation, roads, tobacco and alcohol use, obesity, domestic violence (intimate partner; child), child nutrition and child development, trans fats, and mental health (suicides). All but two are SDG indicators. Using these 16 indicators, the HPOP Billion measures the global impact of efforts by Member States, WHO and other parties to tackle some of the key social, economic and environmental and economic determinants of health.

Fig. 6.1 The Healthier Populations Billion concept



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

6.1 A conceptual framework for healthier populations

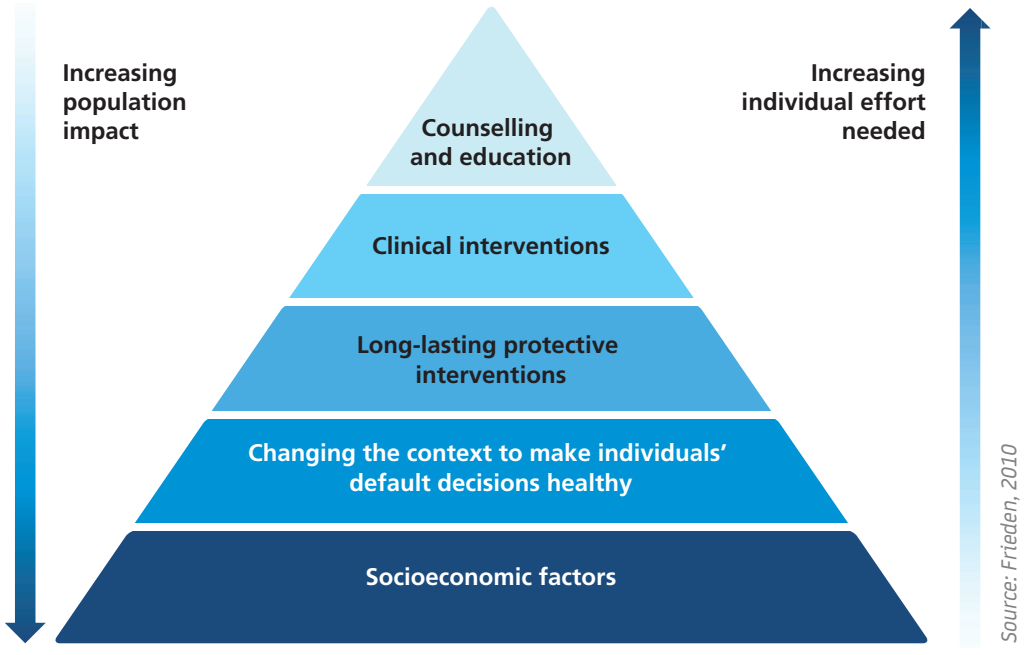
A useful conceptual framework to illustrate the areas targeted for the HPOP Billion is provided by the health impact pyramid (Frieden, 2010). As shown in Fig. 6.2, this pyramid reflects the impact and focus of interventions ranging from individual-level interventions at the top, to those addressing socioeconomic factors at the bottom. Interventions at the top of the pyramid require more effort to generate benefit for individuals; those at the bottom are more

complex but have the potential to generate greater impact at the population level. Much of the focus of the work carried out to achieve the HPOP Billion target is centred on ensuring that the environmental, social, behavioural and economic contexts in which individuals live are conducive to healthy choices. While individuals have responsibility for their decisions (to be physically active or not) and choices (what to eat and drink, and whether to smoke), there are numerous social and behavioural influences over what choices are available to individuals.

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

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

Fig. 6.2 Health impact pyramid

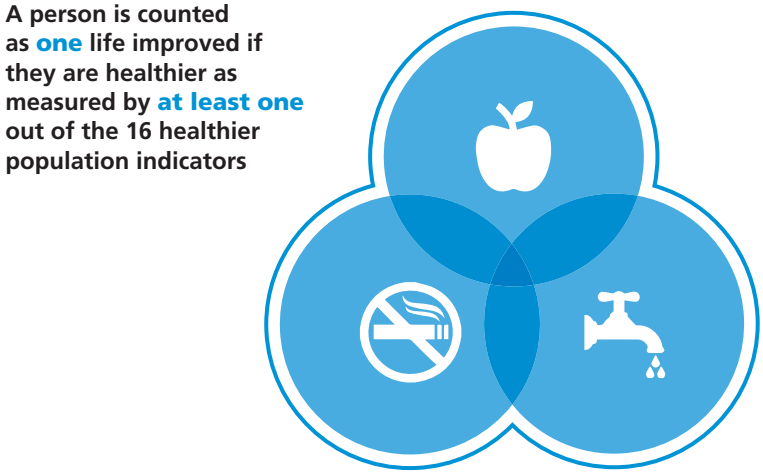


6.2 The healthier lives approach

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 16 selected component indicators. Conceptually, if a person becomes newly healthier in more than one way (e.g. gains clean drinking water and stops smoking) then this will be counted as just one extra healthier life (see Fig. 6.3). If a person becomes healthier in one way but less healthy in another (e.g. 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 an unweighted counting scheme. This approach has the advantage of simplicity, and yet provides a direct measurement.

Fig. 6.3 The healthier lives approach



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

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

6.3 Indicators for measuring healthier populations

6.3.1 Selected indicators

Sixteen GPW13 outcome indicators will be used to measure the Healthier Populations Billion (Table 6.1; Fig. 6.4).

Table 6.1 Indicators for measuring change in healthiness

SDG/WHA number	Indicator short name	Value to be used in billion	Age range	Billion topic
SDG 2.2.1	Childhood stunting	100 – x	<5	Children not stunted
SDG 2.2.2[a]	Childhood wasting	100 – x	<5	Children not wasted
SDG 2.2.2[a]	Childhood overweight	100 – x	<5	Children not overweight
SDG 3.4.2	Suicide mortality	convert	all	Reduced suicide attempts[b]
SDG 3.5.2	Alcohol consumption	convert	≥15	Reduced alcohol use[b]
SDG 3.6.1	Road deaths	convert	all	Road safety[b]
SDG 3.a.1	Tobacco use	100 – x	≥15	Tobacco non-use
SDG 4.2.1	Developmentally on track	x	<5	Child development
SDG 5.2.1	Intimate partner violence (F)	100 – x	partnered women ≥15	Reduced partner violence (F)
SDG 6.1.1	Safely managed water	x	all	Safe drinking water
SDG 6.2.1	Safely managed sanitation	x	all	Safe sanitation
SDG 7.1.2	Clean household fuels	x	all	Clean household fuels
SDG 11.6.2	Mean particulates (PM2.5)	convert	all	Ambient air quality[b]
SDG 16.2.1	Violence against children	100 – x	≥18	Reduced child violence
WHA66.10	Trans fats policy	convert	all	Healthy fats[b]
WHA66.10[c]	Obesity	100 – x	5–19; ≥20	People not obese

F = *female.*

[a] *Wasting and overweight are both forms of unhealthy weight, as measured by the ratio of height to weight. The indicators will be reported separately, but for some parts of the healthier populations calculations account is taken of the fact that these derive from one measurement.*

[b] *Indicates where a transformation to prevalence is used.*

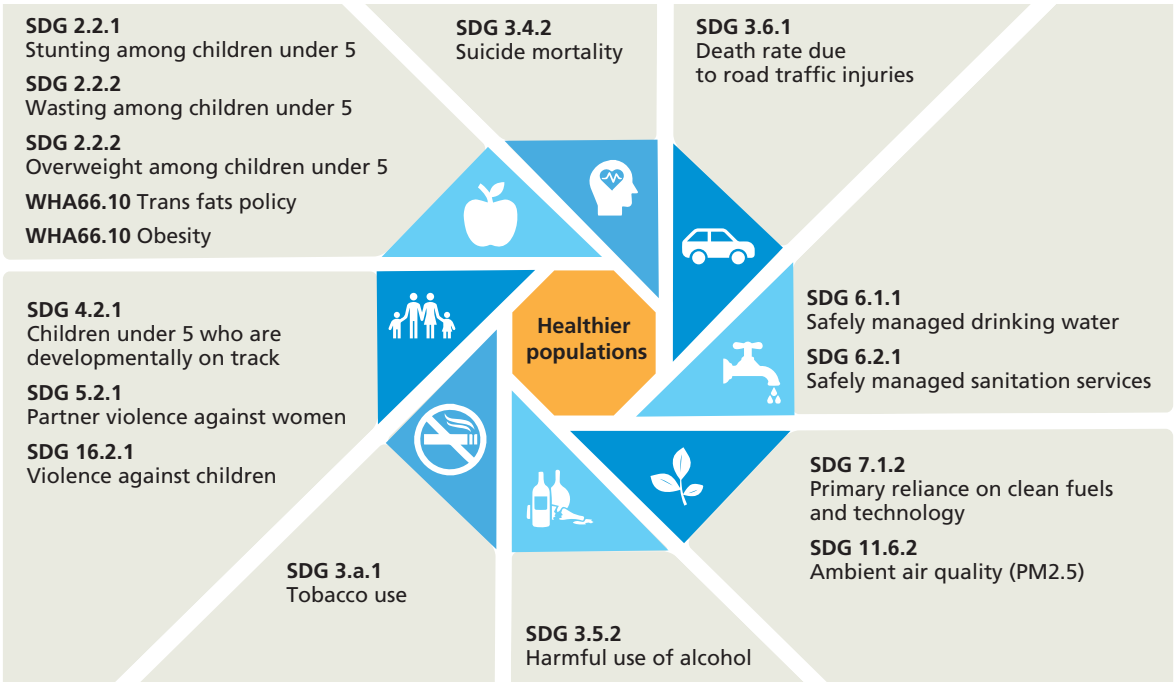
[c] *Obesity is a single indicator, but tracked by two differently defined measures for separate age groups: 20 years and over and ages 5–19. In some contexts the two values will be presented separately.*

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

- significant impact on population healthiness
- motivates change
- emphasis on healthiness
- indicator is a measure of risk or can be used as a proxy for risk
- ideally, indicator measures population prevalence
- plays a key role beyond the health sector.

Most of the selected indicators measure exposure or risk to health (e.g. prevalence of tobacco use, (lack of) access to clean water). The trans fats indicator is an example of an indicator directly measuring policy or regulation (see also Section 6.3.3); it is the only policy indicator in GPW13. Policy indicators are less directly translatable into healthier lives. See also Annex 6.1 for further detail on choice of indicators.

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



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 children under 5, obesity, intimate partner violence, and violence against children (Table 6.1).

6.3.2 Transforming non-prevalence indicators

Five of the selected indicators are not measures of prevalence but are included in the HPOP Billion because each is a key contributor to global healthiness. Given that each of these is important for the billion, and as countries do not wish to gather additional information, a compromise approach is used. This approach involves calibrating a simple transformation of each of the five indicators 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 States to collect additional data.

The transformations to be used are outlined below and do not require countries to collect any further data beyond that required for the GPW13 indicators (see also Annex 6.2).

Reduced harmful use of alcohol

The alcohol-related SDG 3.5.2 indicator measures total alcohol per capita consumption (APC) (in those aged 15 years and over) in litres of pure alcohol per calendar year. For the purposes of counting towards the HPOP Billion, a reduction of APC of 25 litres is equated to 100% of the population being healthier. Smaller changes contribute to the HPOP Billion in a proportional manner. For example, reducing APC by 1 litre would be counted as equivalent to 4% of the population being healthier. Note that the benefit of lower alcohol consumption is likely to be experienced as a significant proportion of the population gaining partial healthiness benefit rather than a few people experiencing a large change (see also Section 3.5 and Annex 6.2).

Road safety

The SDG 3.6.1 indicator measures traffic-related mortality and is used as a proxy for road safety. Safer roads not only result in fewer deaths and injuries, but also provide key health-related benefits; for example, people are more likely to walk or cycle and be physically active if roads are safer. For the HPOP Billion, the additional population avoiding road injury or death will be counted as "healthier". This transformation is likely to be an underestimate of benefit because it does not account for the important secondary effects of safer roads, but is the best that can be done using available data sources. The number of road injuries is estimated based on a simplified relationship linking road mortality, road injuries, and the Socio-demographic Index (SDI), a measure of the development level of a country based on average income per person, educational attainment and total fertility rate (Kassebaum et al., 2016). The fitted relationship allows approximate estimation of the number of injuries and deaths from road accidents based on the SDG mortality values (Annex 6.2). This is used to estimate the change in prevalence of people avoiding death or injury from road traffic-related incidents (over a 5-year period).

Clean air

The SDG 11.6.2 indicator for air particulates measures the mean concentration of PM2.5 in $\mu g/m^3$. For the purposes of calculating the HPOP Billion, a reduction of PM2.5 by 100 $\mu g/m^3$ is equated to 100% of the population being healthier. Smaller changes contribute to the HPOP Billion in a proportional manner. For example, improving PM2.5 by 10 $\mu g/m^3$ would be counted as equivalent to 10% of the population being healthier. Note that the benefit of better air quality is likely to be experienced as a significant proportion of the population gaining partial healthiness benefit, rather than a few people experiencing a large change (Section 3.5; Cohen et al., 2017). See also Annex 6.2.

Trans fats

The trans fats indicator is a policy indicator that records whether WHO best practice policies for eliminating industrially produced trans fatty acids (TFA) have been implemented. For inclusion in the HPOP Billion, countries which implement best practice TFA policy during the GPW13 period will contribute 2.1% of their population to the billion. This is a simplified approach based on estimated global averages. It estimates the proportion of the population who are expected to reduce intakes of trans fats to within guideline levels during the five years following policy implementation. See also Annex 6.2.

Mental health

Mental health is an important aspect of wellness. Inclusion in the HPOP Billion requires a suitable transformation of SDG 3.4.2, mortality due to suicide, into a measure of prevalence of healthiness. The number of additionally healthier lives will be counted as the estimated number of people avoiding suicide or a suicide attempt. The WHO World Mental Health Survey estimates that for each adult who dies by suicide there are more than 20 others who made one or more suicide attempts (Kessler and Ustun, 2008). This ratio is used to estimate the number of people who avoid suicide attempts over a 5-year period. This measure is an underestimate of the number of people who would benefit from improvements to mental health services.

6.3.3 Making use of policy information

Policy, laws, taxation, advocacy, regulation, education and investments are key drivers for change in social, environmental and behavioural risks (Magnusson and Patterson, 2011). They are critical to addressing risks to health and to achieving healthier populations. It is not possible to base the GPW13 HPOP Billion directly on policy and regulation data, because the health-related SDGs and GPW13 indicators (other than that for trans fats) are not measures of policy. However, many of the healthier population indicators run alongside programmes that support and measure policy-based interventions, such as MPOWER for tobacco, INSPIRE for violence against children, and noncommunicable disease progress monitoring (WHO, 2008; WHO, 2016a). 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 progress towards the HPOP Billion. It is intended that information on policy implementation and legislation will be reported and tracked alongside the HPOP Billion. Countries will not be required to provide such data, but where available the data will be presented.

6.4 Calculating the Healthier Populations Billion

6.4.1 Calculation method

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

$$contribution_i = pop_i \times \Delta p_i$$

where pop_i is the population relevant to indicator i (e.g. adult population aged 15 and over) and, Δp_i is the change in prevalence (expressed as a proportion) for indicator i over a period of time.

For example, if in a given country the population aged 15 and over is 1 million and the prevalence of no tobacco use is 81% at the start of the period and 83% at the end of the period, then:

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

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

Reducing double counting

It is likely that there will be some overlap whereby populations become healthier in more than one way. For example, some people may stop smoking and gain access to clean water.

The double-counting correction is used when adding up contributions to the HPOP Billion, and ensures that the contribution to the HPOP Billion can never exceed the country population. It is a simplified, first-level correction that aims to address the concerns of Member States, whilst being realistic about available data sources. This compromise limits overcounting of contributions. The correction also takes account of the fact that not all indicators are improving, and that not all indicators apply to all age groups. Details of the form of the correction for double counting are given in Annex 6.3.

Handling population growth

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

As with the UHC Billion and HEP Billion, population growth is handled using a counterfactual approach (see Section 3.6; Annex 3.1). 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 to reduce tobacco use can be measured by the change in the prevalence of tobacco use. To convert this into a contribution towards the billion, this would be multiplied by the population at the end of the period.

The counterfactual approach outlined above provides a robust method of calculation. Alternative and more general forms of handling population growth are also possible and are considered in Annex 3.1.

Negative contributions

Negative contributions to the HPOP Billion can occur if an indicator prevalence has deteriorated over time. Negative contributions point to where there is an ongoing problem and where particular attention is needed. Current trends suggest this is likely to be especially important for overweight and obesity, for air quality and for alcohol consumption (Table A6.4).

6.4.2 Example country calculation

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

Step 1: Transforming the data

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

Table 6.2 Example country calculation for the Healthier Populations Billion

Billion topic	(Raw value) transformed value (%)		Change in prevalence (%)	Relevant population (millions)	Healthier people (millions)
	Prevalence 2018	Prevalence 2023			
Safe sanitation	(62.37) **62.37**	(65.20) **65.20**	2.83	86.0	2.4
Tobacco non-use	(30.80) **69.20**	(29.10) **70.90**	1.70	66.2	1.1
Reduced alcohol use [a]	(4.63) **81.49**	(4.26) **82.95**	1.45	66.2	1.0
Children not stunted	(12.50) **87.50**	(9.90) **90.10**	2.60	6.4	0.2
Reduced suicide attempts [a]	(8.40) **99.16**	(7.30) **99.27**	0.11	86.0	0.1
Healthy fats [a]	(0.00) **85.70**	(0.00) **85.70**	0.00	86.0	0.0
Children not wasted	(0.99) **99.01**	(1.85) **98.15**	-0.86	6.4	-0.1
Children not overweight	(9.73) **90.27**	(11.12) **88.88**	-1.38	6.4	-0.1
Children not obese	(7.9) **92.10**	(9.8) **90.20**	-1.90	20.0	-0.4
Road safety [a]	(8.90) **97.01**	(12.30) **95.87**	-1.14	86.0	-1.0
Ambient air quality [a]	(34.43) **65.57**	(37.21) **62.79**	-2.78	86.0	-2.4
Adults not obese	(28.2) **71.80**	(32.2) **67.80**	-4.00	62.9	-2.5
Reduced partner violence (F)	No data	(11.00) **89.00**	-	62.9	-
Clean household fuels		No data		86.0	-
Safe drinking water		No data		86.0	-
Child development		No data		6.4	-
Reduced child violence		No data		6.4	-

F = female.

[a] *Requires a transformation to prevalence.*

Notes: Data are available for 12 of the 16 possible indicators (note two measures are used for obesity corresponding to two age ranges). Indicators without data for this country are not counted into the HPOP Billion. Prevalence change shows the 5-year change in the indicator for the transformed values. The "relevant population" is the population to which the indicators apply, for example the number of children under 5 for wasting. The "Healthier people" column shows additionally healthier people over the 5-year historical period.

Step 2: Convert change in prevalence 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 consumption this is the population aged 15 and over, whereas for stunting this is the population of children aged under 5.

For example, for stunting, the change in prevalence is 2.6 and the population of children under 5 is 6.4 million. Hence:

$$healthier\ lives\ due\ to\ reduced\ stunting = 6.4 \times 2.6/100 = 0.17\ million$$

Step 3: Adjust for double counting

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

Table 6.3 Example country totals for counting into the Healthier Populations Billion

Newly healthier lives (corrected for double counting)	4.7 million
Newly unhealthier lives (corrected for double counting)	-6.3 million
Contribution to billion (net healthier lives)	**-1.6 million**
Total population 2023	86 million
% population leading healthier lives	**-1.80%**

6.4.3 Identifying country shares

For healthier populations, all countries are encouraged to make progress. Several of the indicators, such as obesity, are important in countries at all income levels. For the HPOP Billion to be achieved by 2023 in a world of 8 billion people, this would represent one in eight people worldwide living healthier lives. An indicative guideline is for each country to aim for one in eight people to be healthier. However, countries may choose their own objective.

6.5 Limitations of the healthier lives approach

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

An important disadvantage of the approach is that disparate impacts of interventions on individuals, such as access to clean air, access to safe sanitation, and avoiding partner violence, are given equal weight. For example, cessation of smoking typically has a greater impact on health than access to clean sanitation – but is weighted equally. More complex approaches were considered, including a simplified weighting scheme but, on balance, it was decided that a simpler unweighted method to calculate the HPOP Billion would be preferable (see also Annex 6.4).

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

Further discussion of recognized limitations may be found in Annex 3.2 and Annex 6.5.

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 global population healthiness will develop further. This may inspire a broader and more comprehensive index of healthiness. Whilst the approach detailed here captures change in several key risk factors linked to healthiness, it does not provide a full coverage of factors and sectors. We are likely to revisit the selection of indicators beyond GPW13.

A more general index and framework for healthiness could be envisaged, with broader coverage of factors, better 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) (Annex 6.4) (WHO Thirteenth Programme of Work Expert Reference Group, 2019).

7 Healthy life expectancy (HALE)

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

HALE has been selected because it can be used to monitor the overall progress made and because of its alignment with SDG 3. It will be used for GPW13 baseline reporting and for future monitoring. 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 the Institute for Health Metrics and Evaluation (IHME) , although with some differences in data inputs (Hay et al., 2017; WHO, 2018d).

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

- sex-specific period life tables by country
- 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.

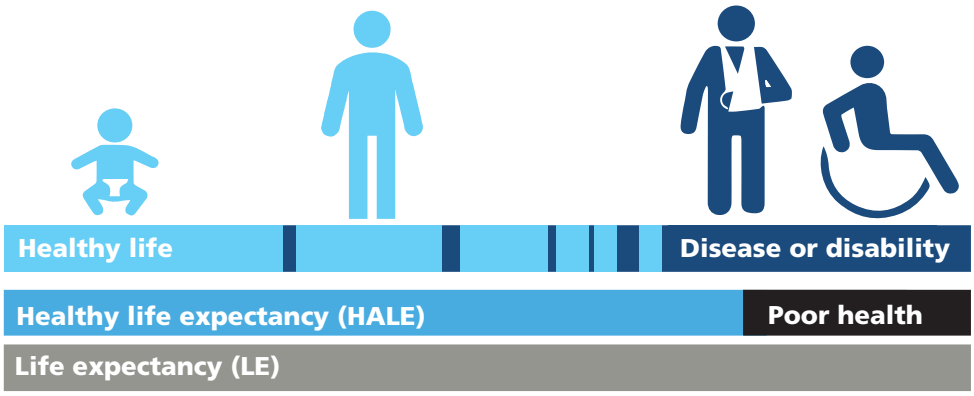
In the **GBD approach** the input data are:

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

By summing YLD over all causes and adjusting for independent comorbidity 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 (Fig 7.1).

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 number of survivors at age x in the period life table. The GBD approach will be used to calculate HALE for the GPW13 impact measurement.

Fig. 7.1 Difference between life expectancy and healthy life expectancy



Note: Different forms of disability occur at varying stages along a person's life course. In the top bar, these are not adjusted for the severity of the condition.

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 disease 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 overlaps between the indicators used in the Triple Billions. These can be direct (e.g. vaccines in both the UHC Billion and the HEP Billion) or indirect when indicators of risk factor interventions and health outcomes are interrelated (e.g. tobacco use in the UHC Billion and HPOP Billion, and high blood pressure, which can be caused by 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 to GPW13 and which attributes changes in HALE to the Triple Billions.

7.3 Equity and HALE

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

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

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Annexes

Annex 1 Outcome indicators

Table A1.1 Availability of data for outcome indicators

SDG/WHA number	Indicator	Number of countries with		
		No data, 2000–2018	Data since 2015	Trend data[a]
SDG 1.5.1	Number of persons affected by disasters (per 100 000 population)	71	93	61
SDG 1.a.2	Domestic general government health expenditure (GGHE-D) (% of general government expenditure (GGE))	3	189	188
SDG 2.2.1	Prevalence of stunting in children under 5 years (%)	48	72	67
SDG 2.2.2	Prevalence of wasting in children under 5 years (%)	50	72	65
SDG 2.2.2	Prevalence of overweight in children under 5 years (%)	49	72	66
SDG 3.1.1	Maternal mortality ratio (per 100 000 live births)	11	183	183
SDG 3.1.2	Proportion of births attended by skilled health personnel (%)	9	126	125
SDG 3.2.1	Under 5 mortality rate (per 1000 live births)	0	194	194
SDG 3.2.2	Neonatal mortality rate (per 1000 live births)	0	194	194
SDG 3.3.1	Number of new HIV infections (per 1000 uninfected population)	76	118	118
SDG 3.3.2	Tuberculosis incidence (per 100 000 population)	0	194	194
SDG 3.3.3	Malaria incidence (per 1000 population at risk)	0	107	107
SDG 3.3.4	Hepatitis B incidence (measured by surface antigen (HBsAg) prevalence among children under 5 years) (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	Probability of dying from any of cardiovascular disease, cancer, diabetes, chronic respiratory disease (aged 30–70) (%)	11	183	183
SDG 3.4.2	Suicide mortality rate (per 100 000 population)	11	183	183
SDG 3.5.1	Coverage of treatment interventions for substance use disorders (%)	194	0	0
SDG 3.5.2	Total alcohol per capita consumption in adults aged ≥15 (litres of pure alcohol)	5	189	189
SDG 3.6.1	Road traffic mortality rate (per 100 000 population)	20	174	174
SDG 3.7.1	Proportion of women (aged 15–49) having need for family planning satisfied with modern methods (%)	65	54	52
SDG 3.8.1	UHC service coverage index	11	183	0
SDG 3.8.2	Proportion of population with large household expenditures on health (>25% of total household expenditure or income) (%)	48	38	31
SDG 3.9.1	Mortality rate attributed to air pollution (per 100 000 population)	11	183	0
SDG 3.9.2	Mortality rate attributed to exposure to unsafe WASH services (per 100 000 population)	11	183	0
SDG 3.9.3	Mortality rate from unintentional poisoning (per 100 000 population)	11	183	183
SDG 3.a.1	Prevalence of tobacco use in adults aged ≥15 (%)	45	149	149
SDG 3.b.1	Proportion of population covered by three doses diphtheria–tetanus–pertussis-containing vaccine (%)	0	194	194
SDG 3.b.1	Proportion of population covered by two doses measles-containing vaccine (%)	25	169	162
SDG 3.b.1	Proportion of population covered by three doses pneumococcal conjugate vaccine (%)	53	141	129

Table A1.1 Continued

SDG/WHA number	Indicator	Number of countries with		
		No data, 2000–2018	Data since 2015	Trend data[a]
SDG 3.b.3	Proportion of health facilities with essential medicines available and affordable on a sustainable basis (%)	194	0	0
SDG 3.c.1	Density of medical doctors (per 10 000 population)	4	160	150
SDG 3.c.1	Density of nursing and midwifery personnel (per 10 000 population)	1	163	157
SDG 3.c.1	Density of dentists (per 10 000 population)	1	182	178
SDG 3.c.1	Density of pharmacists (per 10 000 population)	11	135	122
SDG 3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness	5	189	0[b]
SDG 3.d.2	Proportion of bloodstream infections due to antimicrobial resistant organisms (%)	194	0	0
SDG 4.2.1	Proportion of children under 5 years developmentally on track (health, learning and psychosocial well-being) (%)	123	26	0
SDG 5.2.1	Proportion of women (aged 15–49) subjected to violence by current or former intimate partner (%)	87	29	0
SDG 5.6.1	Proportion of women (aged 15–49) who make their own 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 (%)	79	115	115[c]
SDG 6.2.1	Proportion of population using safely managed sanitation services (%)	94	100	100[c]
SDG 6.2.1	Proportion of population using hand-washing facility with soap and water (%)	98	91	91
SDG 7.1.2	Proportion of population with primary reliance on clean fuels (%)	3	191	191
SDG 11.6.2	Annual mean concentrations of fine particulate matter (PM2.5) in urban areas ($\mu g/m^3$)	0	194	194
SDG 16.2.1	Proportion of children (aged 1–17) experiencing physical or psychological aggression (%)	111	27	0
Health Emergencies	Vaccine coverage for epidemic prone diseases	0	194	0
Health Emergencies	Proportion of vulnerable people in fragile settings provided with essential health services (%)	194	0	0
WHA66.10	Prevalence of raised blood pressure in adults aged ≥18	0	194	194
WHA66.10	Best practice policy implemented for industrially produced trans fatty acids (Y/N)	64	130	130
WHA66.10	Prevalence of obesity among children and adolescents (aged 5–19) (%)	4	190	190
WHA66.10	Prevalence of obesity among adults aged ≥18	4	190	190
WHA68.3	Number of cases of poliomyelitis caused by wild poliovirus	0	168	168
WHA68.7	Patterns of antibiotic consumption at national level	194	0	0

[a] *Has enough data to estimate trend over five years.*

[b] *Refers to data reported using the new State Party Self-assessment Annual Reporting (eSPAR) tool, which only became available in 2018.*

[c] *Includes rural/urban values.*

Notes: Some outcome indicators include more than one measure.

Sources: WHO Global Health Observatory data repository and UN Global SDG Indicators Database (extracted May 2019, with some additions).

Annex 2 Global-level inequality monitoring of outcome indicators

Between December 2018 and August 2019, indicator focal points from across WHO headquarters were contacted and asked for their expert opinion with regards to data disaggregation/inequality monitoring for the indicators from their respective programme 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 identified inequality dimension, focal points were asked to specify:

- the name of the inequality dimension
- the priority subgroup(s)
- the data source from which disaggregated data are available
- 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.

Table A2.1 provides an overview of the answers received from WHO headquarters programme focal points, listing the proposed inequality dimensions and priority subgroups for each outcome indicator. Information on data sources and data availability was patchy and lacking in detail, and therefore is not reported here. Going forward, steps will be taken to collate and verify this information and to conduct 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. The other eight are national-level indicators which cannot be disaggregated:

- SDG 1.5.1: Number of persons affected by disasters
- SDG 1.a.2: Domestic general government health expenditure as % of general government expenditure
- SDG 3.3.5: Number of people requiring interventions against neglected tropical diseases
- SDG 3.c.1: Density of health workers
- SDG 3.d.1: International Health Regulations (IHR) capacity and health emergency preparedness
- Health Emergencies: Proportion of vulnerable people in fragile settings provided with essential health services
- WHA66.10: Best practice policy implemented for industrially produced trans fatty acids
- WHA68.7: Patterns of antibiotic consumption at national level

Table A2.1 Inequality dimensions

SDG/WHA number	Indicator	Inequality dimension	Priority subgroup(s)
SDG 1.5.1	Number of persons affected by disasters (per 100 000 population)	Not applicable	Not applicable
SDG 1.a.2	Domestic general government health expenditure (GGHE-D) (% of general government expenditure (GGE))	Not applicable	Not applicable
SDG 2.2.1	Prevalence of stunting in children under 5 years (%)	1. Economic status	Poorest quintile
		2. Place of residence	Rural
		3. Mother's education	No/low education
SDG 2.2.2	Prevalence of wasting in children under 5 years (%)	1. Economic status	Poorest quintile
		2. Place of residence	Rural
SDG 2.2.2	Prevalence of overweight in children under 5 years (%)	1. Economic status	Richest quintile
		2. Place of residence	Urban
SDG 3.1.1	Maternal mortality ratio (per 100 000 live births)	1. Education	No/low education
		2. Age	Adolescents
		3. Economic status	Poorest quintile
		4. Place of residence	Rural
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
SDG 3.2.1	Under 5 mortality rate (per 1000 live births)	1. Economic status	Poorest quintile
		2. Place of residence	Rural; peri-urban
		3. Mother's education	No/low education
		4. Sex	Female
SDG 3.2.2	Neonatal mortality rate (per 1000 live births)	1. Economic status	Poorest quintile
		2. Place of residence	Rural; peri-urban
		3. Mother's education	No/low education
		4. Sex	Female
SDG 3.3.1	Number of new HIV infections (per 1000 uninfected population)	1. Sex	Male
		2. Age	Adolescents/young adults (15–24 years)
		3. Key populations	Commercial sex workers; injecting drug users; men who have sex with men; transgender; clients of commercial sex workers
SDG 3.3.2	Tuberculosis incidence (per 100 000 population)	1. HIV status	HIV positive
		2. Age × Sex	Elderly men

Table A2.1 Continued

SDG/WHA number	Indicator	Inequality dimension	Priority subgroup(s)
SDG 3.3.3	Malaria incidence (per 1000 population at risk)	1. Age	Children (<5 years)
		2. Economic status	Poorest quintile
SDG 3.3.4	Hepatitis B incidence (measured by surface antigen (HBsAg) prevalence among children under 5 years) (per 100 000 population)	1. Economic status	Poorest quintile
		2. Mother's education	No/low education
		3. Place of residence	Rural
SDG 3.3.5	Number of people requiring interventions against neglected tropical diseases	Not applicable	Not applicable
SDG 3.4.1	Probability of dying from any of cardiovascular disease, cancer, diabetes, chronic respiratory disease (aged 30–70) (%)	1. Sex	Male
SDG 3.4.2	Suicide mortality rate (per 100 000 population)	1. Age	Adolescents/young adults (15–29 years); elderly (≥70 years)
		2. Age × Sex	Middle-aged men (40–59 years); adolescent women (15–19 years)
SDG 3.5.1	Coverage of treatment interventions for substance use disorders (%)	1. Substance type	Opioid
SDG 3.5.2	Total alcohol per capita consumption in adults aged ≥15 (litres of pure alcohol)	1. Age	Adolescents (15–19 years)
		2. Sex	Female
SDG 3.6.1	Road traffic mortality rate (per 100 000 population)	1. Place of residence	Rural
		2. Sex	Male
		3. Age	Adolescents/young adults (15–29 years)
		4. Economic status	Poorest quintile
SDG 3.7.1	Proportion of women (aged 15–49) having need for family planning satisfied with modern methods (%)	1. Age	Adolescents
		2. Marital status	Not married
		3. Place of residence	Rural; peri-urban
		4. Education	No/low education
SDG 3.8.1	UHC service coverage index	1. Economic status	Poorest quintile
		2. Place of residence	Rural
		3. Sex	Female
		4. Age	All age groups
SDG 3.8.2	Proportion of population with large household expenditures on health (>10% of total household expenditure or income) (%) Proportion of population with large household expenditures on health (>25% of total household expenditure or income) (%)	1. Sex of the household head	Female
		2. Age composition of the household	Unknown [a]
		3. Place of residence	Rural
		4. Economic status	Poorest quintile

Table A2.1 Continued

SDG/WHA number	Indicator	Inequality dimension	Priority subgroup(s)
SDG 3.9.1	Mortality rate attributed to air pollution (per 100 000 population)	1. Place of residence	Rural
SDG 3.9.2	Mortality rate attributed to exposure to unsafe WASH services (per 100 000 population)	1. Age	Children (<5 years)
		2. Sex	Female
SDG 3.9.3	Mortality rate from unintentional poisoning (per 100 000 population)	1. Place of residence	Rural
		2. Age	Children (<5 years)
		3. Sex	Male
		4. Occupation	Farmer
SDG 3.a.1	Prevalence of tobacco use in adults aged ≥15 (%)	1. Sex	Male
		2. Age	Variable [b]
		3. Education	Variable [b]
		4. Economic status	Variable [b]
SDG 3.b.1	Proportion of population covered by all vaccines included in national programmes (DTP3, MCV2, PCV3) (%)	1. Economic status	Poorest quintile
		2. Education	No/low education
		3. Place of residence	Rural
		4. Sex	Female
SDG 3.b.3	Proportion of health facilities with essential medicines available and affordable on a sustainable basis (%)	1. Place of residence	Rural; peri-urban
SDG 3.c.1	Density of health workers (doctors; nurses and midwives; pharmacists; dentists per 10 000 population)	Not applicable	Not applicable
SDG 3.d.1	International Health Regulations (IHR) capacity and health emergency preparedness	Not applicable	Not applicable
SDG 3.d.2	Proportion of bloodstream infections due to antimicrobial resistant organisms (%)	1. Age	Children (<5 years); elderly (≥65 years)
		2. Sex	Unknown [a]
SDG 4.2.1	Proportion of children under 5 years developmentally on track (health, learning and psychosocial well-being) (%)	1. Sex	Female
		2. Economic status	Poorest quintile
		3. Place of residence	Rural; peri-urban
		4. Mother's education	No/low education
SDG 5.2.1	Proportion of women (aged 15–49) subjected to violence by current or former intimate partner (%)	1. Age	Adolescents/young adults (15–24 years)
		2. Economic status	Poorest quintile
		3. Place of residence	Rural
		4. Marital status	Partnership/ co-habiting union
SDG 5.6.1	Proportion of women (aged 15–49) who make their own 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

Table A2.1 Continued

SDG/WHA number	Indicator	Inequality dimension	Priority subgroup(s)
SDG 6.1.1	Proportion of population using safely managed drinking water services (%)	1. Place of residence	Rural
		2. Economic status	Poorest quintile
SDG 6.2.1	Proportion of population using safely managed sanitation services and hand-washing facility (%)	1. Place of residence	Rural
		2. Economic status	Poorest quintile
SDG 7.1.2	Proportion of population with primary reliance on clean fuels (%)	1. Place of residence	Rural
SDG 11.6.2	Annual mean concentrations of fine particulate matter (PM2.5) in urban areas (μg/m^3)	1. Place of residence	Urban
SDG 16.2.1	Proportion of children (aged 1–17) experiencing physical or psychological aggression (%)	1. Sex	Male
		2. Economic status	Poorest quintile
Health Emergencies	Vaccine coverage for epidemic prone diseases	1. Age	Children; elderly
		2. Sex	Female
Health Emergencies	Proportion of vulnerable people in fragile settings provided with essential health services (%)	Not applicable	Not applicable
WHA66.10	Prevalence of raised blood pressure in adults aged ≥18	1. Age	Elderly
		2. Education	Variable [b]
		3. Economic status	Variable [b]
		4. Sex	Male
WHA66.10	Best practice policy implemented for industrially produced trans fatty acids (Y/N)	Not applicable	Not applicable
WHA66.10	Prevalence of obesity (%)	1. Education	Variable [b]
		2. Economic status	Variable [b]
		3. Sex	Variable [b]
WHA68.3	Number of cases of poliomyelitis caused by wild poliovirus	1. Age	Children (<5 years)
		2. Sex	Variable [b]
WHA68.7	Patterns of antibiotic consumption at national level	Not applicable	Not applicable

DTP3 – three doses diphtheria–tetanus–pertussis-containing vaccine; MCV2 – two doses measles-containing vaccine; PCV3 – three doses pneumococcal conjugate vaccine

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

[b] *The priority subgroup varies from country to country.*

Annex 3 Triple Billion concept

Annex 3.1 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 to the Healthier Populations Billion). Conversely, without care, a decline in population could cause negative contributions to the Triple Billions, even where indicators have improved.

The GPW13 method for calculating the billions uses a simple robust approach to population growth, which is to calculate the change over 5 years and multiply by the final population. For example, for healthier populations this would be the change in prevalence (expressed as a proportion) of an indicator, i, times the population:

$$\begin{aligned} contribution_i &= pop_{end} \times prev_{i-end} - pop_{end} \times prev_{i-start} \\ &= pop_{end} \times (prev_{i-end} - prev_{i-start}) \end{aligned}$$

The approach can be interpreted as comparing (a) what might have happened if no additional interventions had taken place (the status quo or counterfactual scenario) with (b) what actually happened. In the case of tobacco use, the status quo would be that the prevalence of tobacco use at the end of the period is the same as at the start of the period. The benefit is then measured as the change in prevalence of tobacco use multiplied by the population at the end of the period. This is a good approximation for many indicators but may be less desirable for indicators where population growth requires increased investment to maintain service levels.

Note that it is not practical within GPW13 to deal with population growth by tracking changes in population age structure. For most SDG/GPW13 indicators there is a general lack of data disaggregated by age (see Annex 2). Also, the level of complexity would be disproportionate to the rest of the approach.

Alternative approaches for handling population growth

A more complex population growth method was also evaluated for use in GPW13. This would allow population growth to be treated differently for different indicators (and countries). For example, in the presence of population growth, some indicators, such as water and sanitation, may require additional resources in order to maintain the status quo (i.e. the same prevalence of access in the population). While the alternative approach is more flexible it requires use of an additional parameter which would need to be determined. Also, there are complications in cases where there is a decline in the population. At present, the use of the simpler but robust approach described above is preferred.

Annex 3.2 General limitations of the Triple Billion methods

Limitations linked to indicators

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

Limitations linked to data availability

There are many gaps in data availability of the GPW13 indicators, even for the SDG datasets. Issues include availability of estimates and availability of the underlying or primary data (Section 2.3; Table A1.1). For many SDGs, measurements are often only made every few years and there can be significant lags in time before estimates become available. Issues with data timeliness will be a major challenge, given the time frame of the GPW13 programme and the need to estimate change by 2023. Unless the timeliness of data improves, projection and forecasting will be required.

Limitations linked to lack of supporting information

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

Limitations linked to methodology

The Triple Billion measurement calculations are kept relatively simple, in keeping with the purposes of the specific billion and the requirement that the methods can be assimilated by all Member States. The focus has been to begin with a practical way forward, avoiding complexities where possible. For example, in the Healthier Populations Billion the indicators are unweighted, despite differences in relative health impacts (Annex 6.4). Population growth uses a basic approach, neglecting differences between indicators in the interplay between population growth and impact.

Limitations linked to overlaps

The Triple Billions include some overlaps. For example, some indicators feature in more than one of the billions (e.g. tobacco use in the UHC and Healthier Populations Billions, International Health Regulations (IHR) capacity in the UHC and Health Emergencies Protection Billions). There are also overlaps caused by related indicators (e.g. blood pressure and tobacco use).

Limitations linked to uncertainty

It is anticipated that the uncertainty in the estimated contributions to the billions will be considerable. This reflects issues with data that include representativeness, quality, data frequency and reporting delays. Noise in the data due to sample size and measurement errors, especially those spread over time, will add to uncertainty. Consistent estimates will be used when available. However, interpolation and extrapolation will be needed in some cases and this too will add to the uncertainty.

Limitations linked to time delays

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

Annex 4 Universal Health Coverage Billion

Annex 4.1 Tracer indicators for UHC service coverage

Fourteen tracer indicators are used to calculate average service coverage. These are largely based on the SDG 3.8.1 tracer indicators (UN Statistics Division, 2020) with some minor adjustments (Table A4.1).

Table A4.1 Tracer indicators for UHC service coverage

Tracer area	Indicator definition	Preferred data source	GPW13 scaling [unscaled] (rescaled)	Adjustments made from SDG 3.8.1
Reproductive, maternal, newborn and child health				
Family planning	Percentage of women aged 15–49 years who are married or in-union having need for family planning satisfied with modern methods	National population-based survey		
Pregnancy and delivery care	Percentage of women aged 15–49 years with a live birth in a given time period who received antenatal care, four times or more from any provider	National population-based survey/routine facility information system		
Child immunization	SDG 3.b.1 Percentage of infants receiving three doses of diphtheria–tetanus–pertussis-containing vaccine	National population-based survey/routine facility information system		
Child treatment	Percentage of children under 5 years of age with suspected pneumonia (cough and difficult breathing NOT due to a problem from a blocked nose) in the two weeks preceding the survey taken to an appropriate health facility or provider	National population-based survey		
Infectious diseases				
Tuberculosis treatment	Percentage of new and relapsed TB cases that are detected and treated in a given year	Routine facility information system/ surveillance systems		Use of TB service coverage instead of SDG 3.8.1 TB effective service coverage to avoid issues when drug resistant TB is present
HIV treatment	Percentage of people currently receiving ART among the estimated adults and children living with HIV	Routine facility information system		
Malaria prevention	Percentage of population in malaria-endemic areas who slept under an ITN the previous night	National population-based survey		
Water and sanitation	Percentage of households using at least basic sanitation facilities	National population-based survey		

Table A4.1 Continued

Tracer area	Indicator definition	Preferred data source	GPW13 scaling [unscaled] (rescaled)	Adjustments made from SDG 3.8.1
Noncommunicable diseases				
Prevention of cardiovascular diseases [a]	Age-standardized prevalence of raised blood pressure among persons aged ≥ 18 years (defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg)	National population-based survey (in which blood pressure was measured, not self-reported)	[50–100%] (0–100%)	
Management of diabetes [a]	Age-standardized mean fasting plasma glucose for adults aged ≥ 18 years	National population-based survey	[7.1–5.1 mmol/L] (0–100%)	
Tobacco [a]	SDG 3.a.1 Age-standardized prevalence of adults aged ≥ 15 years not smoking tobacco in last 30 days	National population-based survey	no rescaling	Rescaling removed as SDG 3.8.1 method [50–100%] (0–100%) did not include all Member State values
Service capacity and access				
Hospital access [a]	Total number of hospital beds per 10 000 population	Routine facility information system/ national database	[0–18 per 10 000] (0–100%)	
Health worker density [a]	SDG 3.c.1 Density of health workers (doctors, nurses and midwives per 10 000 population)	National Health Workforce Accounts	[0–154.74 per 10 000] (0–100%)	Adjusted indicator from physicians, psychiatrists and surgeons to physicians and nurses/midwives to reflect latest data sources
Health security [a]	SDG 3.d.1 International Health Regulations (IHR) capacity	Key informant survey		

ART – antiretroviral therapy; ITN – insecticide-treated net.

[a] *Proxy indicator.*

Three adjustments to the 14 SDG 3.8.1 tracer indicators are made for GPW13.

Tobacco: The rescaling of the prevalence of non-use of tobacco has been removed to include all observed values (since 2000).

Tuberculosis: The tuberculosis measure has been simplified to treatment coverage, which is part of the SDG 3.8.1 TB measure. The latter measures effective TB treatment coverage, which is calculated as TB treatment coverage x TB treatment success. This adjustment avoids issues with the SDG 3.8.1 TB tracer when there is drug-resistant TB present.

Health worker density: The health worker density indicator has been modified to measure the density of physicians, nurses and midwives. The updated indicator is aligned with the SDG 3.c.1 Health worker density and distribution indicator, for which data availability has made recent significant progress. The three categories of health workers included represent more than half of the health workforce. This indicator is a proxy for service coverage, and is rescaled

using a maximum density of 155 per 10 000 population, which is the 95th percentile across all national densities from 2000 to 2017. Densities above that level are reset at 100%. The indicator replaces the SDG 3.8.1 tracer for physicians, psychiatrists and surgeons for which data availability is poor, and which neglects the large and important category of nurses.

Note that the remaining indicators that do not directly measure service coverage were examined to determine if the (re)scaling could be improved, but there was no case for adjustment. Three of the proxies are problematic and not good measures for judging service coverage (fasting plasma glucose for management of diabetes; hospital bed density for access; non-elevated blood pressure for prevention of cardiovascular disease). There are insufficient (SDG) data for an alternative at this stage.

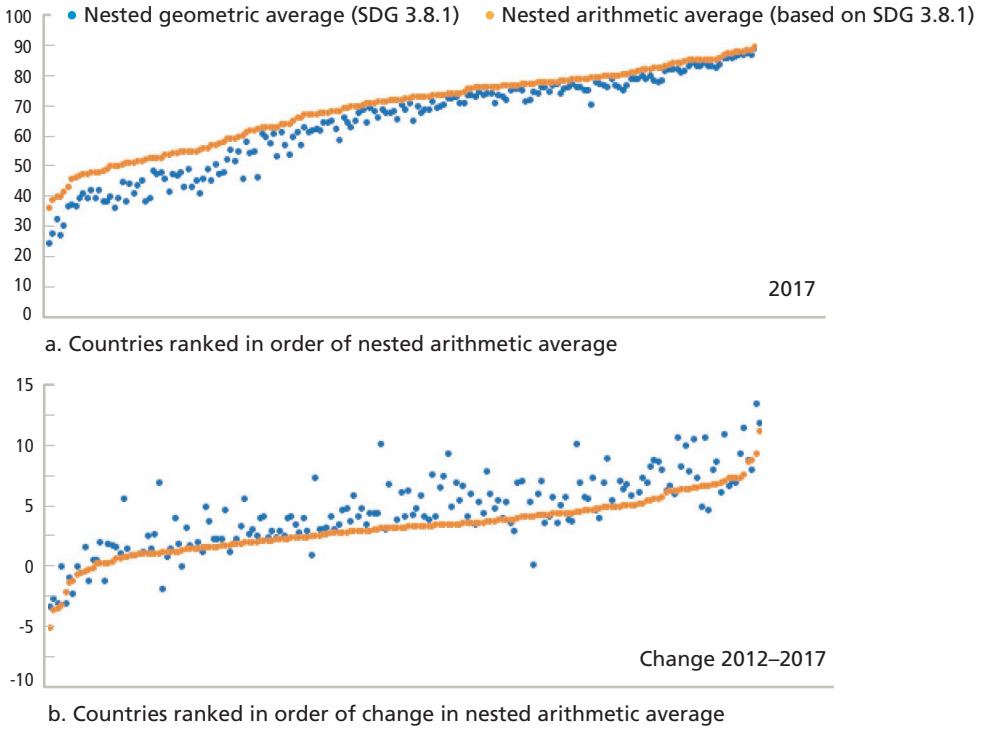
Annex 4.2 Comparing arithmetic and geometric averages

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

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

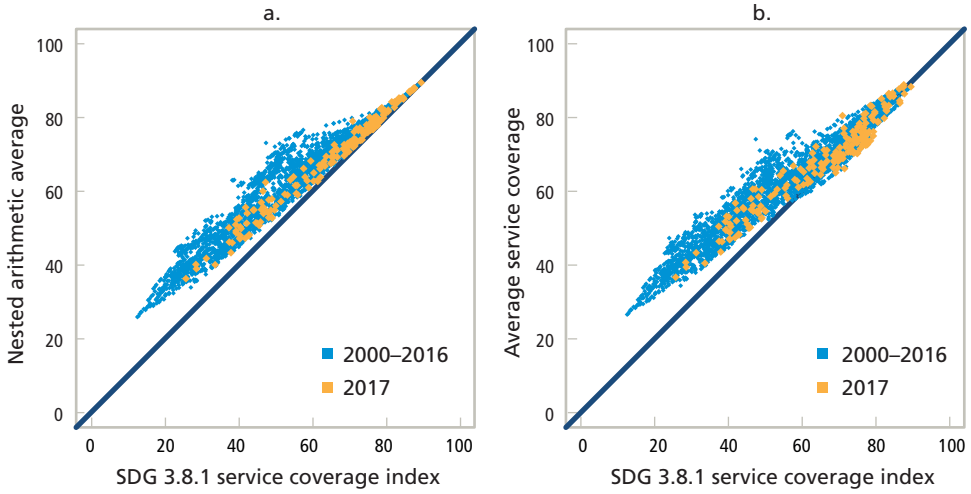
The use of arithmetic means in place of geometric means results in some differences in the observed level of service coverage and the observed change over time. The difference between arithmetic and geometric means tends to be largest for countries with low average service coverage. This is demonstrated in Fig. A4.1a which compares estimates of the SDG 3.8.1 UHC service coverage index calculated using a geometric mean with the same input data averaged using an arithmetic mean. Fig. A4.1b shows the effect of arithmetic averaging on change in service coverage between 2012 and 2017 this tends to be lower for arithmetic means than for geometric means. The change in relative ranking between countries is not majorly affected (e.g. the top five and top bottom countries remain exactly the same).

Fig. A4.1 Nested geometric average versus nested arithmetic average of service coverage, 2017



The SDG 3.8.1 UHC index of service coverage is compared with the arithmetic average service coverage (ASC) in Fig. A4.2. The left-hand plot shows the effect of using arithmetic instead of geometric averaging using the same 14 tracer indicators: i.e. the scatter and non-linearity are the result of the different averaging approaches. In the right-hand plot, the ASC used in the GPW13 UHC Billion is compared to SDG 3.8.1: i.e. this includes the effect of the different averaging and the adjustments made to three of the tracer indicators.

Fig. A4.2 Relationship between SDG 3.8.1 UHC service coverage index and average service coverage



Note: (a) Shows the relationship between the SDG 3.8.1 service coverage index (which is a nested geometric average of the tracer indicators) and the nested arithmetic average of the same tracers. (b) Shows the relationship between the SDG 3.8.1 service coverage index and the UHC Billion average service coverage (which is a nested arithmetic average using revised TB, health worker density and tobacco indicators). Estimates are based on data from 183 countries for 2000 to 2017.

Annex 4.3 UHC and 85% service coverage

WHO has previously estimated the number of people globally who are considered to have "full" UHC service coverage, i.e. ≥85% of essential services (WHO, 2019a). The approach uses additional data sets to measure average service coverage and then combines this with co-coverage data to estimate the proportion of the population with access to ≥85% of essential services. The calculation of average service coverage relies on eight of the SDG 3.8.1 tracer indicators but adds an additional four, making a total of 12. For co-coverage, household survey data on maternal and child health interventions are used; however, these co-coverage data are very limited and only cover some child/maternal health services (i.e. not the range of services included in SDG 3.8.1). The estimation of who has at least 85% of services needed is based on a series of regressions relating co-coverage of these health interventions to average service coverage. At present, 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 more complex, with greater uncertainty and requiring more data and analysis. The results are sensitive to the choice of threshold, and to any extensions to the co-coverage and 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 the average service coverage and the 85% service coverage approaches?

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

The UHC 2019 report (WHO, 2019a) estimates that at current rates the increase in population with access to ≥85% of essential services likely to occur between 2018 and 2023 would be somewhere between 400 and 600 million people. Using the approach proposed for the UHC Billion, the likely increase in service coverage alone is equivalent to a further 350 million people gaining 100% service coverage. Differences are due in part to use of a measure based on averages rather than a threshold. The billion calculation includes the financial component and this will reduce the number of people estimated to have UHC (see also Annex 4.5).

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

Annex 4.4 Limitations of the UHC Billion

Representative service coverage indicators

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

Use of proxies for service coverage

Several of the UHC service coverage indicators are proxies in that they do not directly measure service coverage (Table A4.1). These indicators provide some measure of the level of service; however, interpretation as a proportion of the population is flawed. The interpretation of service coverage as a proportion of population is limited by this issue.

Limitations of indicators for financial hardship

Ideally, the UHC Billion would use a measure of financial protection. In the UHC Billion the indicator used is a measure of financial hardship (Section 4.2; SDG 3.8.2). The complement of indicators of financial hardship do not measure financial protection. This is because the indicators of financial hardship track the impact of out-of-pocket payments resulting from using services. People may avoid spending on health out of pocket because of either:

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

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

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

Data availability

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

Data for service coverage components and for financial hardship would ideally be available annually or for the same year. For both service coverage and financial hardship, annual values will need to be estimated by infilling or extrapolation. Lack of recent data is an issue for several service coverage tracer indicators and is particularly acute for financial hardship (catastrophic spending) for which the long delays in obtaining new datasets are of particular concern. Where there are insufficient recent estimates available, the computation of the UHC Billion may not be possible, or will be based on the assumption of no change in indicator values since the last measurement.

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

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

The absence of jointly collected data at household level on financial hardship and service coverage means we have no real understanding of the interrelationship at household level between these two indicators. It is important to gather joint data on financial hardship and service coverage (Section 2.4) and better understand the joint distribution of these components. A joint data source will provide information relevant to how best to combine service coverage and financial hardship. It will complement but not replace the existing data sources required for service coverage estimates.

Assumption of independence (lack of correlation)

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

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

Combining service coverage and financial hardship (restricted applicability)

The method used to combine service coverage and financial hardship (catastrophic health spending) enables calculation of the UHC Billion. It has been constructed solely for this purpose. It does not replace or amend any part of the existing SDG 3.8.1 indicators. It provides a first attempt at measuring change, at population level, of service coverage provided without catastrophic health spending. It should be anticipated that the approach will be refined once there are sufficient data for this to be practical.

Uncertainty of the UHC Billion

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

Double counting

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

Using population equivalence

The UHC Billion will calculate a population equivalence and not a number of individuals (this is also true for the other billions). If the UHC single measure increases by 10% points, then the contribution to the UHC Billion will be counted as equivalent to 10% of the population.In reality, the services will be distributed unevenly across the population (case 3 in Section 3.5). The approach differs from an alternative approach used in the WHO UHC reports (WHO &

World Bank, 2017; WHO, 2019a) which estimated the global number of people receiving ≥85% of services (with no financial component). The latter is not suited to estimating the UHC Billion because it is complex to apply, it requires additional data beyond the SDG 3.8.1 indicators, and there are insufficient data for calculation at a country level (see Annex 4.3).

Quality of services/effective service coverage

The GPW13 UHC Billion, like SDG 3.8.1, does not take into account quality/effectiveness of service coverage. Nor does it address accessibility. These are important aspects of UHC.

Annex 4.5 Using historical data to estimate the UHC Billion

The UHC Billion will count change in UHC over a five-year period. Initial calculations have been carried out for the historical 5-year period, 2012–2017, to test how the method would perform. The calculations were based on reported and/or imputed (see Annex 4.3) data for service coverage tracer indicators and for financial hardship (catastrophic spending). Recent data on financial hardship are particularly lacking. Several approaches were used. In the first, country contributions were only estimated if there was at least one SDG 3.8.2 estimate from 2012 onwards: this accounted for around 55% of the world population. The final figure was scaled up to account for the population with missing values by calculating:

$$sum\ of\ country\ contributions \times 100/55$$

The second approach used regional medians for the years 2012 and 2017 for those countries lacking data for financial hardship. A third approach used estimated data for SDG 3.8.2, calculated using a methodology described in boxes 4 and 6 of the *Global monitoring report on financial protection in health 2019* (WHO & World Bank, 2020). With all approaches, UHC Billion results were similar (given that the expected uncertainty is large).

Based on this analysis, if the change seen over 2012–2017 continues at a steady rate, the number of additional people expected to benefit from service coverage would be around 350 million. Up to around 60 million additional people would suffer financial hardship. The total expected contribution to the UHC Billion would reach up to around 300 million people. The figures are approximate, but the message is clear: considerable acceleration is needed for achievement of the UHC Billion.

Hogan DR, Stevens GA, Hosseinpoor AR, Boerma T (2018). Monitoring universal health coverage within the Sustainable Development Goals: development and baseline data for an index of essential health services. Lancet Glob Heal. 6(2):e152–68. doi: 10.1016/S2214-109X(17)30472-2.

Lee CY, Wu JS, Liu DP (2018). Challenges of measuring the Healthcare Access and Quality Index. Lancet. 391(10119):429. doi: 10.1016/S0140-6736(18)30146-6.

UN Statistics Division (2020). Indicator 3.8.1: Coverage of essential health services. Institutional information (https://unstats.un.org/sdgs/metadata/files/Metadata-03-08-01.pdf, accessed 1 April 2020).

WHO (2019a). Primary health care on the road to universal health coverage: 2019 monitoring report: full report. Geneva: World Health Organization (WHO/HIS/HGF/19.1); (https://www.who.int/healthinfo/universal_health_coverage/report/2019/en/, accessed 4 September 2020).

WHO (2019b). Thirteenth General Programme of Work 2019–2023 [website]. Geneva: World Health Organization (https://www.who.int/about/what-we-do/thirteenth-general-programme-of-work-2019---2023, accessed 4 September 2020).

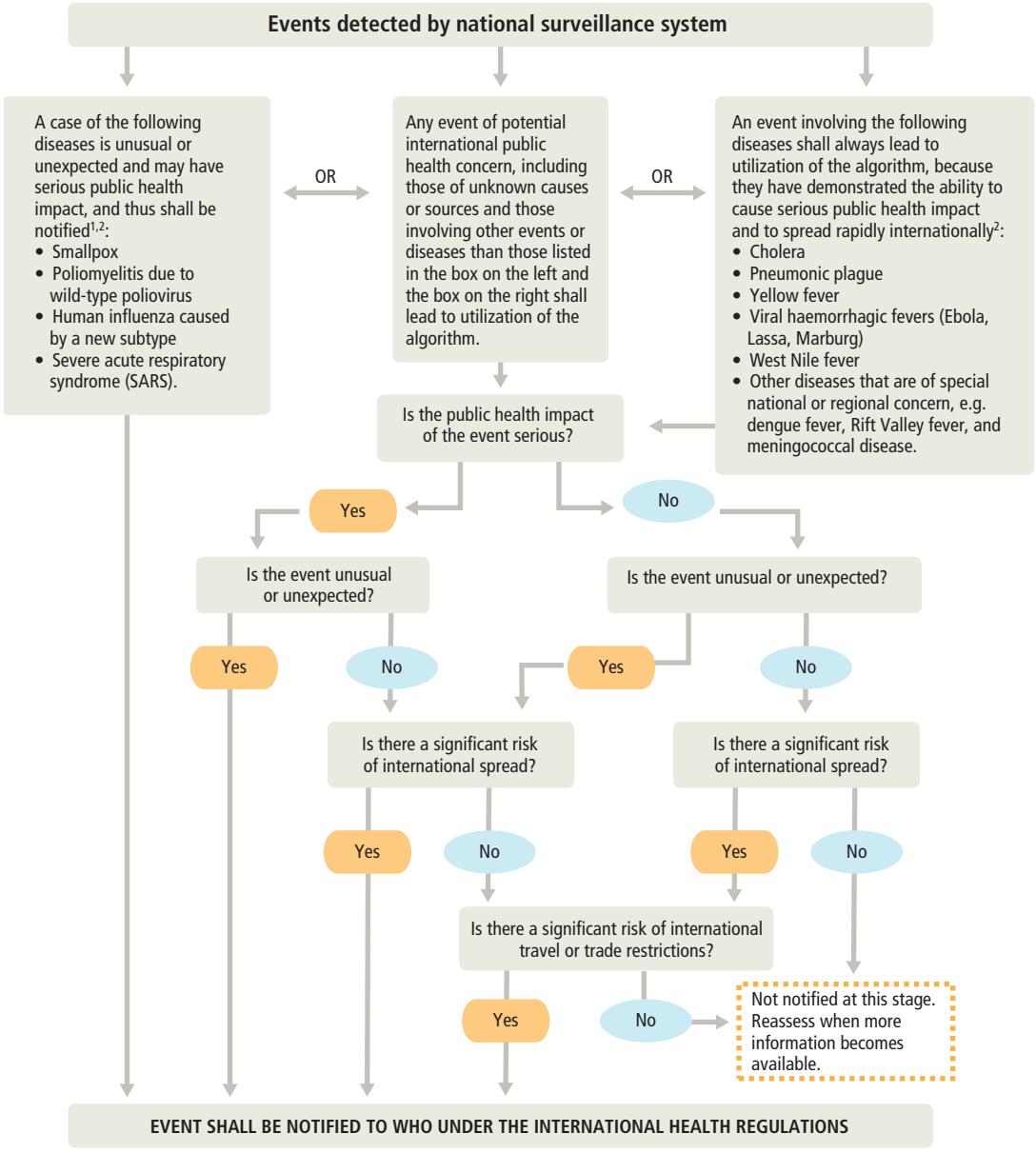
WHO & World Bank (2017). Tracking universal health coverage: 2017 global monitoring report. World Health Organization and International Bank for Reconstruction and Development/The World Bank (https://www.who.int/healthinfo/universal_health_coverage/report/2017/en/, accessed 4 September 2020).

WHO & World Bank (2020). Global monitoring report on financial protection in health 2019. Geneva: World Health Organization and International Bank for Reconstruction and Development/The World Bank (https://www.who.int/healthinfo/universal_health_coverage/report/2019/en/, accessed 4 September 2020).

Annex 5 Health Emergencies Protection Billion

Annex 5.1 Emergencies detection decision instrument

DECISION INSTRUMENT FOR THE ASSESSMENT AND NOTIFICATION OF EVENTS THAT MAY CONSTITUTE A PUBLIC HEALTH EMERGENCY OF INTERNATIONAL CONCERN



[1] As per WHO case definitions.

[2] The disease list shall be used only for the purposes of these Regulations.

Source: adapted from WHO, 2016 (Annex 2).

Annex 5.2 Initial estimation of the HEP Billion

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

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

Using the above (conservative) estimates leads to an estimated total contribution to the HEP Billion of approximately 500 million. Effort will be needed to ensure this billion target is met.

WHO (2016). International Health Regulations (2005). Third Edition. Geneva: World Health Organization (https://www.who.int/ihr/publications/9789241580496/en/, accessed 1 April 2020).

Annex 6 Healthier Populations Billion

Annex 6.1 Choice of indicators for the HPOP Billion

Table A6.1 lists the potential indicators that were considered for inclusion in the Healthier Populations Billion (HPOP Billion) – these are the GPW13 indicators that have some focus beyond the health sector. Most are health-related SDG indicators. The indicators not selected were excluded for the following reasons:

- avoidance of mortality data, where there is an alternative exposure indicator (ambient air pollution mortality; unsafe WASH mortality), or where global burden is lesser (mortality due to poisoning); and
- although impacted by both health and health-sector policies, the main focus is inside the health sector and more relevant to health decisions (informed sexual choice).

Note that whilst stunting and wasting conditions should be managed 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). On these grounds, they are considered to belong in the HPOP Billion.

Table A6.1 Indicators considered for the HPOP Billion

Indicator		Data availability			Ovelaps with health sector	Determinant of/risk to health	Outcome measure	Prevalence measure	Policy measure
		High	Medium	Limited					
GPW13 indicators selected									
SDG 2.2.1	Childhood stunting (<5)		●			●	●	●	
SDG 2.2.2	Childhood wasting (<5)		●			●	●	●	
SDG 2.2.2	Childhood overweight (<5)		●			●	●	●	
SDG 3.4.2	Suicide mortality	●			●		●		
SDG 3.5.2	Alcohol consumption	●				●			
SDG 3.6.1	Road deaths	●					●		
SDG 3.a.1	Tobacco use	●				●		●	
SDG 4.2.1	Developmentally on track (<5)			●		●	●	●	
SDG 5.2.1	Intimate partner violence (F)			●		●		●	
SDG 6.1.1	Safely managed water		●			●		●	
SDG 6.2.1	Safely managed sanitation		●			●		●	
SDG 7.1.2	Clean household fuels	●				●		●	
SDG 11.6.2	Mean particulates (PM2.5)	●				●			
SDG 16.2.1	Violence against children			●		●		●	
WHA66.10	Trans fats policy		●						●
WHA66.10	Obesity	●				●	●	●	
GPW13 indicators considered but not used									
SDG 3.9.1	Mortality due to ambient air pollution						●		
SDG 3.9.2	Mortality due to unsafe WASH						●		
SDG 3.9.3	Mortality due to poisoning						●		
SDG 5.6.1	Informed productive health choices (F)				●	●		●	

F – *female.*

Annex 6.2 Transformations used for non-prevalence indicators

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

Reduced harmful use of alcohol

The SDG 3.5.2 alcohol per capita consumption (APC) indicator measures the average country consumption of alcohol in litres of pure alcohol. For the HPOP Billion, a reduction in APC of 25 litres is equated to 100% of the population being healthier. This covers the 2018 range of observed country values (0–20.5 litres) and means that reductions in alcohol consumption will be recognized for all countries. Smaller changes contribute to the HPOP Billion in a proportional manner. This approach is a simplification in that health benefits from alcohol reduction are (1) not necessarily linear and (2) are likely to be experienced as a significant proportion of the population gaining partial healthiness benefit rather than a few people experiencing a large change.

Other approaches to transforming the APC alcohol indicator were tested, including one in which the proportion of heavy episodic drinkers and abstainers in a population were estimated as a function of APC. Decreases in heavy episodic drinking and increases in abstinence were equated to improved healthiness and used to measure the proportion of the population that can be considered healthier. The transformation was based on analysis of existing modelled estimates of drinking behaviours at country population levels (Manthey et al., 2019). The method is more complex to apply than the linear transformation described above. It was not used because the approach does not allow the transformed data to be mapped to a 0–100 scale.

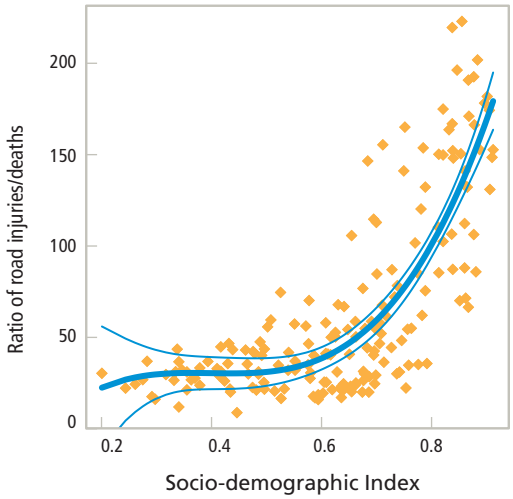
Road safety

For the HPOP Billion, the SDG road-traffic-related mortality rate is used to estimate the number of road injuries and road deaths. The probability of death from road injuries is dependent on many factors, including health care and other services in a country. A relevant measure is the Socio-demographic Index (SDI), a measure of the development level of a country based on average income per person, educational attainment and total fertility rate (Kassebaum, et al., 2016). Fig. A6.1 illustrates the relationship between the ratio of road injuries to road deaths as a function of SDI, for which a cubic equation has been fitted:

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

This relationship is used to transform SDG 3.6.1, road mortality, into an estimate of the proportion of the population experiencing injury or death due to road traffic incidents over a five-year period. This is then converted into the prevalence of people who have not been injured or died over a five-year period. The SDI value used in this transformation will be fixed at the baseline year 2018. Note that the transformation produces an underestimate of the benefit of safer roads as it does not account for secondary effects.

Fig. A6.1 Relationship between ratio of road injuries to road deaths and the SDI



Note: Lines show a fitted cubic equation plus 95% confidence intervals.

Source based on data from the Institute of Health Metrics and Evaluation, June 2018

Clean air

The SDG 11.6.2 indicator for air particulates measures the mean concentration of PM2.5. For the HPOP Billion, a reduction in PM2.5 of 100 μg/m^3 is equated to 100% of the population being healthier. This covers the range of observed country values (5–93 μg/m^3) and means that improvements in air quality will be recognized for all countries. Smaller changes will contribute to the HPOP Billion in a proportional manner. For example, improving the mean PM2.5 by 10 μg/m^3 would be counted as the equivalent of 10% of the population being healthier. For historical data (2011–2016), this results in a net total of around 180 million lives having become less healthy over the most recent five years. It is, however, a simplification – health benefits from changes in air pollution are not linear over the range 0–100 μg/m^3.

Other approaches were also considered for transformation of SDG 11.6.2 but not adopted 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. mean PM2.5 of less than the 10 μg/m^3 WHO guideline level. For this, underlying gridded data were used to estimate the proportions of the population that were exposed to PM2.5 levels above and below this threshold. This approach resulted in around 170 million people benefiting over a historical five-year period – most of this occurring in developed countries such as in Europe and the USA. However, the method fails to capture the issue of worsening global air quality seen in many other countries – for example, use of 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 experienced better/worse air quality at one or other level. This approach also showed a similar net positive contribution to the HPOP Billion. Neither approach captures a worsening global air quality. The proportional approach outlined above is preferred.

Trans fats

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

1. The global average prevalence of excessive intake of TFA (>1% of total energy intake) for people living in countries that do not have a WHO best practice policy on TFA. Based on data for 144 countries, this is estimated to be 14.3% of the population.
2. The expected reduction in the prevalence of excessive intake of TFA (>1% of total energy intake) that follows implementation of best-practice TFA policy (over a 5-year period). Implementation of best practice policy can significantly reduce excessive consumption of trans fats (Parziale and Ooms, 2019). Based on seven countries where a best practice policy has been in effect over a number of years (Austria, Chile, Denmark, Hungary, Iceland, Norway, South Africa), a 15.0% reduction in prevalence of excessive TFA intake is estimated.

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

Annex 6.3 Details of the correction for double counting

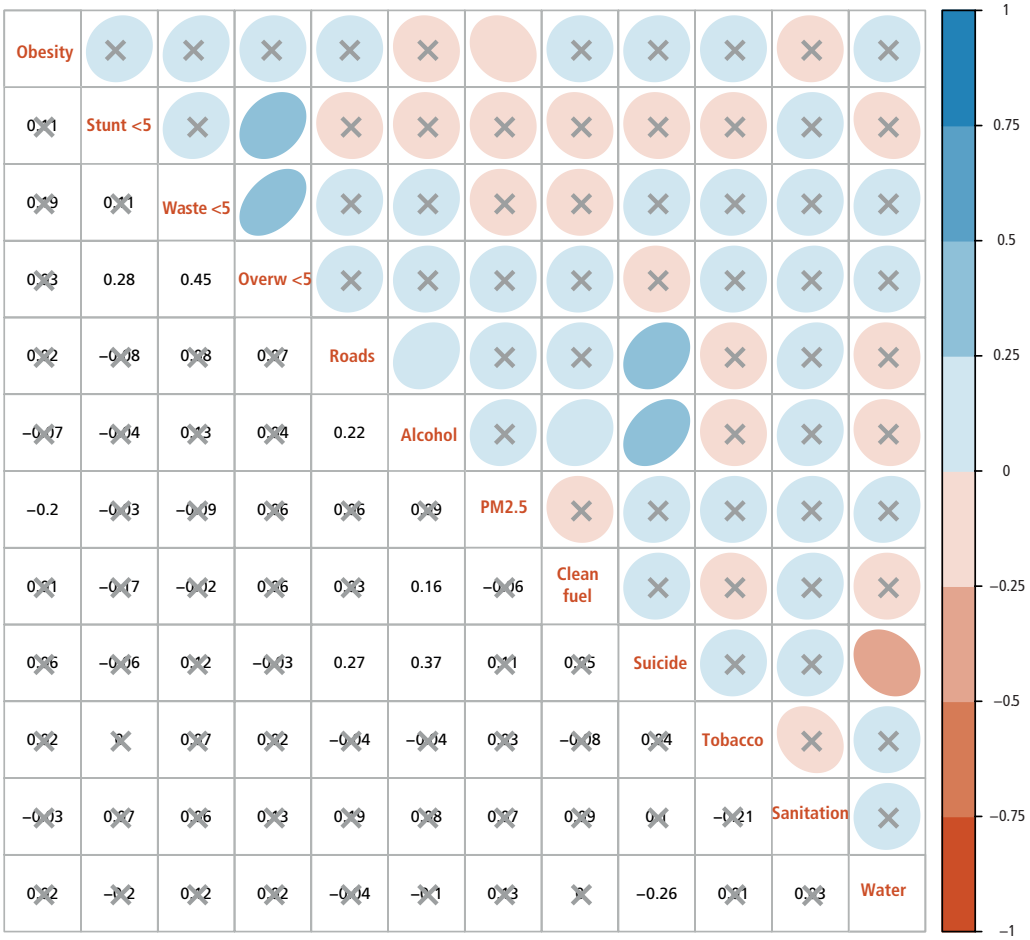
A double-counting correction is used when adding up contributions to the HPOP Billion. It is a simplified, first-level correction that aims to address Member State concerns, whilst being realistic about available data sources. The correction is based on the assumption that the changes in each of the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

To illustrate the approach, consider the extreme case in which 100% of a population (newly) gets both clean air and clean water. If these two contributions were counted separately and without a correction into the billion, then 200% of the population could be counted as healthier. This is not desirable. Now, consider a scenario in which 50% of the population newly gets clean air, and 50% clean water. We cannot know if this means that everyone benefits from just one thing (air or water), or half the population benefits from both (air and water), or somewhere in the middle. The simplest approach is to assume it is random who gets clean 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, 25% get both and 25% get neither air nor water (simple probabilities). So, using the double-counting correction, this would count 75% of the population as getting clean air, or clean water or both (compared with 100% if we just added 50% and 50% without a correction). This is the basis of the double-counting correction. Note that if there are strong correlations (e.g. most people who get clean air also get clean water) then the correction would not account for this. In reality, some indicators are highly correlated with socioeconomic/income levels (e.g. access to safe water and sanitation, clean fuels, childhood stunting) so improvements may be expected to centre on addressing the needs of lower-income populations – and this could cause double counting that will not be captured.

A more sophisticated and accurate approach would be to account directly for the correlations in the populations benefiting from each indicator (e.g. by using a joint distribution estimation method). However, this would need much more detailed data than are currently available on a global level.

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 at the within-country level (i.e. for subpopulations of countries), the assumption of independence of change appears to be reasonable when considered at a between-country level: historical data show that maximum observed correlations for changes in indicators are less than 0.5 (Fig A6.2).

Fig. A6.2 Correlations in changes in observed indicators for recent historical data



Note: Pearson correlations are shown as coloured ellipses (top right) and as numbers (bottom left). Correlations marked with an X are not significant at the 95% level. Colour shading indicates the strength of the correlation. Change is estimated change over the most recent five years.

Sources: WHO Global Health Observatory data repository and UN Global SDG Indicators Database (extracted May 2019, with some additions).

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

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

which simplifies to:

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

where $|\Delta p_i|$ is the absolute value of the change in prevalence for indicator i, j are distinct population tranches (e.g. under 5 years in rural areas, 5–9 year-olds, 18 years and older in urban areas) and i are the indicators relevant to each population tranche. The population is divided up by age (under 5, 5–14, 15–17, 18–19, 20 and over), by location (rural/urban) and by marital

status (ever-partnered women, other). Different tranches of the population are affected by different sets of indicators: for example, some indicators are relevant to children under 5 years, some to the whole population and some others to adults only. For water and sanitation data there are several countries which have estimates for either rural or urban values (but not the total).

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

The correction also needs to take account of the fact that not all indicators are improving. Where $\Delta p > 0$ it means that the population has reduced exposure to risks to healthiness, and where $\Delta p < 0$ it indicates the population is experiencing increased exposure to risks to healthiness. 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. If 10% of a population becomes healthier due to improved air quality and 10% becomes less healthy due to increased body weight, then the net number of healthier lives is zero – the two changes approximately offset each other (see also Annex 6.5 below).

Annex 6.4 Possible methods for measuring the HPOP Billion

Criteria for choice of method

The HPOP Billion methodology is a new departure for WHO. The following criteria have been used in selecting the method:

- 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 existing GPW13 outcome indicators (largely SDG indicators) and avoid imposing the burden of further data collection on Member States.
- The method should count change that is meaningful for healthiness (e.g. new access to water is likely to result in a healthier life; implementing a policy at population level would not necessarily 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 (Section 6.2).

Alternative methods have been considered, notably (1) a GPW13 Expert Reference Group (ERG) recommendation to weight indicators by disability-adjusted life years (DALYs) averted so as to estimate a relative health gain for each indicator and (2) a simplified weighting scheme. These alternatives are more complex, require more development, and are considered less likely to be easily assimilated by all Member States.

DALYs averted

The GPW13 Expert Reference Group recommended development of an approach in which each of the indicators is converted into an equivalent health gain, using DALYs averted. This addresses an obvious shortcoming of the healthier lives approach which is that all indicators are treated as having equal impact on healthiness.

The approach aims to quantify the relative health gain due to different indicators, for example, reduced harmful use of alcohol versus a violence-free childhood. It requires determining both a weighting scheme and then a means of converting the health gains back into a number of lives. The use of DALYs averted as weights is conceptually appealing in that it provides a principled basis for aggregation across disparate efforts. A disadvantage is that it requires considerably more effort to communicate how the calculations are implemented and does not map as directly onto the "billion persons" heuristic. Furthermore, DALYs averted may not provide the ideal weighting scheme for measuring change in healthiness. Care would be needed when applying DALYs averted to different age groups (total DALYs averted across the full age spectrum would probably have to be used). For example, childhood and adolescence could be considered key ages with the potential to most impact long-term population healthiness, at least in terms of overweight and smoking. A young smoker is more likely to end up as a lifelong smoker, and an overweight child may be more likely to end up as an obese adult. Yet the DALYs for these age groups are low because health impacts are not felt until later in life. Secondly, it is not clear that DALYs fully capture all aspects that constitute healthiness, such as the associated well-being and impacts on relationships. The effect of intimate partner violence and of childhood conditions appears relatively small in terms of DALYs, but these factors can have long-lasting implications for people's lives.

Simplified weightings

As previously mentioned, a key limitation of the healthier lives method is that changes in the indicators are not weighted by health gain. Consideration was thus also given to ways in which it may be possible to derive approximate weightings for each of the indicators, based on the global burden of disease as estimated by DALYs. For each indicator, the average DALYs per person exposed was estimated using the prevalence of people experiencing unhealthy conditions as shown in Table A6.2. For example, for smoking, the average DALYs per person affected was estimated as the total DALYs divided by the number of people using tobacco in the world. Prevalences were extracted from IHME data where possible, or from the *World Health Statistics* report (WHO, 2019), or from published scientific peer-reviewed articles. However, this required simplifying and subjective assumptions, and there are complicating factors: for example, for tobacco use the approach neglects DALYs that arise from ex-smokers, which are also counted into the overall burden of tobacco use. For those indicators which are not prevalences (e.g. air pollution, road safety) and need transformation, the estimated DALYs per person is even more tenuous. These limitations, and others not detailed here, serve to illustrate just how difficult this endeavour is. To carry this forward would likely require a much bigger and more consistent approach with a revised set of indicators.

Table A6.2 Global burden of disease for indicators in the HPOP Billion

Risk factor/cause	**DALYs** (millions)	**Population exposed** (%)	**DALYs per person exposed**
Tobacco (10 years and over)	213	19	0.18
Obesity (20 years and over)	147	13	0.22
Alcohol use	108	33	0.04
Child wasting (under 5 years)	88	8	1.69
Ambient particulate matter pollution	83	91	0.01
Road injuries	68	22	0.04
Unsafe water source	64	29	0.03
Household air pollution from solid fuels	59	36	0.02
Unsafe sanitation	41	21	0.03
Self-harm	34	4	0.13
Child stunting (under 5 years)	19	27	0.11
Intimate partner violence (all ages)	7	20	0.00
Diet high in trans fatty acids	6	14	0.01
Child maltreatment (under 20 years)	2	10	0.03

Notes: Risk factors/causes are listed in descending order of GBD magnitude (DALYs), as reported in the Global Burden of Disease Study 2017 (IHME, 2018). (WHO does not produce DALYs for most of these risk factors.) The calculations use the following approximations for estimating prevalence: obesity – prevalence in adults (Ng et al., 2014); road safety – population not covered by road safety laws meeting best practice (WHO, 2018); unsafe water – proportion of population using safely managed drinking water services (WHO, 2019); alcohol – prevalence of current drinkers (Griswold et al., 2018) (other approaches were tried but gave similar results). For trans fats, estimates of the proportions of the population exceeding WHO guideline levels were used (IHME, in press). The bar lines in the final column are truncated at 0.5.

To test the concept of a simplified fixed weighting scheme, a fixed weight (between 0 and 1) was ascribed to each indicator. A value of 1 indicates that a change in the indicator is equal to a fully 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 is a simple means of balancing different indicators according to health gain; for example, stopping smoking has a bigger health impact than safe sanitation. Over half of indicators were given a full weight of 1 (e.g. tobacco, stunting, obesity) because a change in these was considered to mean a person would have a strong health benefit. Other indicators were given smaller weightings in accordance with the DALYs per person exposed.

Beyond subjectivity, the simplified weighting scheme has other known limitations. For those indicators given a weight of 1, there remains no distinction between relative health benefits (including the longer-term health benefits), i.e. the original problem of the unweighted approach remains. It quickly becomes apparent that it is necessary to start to combine health benefits in order to create something like an index of healthiness. This implies a more comprehensive method, akin to the DALYs averted approach detailed above and beyond the scope of GPW13. As an aside, simplified weighting also makes it much more challenging to reach the HPOP Billion (i.e. based on historical data, the contributions could be around a quarter of the unweighted scheme). Whilst it was hoped that simplified weighting could perhaps provide an intermediate solution and an alternative to DALYs averted, it is too subjective and not justifiable for the

GPW13 HPOP Billion. Use of the unweighted approach, with clear recognition of its limitations is preferred.

Index of healthiness

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

Annex 6.5 Limitations of the HPOP Billion

The objective of the GPW13 HPOP Billion is to measure and encourage improvements in the healthiness of the world's populations. The proposed method offers a solid first attempt at this – with the ability to monitor important changes in population healthiness linked to GPW13 whilst being accessible at country level. It does, however, have its limitations. Limitations common to all the Triple Billions are listed in Annex 3.2. Issues specific to the HPOP Billion (and some response to these) include:

- The framework for the HPOP Billion is built on indicators that were selected for the GPW13 programme (mainly SDGs). This a nonoptimal set of indicators for measuring change in overall population healthiness – the indicators are not comprehensive of all environmental, behavioural and social risks affecting healthiness. The healthier lives approach proposed here will be specific to the GPW13 programme. In the future a more general index and framework for healthiness should be envisaged, with a broader coverage of sectors and factors. Table A6.3 shows candidate additional indicators which would broaden the measurement of change in healthiness and address key missing topics.

Table A6.3 Sectors and indicators that should be considered for future measurement

Sector	Indicator
Climate	Health-related climate support [a]
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	
Well-being	Happiness
Chemicals	**Poisoning**
Older people	Accessibility/safety
Gender equality	

[a] *SDG indicators for climate change have not yet been agreed.*

Note: Items in bold have existing data sets but are not included in the set of GPW13 outcome indicators.

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 overrepresented – there are several indicators specific to children under 5 years, 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 age groups may also not be well represented, for example adolescents and the elderly.

- The index is an index of change, not absolute level. The method will not provide a ranking of (non-health-sector) healthiness. It is not designed for this purpose.
- The method weights all indicators equally. Although a change in each indicator marks an important step in healthiness, this is not ideal. For example, consider the situation in which a country has worsening air pollution equivalent to 7% of the population and improved tobacco non-use equivalent to 5% of the population. This totals to –2%, a less healthy population. But, arguably, tobacco has a bigger impact on health than air pollution – this could mean that the population is actually healthier (i.e. the contribution to the billion could be misleading as an overall measure of change in healthiness). It is important to examine underlying changes and not just the top-level numbers, and to remember that the billion is intended to drive change rather than provide a perfect count.
- Concerns about the impact of double counting have been partially addressed using a correction based on assumptions of independence of change. The correction ensures that it is not possible to count more than 100% of the population and reduces the impact of double counting but does not account for within-population correlations.
- Not all indicators are expressed as a prevalence and not all indicators are measures of risk (e.g. "road deaths" is an outcome but used as a proxy for risk). The transformations used to convert indicators into an estimate of prevalence are subjective and the choices involved can make a big difference to the billion. In creating the transformations, the objective has been to make the changes in healthiness due to the different indicators as equivalent as possible. For the two mortality indicators, there were very limited options available and it is recognized that these indicators are underrepresented in the billion.
- Some GPW13 datasets are not yet available for all regions. For example, water and sanitation data are badly lacking in Africa. It is hoped that this will improve during GPW13. Availability of new data will make an important difference to estimated contributions to the HPOP Billion.

Annex 6.6 Using historical data to estimate the HPOP Billion

The healthier lives approach measures change over a period. To test the performance of the approach, contributions were calculated at the country level for indicators with enough data to measure change over a recent five-year period (approximately). If data were available for a slightly longer or shorter period these were used and rescaled to a five-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. The summary contributions by region and by indicator are shown in Table A6.4, and Fig. A6.3.

Important things to note from this exercise include:

- No infilling of missing data has been made, and additional contributions are expected (e.g. for water and sanitation).
- Changes from a large country can have a big impact on the total (e.g. sanitation improvements for this period are dominated by those which have occurred in China).
- The calculation uses a simplified estimate of change over five years. In the future, better methods of projection/trend estimation should be used.
- For the historical five-year period the contribution to the billion is around 650 million, but with considerable uncertainty. It seems most likely that the HPOP Billion will require acceleration during GPW13.
- There are typically a mix of negative and positive contributions within a region. Negative values indicate that, overall, lives have become less healthy. Alcohol has the most mixed

picture, with some regions making progress (Europe) and others losing ground (South-East Asia and the Western Pacific). Increases in air pollution and obesity are globally the largest contributors to less healthy lives.

Table A6.4 Estimated number of people with healthier lives, by indicator and WHO region (millions)

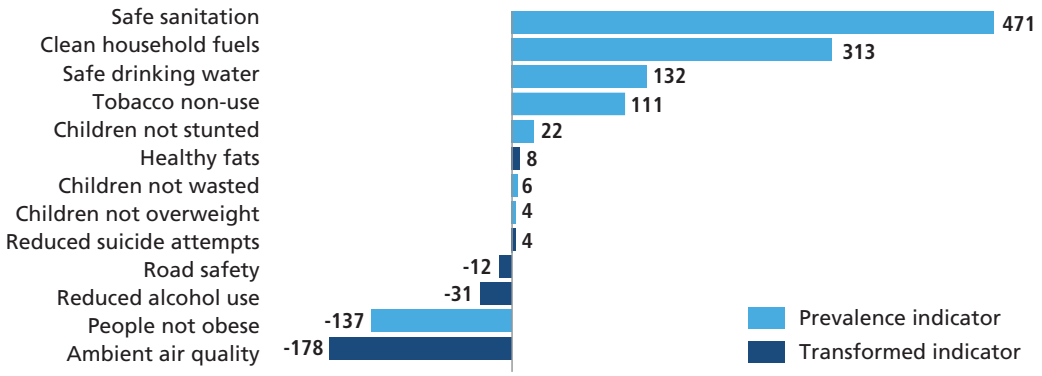
Billion topic	Africa	The Americas	South-East Asia	Europe	Eastern Mediterra-nean	Western Pacific	Total
Safe sanitation	8	47	116	19	7	275	471
Clean household fuels	13	13	218	6	23	40	313
Safe drinking water	8	5	108	10	1	0	132
Tobacco non-use	6	20	45	15	8	18	111
Children not stunted	4	1	11	1	3	2	22
Healthy fats[a]	0	8	0	0	0	0	8
Children not wasted	6	0	-2	0	1	1	6
Children not overweight	2	0	3	0	1	-3	4
Reduced suicide attempts[a]	0	-1	0	2	0	2	4
Road safety[a]	0	-3	-18	0	5	5	-12
Reduced alcohol use[a]	1	6	-54	30	0	-15	-31
People not obese	-14	-27	-22	-21	-17	-36	-137
Ambient air quality[a]	-40	20	-183	23	-33	35	-178
Total (corrected)	-5	80	187	79	-1	308	648

[a] *Indicates where a transformation to prevalence is used.*

Notes: Values are summed over countries where there are sufficient data to estimate change over the most recent five years, and rounded to the nearest million. The last row, which shows the totals for each region, includes the correction for double counting (thus is less than the sum of the values in the column above). Data only shown for indicators with enough values to measure change.

Sources: WHO Global Health Observatory data repository and UN Global SDG Indicators Database (extracted May 2019, with some additions).

Fig. A6.3 Contributions to the HPOP Billion for a recent historical 5-year period



Sources: WHO Global Health Observatory data repository and UN Global SDG Indicators Database (extracted May 2019, with some additions).

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Annex 7 Healthy life expectancy (HALE)

Annex 7.1 HALE metadata

Name abbreviated	Healthy life expectancy (HALE)
Indicator name	Healthy life expectancy at age x (e.g. at birth, at age 60 years)
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 I_x (survivors at age x): $$HALE_x = \left[\sum_{i=x}^{w} YWD_i\right] / I_x$$ where $YWD_x = L_x(1 - D_x)$ – 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.
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 resources	Hay SI, Abajobir AA, Abate KH, Abbafati C, Abbas KM, Abd-Allah F 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. Lancet. 390(10100):1260–344. doi: 10.1016/S0140-6736(17)32130-X. Sullivan DF (1971). A single index of mortality and morbidity. HSMHA Health Rep. 86:347–54. WHO (2018). WHO methods and data sources for life tables 1990–2016. Geneva: World Health Organization (https://www.who.int/healthinfo/statistics/LT_method.pdf?ua=1, accessed 4 September 2020).

Annex 7.2 HALE calculation template

An Excel spreadsheet (or online tool) will be made available to countries who wish to calculate health-adjusted life expectancy (HALE). An example of this is shown in Table A7.1.

Table A7.1 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	$YWD_x=(1-YLD_x)*L_x$	$\sum YWD_x$	$HALE_x=\sum(YWD_x)/l_x$
<1	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

Note: Columns shown in blue are the input data required for the calculation.

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