ANALYSIS AND USE OF HEALTH FACILITY DATA

Guidance for national and district planners and managers

WORKING DOCUMENT, JANUARY 2019

World Health Organization

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MODULE 2. Guidance for national and district planners and managers

LEARNING OBJECTIVES

This module provides guidance on the analysis and use of routine data collected at the facility level that are relevant for all national and subnational (district) planners and managers. The module presents core facility indicators for an overarching analysis of the service delivery system at national and/or subnational levels, and addresses data quality issues as well as considerations and limitations for using the data.

The module consists of five sections:

- Introduction
- Mortality
- Morbidity
- Delivery of essential health services: access, coverage and quality
- Health service inputs

By the end of this module, participants will be able to:

- Undertake critical review of key indicators, analytics and data visualizations relevant for national and district planners and managers;
- Design dashboards displaying key analytics appropriate to national and/or subnational audiences;
- Be aware of key considerations and limitations of the data under review;
- Understand and interpret their data to drive service delivery improvements.

AUDIENCE

This module is relevant for all national and district planners and managers, including:

- Policy-makers and managers at the national and district levels of the health system;
- Monitoring and evaluation staff members and analysts at national and district levels;
- Health management information system staff;
- Staff members involved in the analyses of mortality and cause-of-death statistics; and
- Consultants and staff members working at research institutes involved in the analysis of facility data and/or efforts to improve the quality of facility data.

KEY AUTHORS

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INTRODUCTION

1. Background

Accurate and timely data are needed for countries to assess the state of a population's health, to establish priorities and to track progress towards goals and objectives, including the Sustainable Development Goals (SDGs) and Universal Health Coverage (UHC). These data are obtained from a number of different data sources, such as civil registration and vital statistics systems (CRVS), population-based surveys, health facility assessments and routine health facility reporting systems.

Routine facility reporting systems are also called routine health information systems (RHIS) or health management information systems (HMIS). In this document, the term "RHIS" is used. The RHIS includes both general and programme-specific facility reporting systems that collect data on routine health service activities and health problems. These data are reported on a regular basis (e.g. monthly or quarterly) from health facilities to subnational levels (e.g. district) and then to the national level of the health system.

The RHIS is a primary source of data for assessing health sector performance. The Ministry of Health compiles the data on a regular basis to report on achievements and trends in key health service performance indicators. In addition, RHIS data provide insights into morbidity and mortality patterns that inform policy, planning and resource allocation.

2. Core facility indicator categories for planners and managers

This module takes a cross-cutting approach to health facility data, presenting a limited set of core indicators, standard analyses and dashboards that provide planners and managers with a quick, easily-accessible overview of the general status of health service delivery. The indicators represent multiple key health programmes as well as service delivery components common to many programmes. The selected indicators intend to serve as tracers that can highlight areas where further attention is needed.

Core health facility indicators

Refer to page 16 for the core facility indicator list. This indicator set can be adapted according to country-specific needs, e.g. a country may include indicators linked to the national health sector strategic plan.

The indicators are organized according to categories that broadly relate to a results chain or theory of change model:

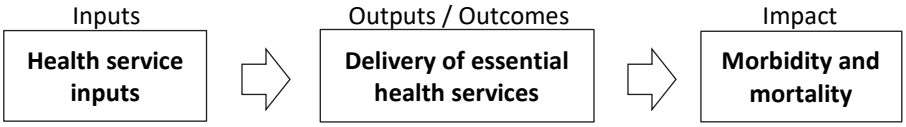


Table 1. Core facility indicator categories

Mortality:	• the illnesses and conditions from which people die while admitted to a health facility
Morbidity:	• the illnesses and conditions for which people visit or are admitted to health facilities
Delivery of essential health services: Access: Coverage: Quality, safety, efficiency:	 • the availability of services and the extent to which people use them • the extent to which the population receives essential health interventions • how well the services are delivered
Health service inputs:	• the resources used to deliver essential health services

In the related sections of this module, each indicator is described in terms of its purpose, calculation, interpretation and potential limitations. Recommended core analyses and visualizations for displaying the indicator are presented alongside.

3. Core analyses and dashboards

The module presents standard ways of analyzing and visualizing data for each core indicator, as well as standard dashboards that display groups of indicators. Note that in this module, the recommended analyses, visualizations and dashboards specifically target managers and planner that require a broad overview of health services performance. Dashboards for specific disease programmes are presented in other modules.

Basic analyses:

- **Summary tables** showing multiple indicators compared across time periods or geographic areas/facilities;
- **Line charts** showing time trends;
- **Bar charts** comparing disease burden or performance (in ranked order) among geographic areas/ facilities;
- **Maps** identifying differences among geographic areas;
- **Pie charts** showing proportion distributions: sex or age disaggregation; top 10 causes of death or morbidity;
- Additional indicator-specific analyses where relevant.

(Note: in general, line charts are used for time trends, bar charts for comparisons and tables for showing multiple indicators. However, other visualization can also be used.)

In this module, the national trend for the past four years is presented for each indicator, along with a comparison of districts for the most recent year.

These basic analyses can help planners and managers to identify:

- whether the occurrence of a disease/health condition is changing over **time** and whether health service performance is improving over time;
- the **places** where particular disease/health conditions occur and where programmes or interventions are most or less effective;
- the types of **people** affected by health conditions or receiving the services (sex, age groups).

Using this information, managers can decide where to target support and resources and where lessons can be learned from high performing areas in order to strengthen performance in other areas.

Dashboards for various health system levels

Variations of the basic analyses and dashboards can be produced for different levels of the health system, based on the decision making needs and the frequency with which the information is needed at each level. Dashboards can also be created for specific audiences or technical areas, e.g. primary care, hospitals, UHC. In this module, three health system levels are used for illustration: national, district and facility.

- **National dashboards**

Data from the RHIS can be used to support national level health sector reviews and planning, through tracking of annual trends and progress against national and global targets. The national level dashboards in this module present mainly annual trends and district comparisons. These dashboards are intended for use mainly during periodic reviews that take place every year or every few years, e.g. in relation to the national health sector strategic planning cycle. The national dashboards can also be

adapted for more frequent monitoring needs, e.g. midyear reviews. In this case, quarterly or monthly data for the current year can be provided. Certain indicators may require monitoring on a more frequent basis even at national level, e.g. surveillance for diseases of epidemic potential.

- **District dashboards**

Data from the RHIS are also used to support district level reviews and planning. During the district's annual planning process, district managers can use RHIS data to motivate at national level for resources for their district, to decide on distribution of resources (e.g. staff) within the district, and to prioritise activities for the coming year. District managers are also concerned with the current functioning of the service delivery system within the district. They need to monitor the health situation and service performance more frequently for timely detection of issues that require action.

Two main types of district dashboards are needed:
- Annual review dashboard: shows annual trends, quarterly or monthly trends for the most recent year, and facility comparisons.
- Quarterly review dashboard: shows quarterly analyses of mortality and morbidity trends, service utilization, district performance against quarterly and/or annual targets and facility comparisons for selected indictors.

District managers may also need dashboards that display monthly or weekly trends for selected diseases or conditions of public health importance.

- **Facility dashboards**

Health facility managers may also conduct annual reviews of facility performance and be required to submit annual plans and resource requirements. However, facility managers are mainly concerned with more frequent monitoring of the number and types of morbidities that are seen at the facility, and activities and performance of the facility.

Two main types of facility dashboards are needed:
- Annual review dashboard: shows annual facility trends and monthly trends for the most recent year.
- Monthly review dashboard: shows monthly analyses of morbidity trends (and mortality trends for inpatient facilities), service utilization and facility performance against targets.

Note: Health facilities (and sometimes also districts and other subnational areas) often do not have reliable catchment population data. This means that for indicators that need population denominators, e.g. coverage indicators, it is difficult to produce meaningful information. In this case, it may be more useful to present numerator trends than to calculate the indicators.

Table 2 provides summary of the types of analyses and visualizations used in the dashboards for each of the three health system levels.

Table 2. Analyses and visualizations for three health system levels

Type of analysis:	**Indicator summary**	**Time trends**	**Geographic comparisons**	**Proportion distributions**
Type of visualization:	**Table**	**Line chart**	**Bar chart or map**	**Pie chart**
National dashboards				
Periodic review and planning dashboard:	• Annual data, last 5 years • Annual data last one year, all districts	• Annual data, last 5 years • Quarterly or monthly data for last one year as needed	• Annual data, last one year	• Annual data, last one year
District dashboards				
Annual review and planning dashboard:	• Annual data, last 5 years • Annual data, last one year, all facilities	• Annual data, last 5 years • Quarterly or monthly data, last one year	• Annual data, last one year	• Annual data, last one year
Monitoring dashboard for current year:	• Quarterly data	• Quarterly data • Compare with same quarter of previous year • Weekly/monthly trends for defined indicators, e.g. surveillance	• Last quarter data	• Last quarter data for proportional mortality and morbidity • See note 1
Health facility dashboards				
Annual review and planning dashboard:	• Annual data, last 5 years	• Annual, last 5 years • Monthly, last one year	• Among hospital wards (selected indicators)	• Annual data, last one year • See note 3
Monitoring dashboard for current year:	• Quarterly progress against facility targets	• Monthly (or quarterly for some programmes) • Weekly or monthly for defined surveillance indicators	• Among hospital wards (selected indicators)	• See notes 1, 2 and 2

Notes:
1. Age and gender disaggregation proportions may only need to be presented annually, unless there are identified reasons for more frequent monitoring. If more frequent monitoring is needed, stacked bar charts may be a more useful way to present the data, to enable easy comparison with the previous quarter or month.

2. For monthly monitoring of proportional mortality and morbidity, stacked bar charts can also be used.

3. Where reliable catchment population estimates are not available to be used as denominator, numerator trends should be displayed.

4. Considerations for facility data analysis

RHIS data are a key element of a country's health information system. However, a number of issues should be considered when analysing and interpreting health facility data.

How representative are RHIS data of health services in a country?

National RHIS data represent only those facilities that report into the RHIS. In some countries, all health facilities are required to report into the national RHIS. In other countries, only Ministry of Health (MOH) facilities are part of the system. The private sector (including private-for-profit providers, non-governmental organizations (NGOs) and faith-based organizations) often delivers a substantial part of a country's health services but may be poorly represented in the RHIS. While facilities operated by NGOs generally have good reporting rates, the private for profit sector is often a challenge.

It is not easy to solve this issue, but insights can be obtained into the size of the problem related to the poor reporting of the private sector. The proportion of facilities (by type) and hospital beds that are privately owned provides a general indication of the role of these providers, especially for inpatient services.

An updated national Master Facility List should ideally provide a list of all health facilities (by type and ownership) in the country. Survey data can also be used to obtain an idea of how large the share of the private sector in the provision of services for specific interventions. DHS and socioeconomic surveys can provide data on the general use of private facilities as a first source of health care (e.g. where did you go for your last visit to a health facility). The DHS and MICS surveys provide more detailed data on the private sector role in family planning methods, antenatal / delivery and postnatal care and childhood treatment services. This allows an estimation of the relative contribution of the private sector to the provision of specific services.

RHIS analyses should state clearly which providers are included and should also provide an indication of the number/proportion of facilities (with their ownership) that are not included.

Information on the completeness of reporting from RHIS facilities is also essential for interpretation of the data, as discussed in the data quality sections of this module. Furthermore, facility data provide information only on those people who use the facilities. A substantial part of the population may not have access to the facilities or may choose to use alternate care options, e.g. self-medication, traditional healers.

Denominators

Population data serve as the denominator for calculating rates, percentages and coverage. Obtaining the correct denominator (the target population) for facility indicators that require a population denominator is an ongoing challenge in many settings.

Official national population estimates are usually projections based on the last census and the official annual population growth rate. However, these projections may be problematic when, for example: the last census was conducted more than 10 years ago; the census methodology did not meet international standards or did not provide sufficient subnational population estimates, e.g. for districts; there were substantial increases or decreases in the total population, e.g. people migrating into or out of the country; there were changes in population distribution within the country, e.g. urbanization.

For coverage indicators, denominators based on census population projections often result in coverage rates substantially over 100%, especially at the subnational level. While such rates may in some cases

be true (e.g. people living in one subnational area may use services in a neighboring area), a common cause is underestimation of the target population due to incorrect or out of date census projections. The opposite (coverage that is much lower than in reality) probably happens equally often, but is much more difficult to detect than coverage of over 100%. Unexpected year-to-year changes in coverage estimates are sometimes the result of adjustments made to target population estimates when the findings from a new census become available. To show the influence of such denominator adjustments, instead of charting coverage by year it is useful to show the numerators and the denominators by year.

Various methods have been proposed to improve denominator estimations and coverage calculations. These are discussed in Annex 1. Furthermore, Module 1 (General Principles) of the toolkit also addresses overall data quality assessment, adjustment and denominator estimation.

Disaggregation

The extent to which recommended age and sex disaggregation is available, influences both the interpretation of the data and the data quality. Lack of disaggregation may mask important differences in disease patterns among different age groups and sexes. However, excessive disaggregation may result in a deterioration of data quality due to the reporting burden.

While the need for disaggregated data is undisputed, the specific purposes for and frequency at which specific disaggregations are required, warrants careful consideration. This is particularly important in relation to disaggregation into multiple age/sex groups, as the reporting burden may be substantially increased (and data quality consequently decreased), particularly in paper-based systems. If short-term variations are unlikely, the RHIS may not be the most suitable means of obtaining detailed disaggregated data. Other data collection methods should be considered, for example, sentinel sites, periodic studies or population-based surveys. The following extract concerning immunization data provides an illustration:

"…Sometimes the administered doses are further disaggregated, for example by sex of the child, or the strategy that was used to vaccinate it (i.e. fixed versus outreach), or whether or not the child lives within the catchment area of the health facility. These additional dis-aggregations are not recommended as there is scant evidence that reliable data disaggregated in these ways can be collected or meaningfully used. Moreover, the recording and reporting workload doubles every time a new level of disaggregation is introduced. Therefore the decision to further disaggregate immunization data needs to be weighed carefully against the benefit of the use that will be given to the collected data. Those designing routine reporting forms should aim to limit the number of cells and rely upon findings from household surveys to more reliably answer many questions…"[1]

[1] WHO. Analysis and use of health facility data. Guidance for immunization programme managers. p13. Working document February 2018

5. Assessing data quality

All data have quality limitations that affect the reliability and interpretation of the data. RHIS data often exhibit problems of quality and many users do not trust these data. Data cannot be interpreted without first knowing how complete they are and then examining them for inconsistencies and errors. The data may need to be adjusted before they can be meaningfully analyzed. Findings from review of the data quality and explanations of any adjustments to the data must always be presented explicitly and transparently along with the analyses.

RHIS quality should be reviewed both routinely as a part of the routine data analysis process and also periodically through specific data quality reviews.

Routine data quality review should take place on a monthly basis. For countries using DHIS2 software to manage their routine data, WHO has also developed the Data Quality Tool, an application that can be installed on the national DHIS2 system and that automatically generates findings on data quality at national or sub-national level.

A periodic data quality review (DQR) consists of two components: a desk review and a data verification survey. The desk review involves carrying out quality checks on the data available in the electronic system. The data verification survey assesses a sample of districts and health facilities to determine the extent to which the reported data match with the source documents (e.g. facility registers and tally sheets). WHO has developed a Data Quality Review (DQR) Toolkit[2] to support assessment of routine facility data.

Data quality assessment involves four dimensions: completeness and timeliness, internal consistency, external consistency with other data sources, and external comparison with population data.

Dimension 1: Completeness and timeliness

- *Completeness* has two components: i) the extent to which the facilities or districts that are required to submit monthly/quarterly reporting forms are actually doing so, and ii) the completeness of specific data elements within the reporting forms. Reporting of data from outpatient facilities is often more complete than hospital reporting.
- *Timeliness* looks at whether a facility or district submits the reporting form within the required timeframe, e.g. by the 5th day of the following month.

Indicators for data completeness and timeliness include:

- Percentage of facilities/districts that report each month;
- Percentage of facilities that submit complete data for a specific data element/set of data elements;
- Percentage of facilities that submit reports on time.

Dimension 2: Internal consistency

- *Presence of outliers*: Outliers are reported values that are unusually high or low in comparison with historical trends or other reporting units.
- *Consistency over time*: Trends are assessed to determine whether reported values seem unusual in relation to other values reported during the year or over several years. This is useful for understanding whether variations represent data quality problems or expected seasonal variation.

[2] https://www.who.int/healthinfo/tools_data_analysis/en/

- *Consistency between data elements / indicators*: Data elements / indicators that have a predictable relationship are examined to check whether the expected relationship exists between those indicators, e.g. the number of cases of confirmed malaria should equal the number of positive malaria tests.
- *Consistency between reported data and original records*: This is measured by a data verification exercise that assesses the extent to which the reported data match with the source documents in the health facilities.

Dimension 3: External consistency with other data sources
This compares the level of agreement between two sources of data measuring the same indicator. An RHIS indicator is usually compared to the same indicator obtained through a population-based survey.

Dimension 4: External comparisons of population data
This is a review of the denominator data used to calculate RHIS indicators. Two different sources of population estimates (for which the values are calculated differently) are compared. If the two estimates are very different, the coverage estimates for an indicator can be very different even though the programmatic result (numerator) is the same. The greater the consistency between denominators from different sources, the more likely it is that they represent the true population value.

Table 3. Data quality measures and suggested frequency of review

Dimension	Data quality measure	Frequency
Completeness and timeliness	Completeness and timeliness of reporting (reports submitted)	Monthly, Annually
	Completeness of data elements / indicators	Monthly, Annually
Internal consistency	Presence of outliers	Monthly, Annually
	Consistency over time	Monthly, Annually
	Consistency between data elements / indicators	Annually
	Consistency between reported data and original records	Annually
External consistency with other data sources	Consistency between RHIS data and sources such as population based surveys, special studies	Annually
External comparisons of population data	Consistency between population data used for calculating facility indicators and other sources of population estimates	Annually

The chapters following describe data quality issues specific to the chapter topic. Additional information is also available in Annex 1 as well as in the General Principles module.

6. Core health facility indicators

Core Indicators	Definition	Disaggregation*
MORTALITY		
Mortality levels		
1.Institutional mortality rate	Institutional deaths (all causes) per 1000 admissions N: Number of inpatient deaths x 1000 D: Number of admissions (or discharges + deaths) (Institutional deaths = deaths in health facilities = inpatient deaths)	Age (<5, ≥ 5) Sex Cause of death
2. Neonatal mortality rate in health facilities	Neonatal deaths (first 28 days of life) per 1000 live births in health facilities N: Number of neonatal deaths in health facilities x 1000 D: Number of live births in health facilities (Includes any neonatal death in a facility that occurred in the first 28 days: pre-discharge after birth or upon re-admission for an illness)	Cause of death
3. Stillbirth rate in health facilities	Stillbirths as a percentage of all births in health facilities N: Number of stillbirths in health facilities X 100 D: Number of live births + still births in health facilities (Stillbirth: baby born with no sign of life and weighing at least 1000g or born after 28 weeks of gestation)	Fresh, macerated
4. Maternal deaths in health facilities	Number of maternal deaths in health facilities	Age (10-14, 15-19, 20+) Cause of death
Leading causes of death		
5.Distribution of causes of death in health facilities (Proportionate mortality)	Distribution of the leading causes of death in health facilities as a percentage of all inpatient deaths N: Number of inpatient deaths by cause X 100 D: Total number of inpatient deaths	Age (<5, ≥ 5) Sex
Mortality due to specific causes		
6.Case fatality rates (CFR) for major causes	Cause-specific inpatient deaths per 100 admissions for major causes N: Number of inpatient deaths by cause x 100 D: Number of admissions by cause (admissions = discharges + deaths)	Age (<5, ≥ 5) Sex
7.Population incidence of inpatient deaths (e.g. malaria)	Number of inpatient malaria deaths per 100,000 population at risk of malaria N: Number of inpatient deaths due to malaria x 100,000 D: Estimated total population of areas at risk of malaria	Age (<5 vs ≥ 5)
*8.*Perioperative mortality rate	All-cause death rate prior to discharge among patients that had one or more procedures in an operating theatre during the relevant admission N: Number of deaths prior to discharge among inpatients that had a surgical procedure x 1000 D: Number of inpatients that had a surgical procedure	Procedure Emergency, elective Age

Core Indicators	Definition	Disaggregation*
MORBIDITY		
Leading causes of morbidity		
1.Leading inpatient discharge diagnoses (rate per 1000 population and percentage distribution)	a. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities per 1000 population N: Number of discharges and deaths by diagnosis X 1000 D: Total population b. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities expressed as percentage distribution of total discharges N: Number of discharges and deaths by diagnosis x 100 D: Total number of discharges and deaths	Age (<5, ≥ 5) Sex
2.Leading outpatient diagnoses (rate per 1000 population and percentage distribution)	a. Diagnoses of first/new outpatient (OPD) visits expressed as rates per 1000 population N: Number of OPD new/first visits by diagnosis X 1000 D: Total population b. Diagnoses of first/new outpatient* (OPD) visits expressed as percentage distribution of total new/first visits N: Number of OPD new/first visits by diagnosis X 100 D: Total number of OPD new/first visits (*Only curative visits are included (i.e. excluding preventive care visits, e.g. ANC, immunization)	Age (<5, ≥ 5) Sex
Morbidity due to specific causes		
3.Inpatient incidence rate and proportional contribution due to specific conditions	This indicator has the same definition as indicator 1, but presents a limited number of specific conditions as defined by the country, e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR)- notifiable diseases, neglected tropical diseases, cancer new cases, myocardial infarction new cases, stroke new cases, adverse events following immunization (number) Refer to relevant modules for further details.	Age (<5, ≥ 5) Sex
4.Outpatient incidence rate and proportional contribution due to specific conditions	This indicator has the same definitions as indicator 2, but presents a limited number of specific conditions as defined by the country, e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR-) notifiable diseases, neglected tropical diseases, cancer new cases; hypertension new cases, diabetes new cases, adverse events following immunization (number), etc. Refer to relevant modules for further details.	Age (<5, ≥ 5) Sex

*Geographic location is not presented as a disaggregation type in this table. All data are expected to be analyzed by geographic location

Core Indicators	Definition	Disaggregation*
ACCESS		
1.Service-specific availability	1) Number of health facilities offering specific services per 10 000 population N: number of facilities offering the service X 10 000 D1: total population OR 2) Percentage of facilities offering the service N: number of facilities offering the service X 100 D2: total number of facilities (Specific service may include: general outpatient curative services; specific services: e.g. HIV; TB; NCD; mental health; general maternal child health services, immunization, basic emergency obstetric and neonatal care (BEmONC), comprehensive emergency obstetric and neonatal care (CEmONC); basic and comprehensive surgical care, etc.)	Facility type Facility ownership
2.Outpatient service utilization	Number of outpatient department (OPD) visits per person per year N: Number of new and re-visits to OPD in a year D: Population	Age (<5, >5) Sex
3.Hospital admission rate (Inpatient utilization)	Number of hospital admissions per 100 population per year N: Number of hospital new and re-admissions in a year X 100 D: Population	Age (<5, >5) Sex
4.Caesarean section rates	Percentage of deliveries by caesarean section a) Population C-section rate: N: Number of caesarean sections X 100 D1: Estimated number of live births in the population b) Facility C-section rate: N: Number of caesarean sections X 100 D2: Number of deliveries in health facilities	Age (10-14;15-19; 20+)
5.Surgical volume	Number of surgical procedures undertaken in an operating theatre per 100 000 population per year N: Number of surgical procedures in a year X 100 000 D: Population (A surgical procedure is defined as the incision, excision, or manipulation of tissue that needs regional or general anaesthesia, or profound sedation to control pain.)	Procedure type; Emergency, elective
COVERAGE		
1. Contraception first time users (UHC proxy)	Persons who accept for the first time in their lives a contraceptive method N: Number of persons who accepts a modern family planning method for the 1st time	Age (10-14, 15-19, 20+) Sex
2. Antenatal client 1st visit before 12 weeks	Percentage of antenatal clients with 1st visit before 12 weeks gestation N: Number of antenatal client 1st visits before 12 weeks D: Number of antenatal client 1st visits	Age (10-14, 15-19, 20+)
3. Deliveries in health facilities (UHC related)	Percentage of deliveries that take place in a health facility N: Number of deliveries in a health facility X 100 D: Number of live births in the population	Age (10-14, 15-19, 20+)

UHC: Universal Health Coverage

Core Indicators	Definition	Disaggregation*
4. DPT3 coverage (UHC) Also coverage of other vaccines	Percentage of the target population that received the third dose of DPT3 containing vaccine N: Number of infants less than one year of age receiving the third dose of diphtheria-tetanus-pertussis vaccine X 100 D: Estimated number of infants less than one year of age (surviving infants)	By vaccine / dose of vaccine Age (<1 yr, ≥ 1 yr for infant immunizations; ≤ 2 yrs , ≥ 2 yrs for toddler immunizations) Status (pregnant women, others) for TT
5. Antiretroviral therapy (ART) coverage (UHC)	Percentage of persons living with HIV that are currently receiving ART (at the end of the specified reporting period) among the estimated number of PLHIV N: Number of adults and children who are currently receiving ART at end of the reporting period X 100 D: Estimated number of adults and children living with HIV	Age (<15; 15+) Sex (m, f, TG) Key populations
6. TB notification rate (UHC related)	TB cases notified in a specified time period, usually one year, per 100,000 population N: Number of TB cases notified in a specified time period x 100,000 D: Estimated population in the same time period	By case type: pulmonary: bacteriologically confirmed or pulmonary clinically diagnosed; By treatment history: new and relapse (incident cases) or previously treated, excluding relapse
7. Malaria diagnostic testing ratio	Percentage of suspected malaria cases that had a diagnostic test for malaria N: Number of malaria tests performed x 100 D: Number of suspected malaria cases (Malaria tests = Number of RDT + number of microscopy Suspected malaria cases = Number of malaria tests performed + Number of presumed cases of malaria reported)	Microscopy , RDT Age (<5, 5-14, 15+)
8. Hypertension treatment initiation (UHC related)	INDICATOR PRESENTED AS DRAFT FOR DISCISSION: Number of people started on treatment for hypertension	Age Sex
9. Diabetes treatment initiation (UHC related)	INDICATOR PRESENTED AS DRAFT FOR DISCUSSION: Number of people started on treatment for diabetes	Agw Sex
10. Cervical cancer screening (UHC related)	RHIS INDICATOR IN DEVELOPMENT Number of women aged 30-49 years that were screened for cervical cancer in a reporting period	Age
QUALITY, SAFETY AND EFFICIENCY		
1. Antenatal client syphilis screening	Percentage of antenatal clients screened for syphilis N: Numbr of antenatal clients screened for syphilis X 100 D: Number of antenatal client 1st visits	Age (10-14, 15-19, 20+)

Core Indicators	Definition	Disaggregation*
2.Immunization drop-out rates	Percentage of infants who received DPT1 but did not receive DPT3 vaccination N: (DPT1 doses – DPT3 doses) x 100 D: DPT1 doses Percentage of infants who received BCG but did not receive the first dose of measles vaccination N: (BCG doses – MCV1 doses) x 100 D: BCG doses Percentage of infants who received MCV1 but did not receive MCV2 N: (MCV1 doses - MCV2 doses) x 100 D: MCV1 doses	
3. HIV clinical cascade	Number of persons newly diagnosed with HIV vs Number of persons newly diagnosed with HIV that initiated ART vs Number of persons retained on ART after a specified time period among those that initiated ART	Age (<1, >1) Sex (M,F, TG) Special populations (KPs) Specified duration (current/ever, 12, 24, 36, 48, 60 months)
4. TB treatment success rate (UHC proxy)	Percentage of TB cases successfully treated (cured plus treatment completed) among TB cases notified to national health authorities during a specified time period, usually one year. N: Number of TB cases notified in a specified period time period that were successfully treated X 100 D: Number of TB cases notified in same period	Refer to TB module for recommended disaggregations
5. Confirmed malaria cases treated with ACT (UHC proxy)	Percentage of confirmed cases of malaria that receive first-line antimalarial treatment: artemisinin-based combination therapy (ACT) N: Number of confirmed cases of malaria treated with ACT x 100 D: Number of confirmed cases of malaria (Number of confirmed cases = number of RDT positive cases + number of microscopy positive cases)	RDT, microscopy; Age (<5, 5-14, 15+); Geographic area / residence / focus; Facility/community
6. Bed occupancy rate (BOR)	Percentage of available beds that were occupied over a specified time period N: Number of occupied bed-days X 100 D: Total number of available bed-days	Facility type
7. Average length of stay (ALOS)	Average number of days that patients spend in hospital over a specified time period N: Number of occupied bed-days D: Number of admissions (Admissions = discharges + deaths)	Facility type

MORTALITY

1. Introduction

Reliable mortality and morbidity statistics are instrumental in guiding national, regional and global policies and priorities for health and development. Knowledge of cause-specific mortality and morbidity patterns in a population, with disaggregation by age, sex and geographic location, is essential for policy-making, planning and adjustment of interventions to population needs. For example, by using of a framework that links disease control intervention to impact measures (e.g. morbidity and mortality), programmes can assess the effectiveness of their interventions and refine their targeting or policies to optimize impact.

Population-based data systems are the primary source of mortality data. All countries should routinely collect mortality and cause-of-death statistics from civil registration and vital statistics (CRVS) systems. However, in many settings CRVS systems are inadequate. Information on causes of death can often be obtained only from health facilities[3] where deaths are recorded and where there are physicians to certify the cause of death. Data on the cause of death, along with demographic information of the deceased and geographic information on the place of death, can then be captured in the routine facility health information system (RHIS) and institutional mortality calculated. Such information, when analyzed properly, provides information for policy-makers and managers on 1) mortality levels in health facilities, which can be an indicator of the quality of care and 2) the distribution of the causes of death within health facilities.

As the number of deaths occurring in health facilities is often only a small fraction of all deaths that occur in a country, institutional mortality is not representative of overall mortality in the population. This is particularly the case in contexts where most deaths occur at home. Nevertheless, institutional mortality data may provide insights into disease patterns as well as access to and quality of health services and should therefore be used to support health decision-making and actions.

2. About the data

Ideally, the information on the deceased is recorded as a single individual record. The compilation of all the individual records into a data base is the starting point for analysis. The minimum variables required for analyses are: sex, age, facility identifier, date of death and cause of death.

In some countries, a data base of individual death information does not exist. In this case, mortality and cause of death analyses are based on the aggregate reports from health facilities and districts. The levels of disaggregation possible are then more limited than when analyzing individual data. At minimum, aggregate reporting should provide two age groups (under 5 year of age, and 5 years and older), as well as sex disaggregation.

Data should be collected according to international standards.

[3] The term “hospital” is used in this document as a generic term to describe all facilities that have inpatient services and that report on admissions, discharges and deaths. It is recognized that the precise naming of facilities may differ among countries.

For causes of death this implies that:

- Doctors complete the medical certificate of the cause of death which should be compliant with the WHO International Form of Medical Certificate of the Cause of Death;
- The coding and selection of the underlying cause of death follow the rules of the international statistical classification of diseases and related health problems (ICD);
- Doctors complete the discharge summary and provide the medical diagnoses which should be mapped to the codes of the ICD.

The ICD has a large number of codes and details that may be challenging to use in some settings. WHO has developed an application of ICD-10 that enables simplified coding of cause of death: the Startup Mortality List (ICD-10-SMoL).4 This list includes slightly more than 100 causes and is easier to use than a full ICD.

3. Assessing data quality

Mortality data are assessed according to the main data quality dimensions. The findings should be presented in the same dashboard or report that presents the mortality and cause-of-death statistics, to help the reader understand the strengths and limitations of the data and to inform interpretation.

Completeness of hospital reporting of mortality data

- *Percentage of hospitals reporting:*
  Routine reporting from hospitals is sometimes significantly incomplete. The report should also explicitly state whether data came from all hospitals or only a selected group of sentinel hospitals. Proportional mortality by cause is less sensitive to incomplete reporting than institutional mortality rates, but may be affected by changes in the types of hospitals reporting (e.g. whether or not referral hospitals are included).
- *Availability of age and sex disaggregation*
- *Availability of deaths by cause*

Internal consistency

- *Trends in the numbers of deaths over time:*
  This provides additional information on the completeness and quality of reporting, as large variations between years are not expected. Presentation of three to five years of data is recommended.
- *Seasonal trends for deaths by month:*
  This is useful for understanding whether variations represent data quality problems or expected seasonal variation, especially if assessed in association with admissions.
- *Incorrect sex-specific causes or implausible causes of death for age:*
  It is necessary to conduct these checks particularly if the system for recording causes of death does not include automatic validation checks at the data entry point. If potential errors are identified, the medical certificate of the cause of death should be reviewed and corrected before proceeding further with the analyses. Examples include:
  - Male deaths from maternal conditions, cervical cancer, uterine cancer, ovarian cancer;
  - Female deaths from prostate cancer, benign prostatic hypertrophy;
  - Deaths from maternal conditions below age 10 years or above 49 years;
  - Deaths from suicide below age 5 years;
  - Deaths from perinatal conditions at age 5 years and above.

[4] WHO Application of ICD-10 for low-resource settings initial cause of death collection: The Startup Mortality List (ICD-10-SMoL), V2.1. Geneva: World Health Organization; 2018.

External consistency

- *Comparison with disease-specific programme data:*
  Disease-specific mortality rates obtained from hospital data should be compared with those from disease-specific programmes, which may use alternate reporting systems.
- *Comparison with population mortality estimates:*
  The distribution of causes of death obtained from hospital data can also be compared with estimates for the whole population obtained through statistical modeling, such as WHO's Global Health Estimates and the IHME Global Burden of Disease. Such comparisons are intended less as a data quality assessment than a source of insights into the extent to which hospital-based causes of death are indicative of what people die from in the general population. The main challenge here is to ensure that the cause-of-death categories used in hospitals are comparable with those used in the estimates. Refer to Annex 1 for further details.

Additional quality issues

The proportion of deaths with a "garbage" code (ill-defined or unknown causes) is a key measure of the quality of the data. These refer to conditions that are vague or with unknown etiology, as included in the ICD-10 chapter XVIII "Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified". Deaths where only the terminal event or mode of dying is captured (e.g. cardiac arrest) are also considered "garbage" because there is no information on the condition that led to the cardiac arrest. These ill-defined causes are unfortunately commonly reported, but are of no value for informing public health policies and debates in countries.

As the proportion of ill-defined deaths increases, the quality of data decreases. If ill-defined causes are used commonly (>20%), it suggests serious problems with certification and/or coding. The quality of cause-of-death data is highly dependent on the accuracy of the certifiers in indicating the sequence of causes that led to the death. Poorly completed death certificates prevent coders or information officers from properly selecting the cause of death. Even in countries where causes are assigned by medically-qualified workers, there is often substantial use of coding categories for unknown and ill-defined causes.

Annex 1 provides additional details on assessment of the quality of mortality and cause of death data in hospitals, including the calculation of a core set of data quality metrics.

4. Core facility indicators for mortality

Core Indicators	Definition	Disaggregation*
Mortality Level		
1.Institutional mortality rate	Institutional deaths (all causes) per 1000 admissions N: Number of inpatient deaths x 1000 D: Number of admissions (or discharges + deaths) (Institutional deaths = deaths in health facilities = inpatient deaths)	Age (<5, ≥ 5) Sex Cause of death
2. Neonatal mortality rate in health facilities	Neonatal deaths (first 28 days of life) per 1000 live births in health facilities N: Number of neonatal deaths in health facilities x 1000 D: Number of live births in health facilities (Includes any neonatal death in a facility that occurred in the first 28 days - pre-discharge after birth or upon re-admission for an illness)	Cause of death
3. Stillbirth rate in health facilities	Stillbirths as a percentage of all births in health facilities N: Number of stillbirths in health facilities X 100 D: Number of live births + still births in health facilities (Stillbirth: baby born with no sign of life and weighing at least 1000g or born after 28 weeks of gestation)	Fresh, macerated
4. Maternal deaths in health facilities	Number of maternal deaths in health facilities	Age (10-14, 15-19, 20+) Cause of death
Leading causes of Death		
5.Distribution of causes of death (Proportionate mortality)	Distribution of the leading causes of death in health facilities as a percentage of all inpatient deaths N: Number of inpatient deaths by cause X 100 D: Number of inpatient deaths	Age (<5, ≥ 5) Sex
Mortality due to specific causes		
6.Case fatality rates (CRF) for major causes	Cause-specific inpatient deaths per 100 admissions for major causes N: Number of inpatient deaths by cause x 100 D: Number of (discharges + deaths) by cause	Age (<5, ≥ 5) Sex
7.Population incidence of inpatient deaths (e.g. malaria)	Number of inpatient malaria deaths per 100,000 population at risk of malaria N: Number of inpatient deaths due to malaria x 100,000 D: Estimated total population of areas at risk of malaria	Age (<5 vs ≥ 5)
*8.*Perioperative mortality rate	All-cause death rate prior to discharge among patients that had one or more procedures in an operating theatre during the relevant admission N: Number of deaths prior to discharge among inpatients that had a surgical procedure x 1000 D: Number of inpatients that had a surgical procedure	Procedure Emergency vs elective Age

5. Core analysis

5.1 MORTALITY LEVELS DASHBOARD

Purpose

Institutional mortality rates are the simplest measures of mortality. Overall institutional mortality provides a snapshot of the quality of health services delivery, the health status of the population using the health facilities and, indirectly, of population health. Disaggregation by facility or region may highlight potential epidemics or other health issues. Analysis of mortality trends over multiple years can provide insights into epidemiological trends.

Analysis

Four institutional mortality indicators provide a general picture of service quality and the health status of the service users:

- Institutional mortality rate;
- Institutional neonatal mortality rate;
- Institutional stillbirth rate;
- Institutional maternal deaths.

Analysis of mortality levels in health institutions should include:

- Trends in mortality levels over multiple years;
- Disaggregation by geographic areas and health facilities;
- Mortality levels by age and sex;
- Proportion of deaths from ill-defined and unknown causes;
- Information on data quality.

Trends in recorded deaths and distribution by facility

Interpretation of the data should take into account a number of issues, including completeness and quality of the data. A large percentage of deaths may never be observed or reported by health workers. Care-seeking practices may vary considerably by age, sex, disease and geographic area. The problem may be compounded by variations between health facilities, between geographic areas and between health conditions in the expertise, laboratory tests and equipment required to reliably diagnose diseases. If most deaths are not reported by health facilities and if the completeness of such reporting varies significantly over time and between geographic areas, any reports on analysis of trends and geographic comparisons must acknowledge these considerable limitations.

Age and sex distribution

If mortality data are available by age and sex, the completeness or coverage of deaths by facilities can be assessed in greater detail for specific age-sex groups. Examining the age distribution of reported deaths is useful for detecting any bias in the reporting of age of death, if the distribution does not match what is expected based on historic patterns. An example of such bias is “digit preference” or “age-heaping” which refers to peoples’ preference to report age as a number ending in 0 or 5 (e.g. 45, 50, or 55). It is also common for families to report that the deceased person was older than was actually the case. This highlights the importance of checking the plausibility of age-patterns for mortality. (Refer also to the mortality by cause section.)

1. Institutional mortality rate (all-cause)

Institutional deaths (all causes) per 1000 admissions	N: Number of inpatient deaths x 1000 D: Number of admissions Institutional deaths = deaths in health facilities = inpatient deaths Number of admissions = number of discharges + number of deaths)

The numerator is the total number of deaths that occurred in a health institution during a defined period of time. For the denominator, it is preferable to use the number of discharges plus the number of deaths, rather than the number of admissions. Discharges include: authorized discharges, transfers out and unauthorized discharges ("absconders"). Data should be disaggregated by sex and, at minimum, should also show the results for children under 5 years of age. If individual level data are available, more detailed analysis of the age-sex distribution of deaths may be useful.

2. Maternal deaths in health facilities

Number of maternal deaths in health facilities

Women who gave birth outside of a health facility or in a different health facility are also included. Furthermore, the number of institutional maternal deaths should include antepartum deaths, deaths during delivery and post-partum deaths. Both antepartum and postpartum deaths are likely to be underreported as these deaths are often not recorded in maternity registers. As an institutional maternal death is a relatively rare event, it is recommended to present the absolute number of deaths instead of the institutional maternal mortality ratio (institutional maternal deaths per 100,000 institutional live births). Calculation of the institutional maternal mortality ratio may however help in interpretation of population-based maternal mortality ratios.

This indicator is used to measure the quality and safety of care in the facility. However, it is also influenced by an absence of antenatal care, the quality of antenatal care or delays in reaching the facility.

3. Neonatal mortality rate in health facilities

Neonatal deaths (first 28 days of life) per 1000 live births in health facilities	N: Number of neonatal deaths in health facilities x 1000 D: Number of live births in health facilities

This indicator is also known as the pre-discharge neonatal mortality rate and includes any neonatal death in a facility that occurred in the first 28 days of life (pre-discharge after birth or upon re-admission for an illness). As most newborns are discharged within a few days after delivery, it is useful to also analyze first day mortality (the first 24 hours). This may also be extended to mortality in the first 2-3 days if the overwhelming majority of women are not discharged before that time.

This indicator is a reflection of the quality of antenatal care, delivery care and neonatal care. Reliable estimates for individual facilities can only be obtained for very large facilities if there are large numbers of deliveries and neonatal admissions. Comparisons among facilities should be interpreted with care because facility neonatal mortality rate is very sensitive to the case mix of deliveries and neonatal admissions. An increased rate in a particular facility may not necessarily suggest poorer quality of neonatal care in that facility, as the neonatal mortality rate may rise or fall with changes in the case-mix. Also, improvements in antenatal and delivery care as well as advances in medical technology may increase the neonatal mortality rate because babies who may otherwise have been stillbirths may survive delivery only to die in the neonatal period.

4. Stillbirth rate in health facilities

Stillbirths* as a percentage of all births in health facilities (*Baby born with no sign of life and weighing at least 1000 g or born after 28 weeks of gestation)	N: Number of stillbirths in health facilities X 100 D: Number of live births + still births in health facilities

Stillbirths can occur before or during delivery. The disaggregation of antepartum (macerated) versus intrapartum (fresh) stillbirths is important. The percentage of fresh stillbirths is not expected to vary a great deal from year to year within the health institution data, unless there are very strong interventions to reduce intrapartum problems (as opposed to interventions during pregnancy that are aimed at reducing antepartum stillbirths). Therefore, the levels and trends in stillbirth rate overall and the percentage of stillbirths that are intrapartum can be used as an indicator of quality. Population level stillbirth rates may vary from less than 0.5% to 4%. Studies in high mortality settings have shown that the percentage that is intrapartum varies from 30-50%.

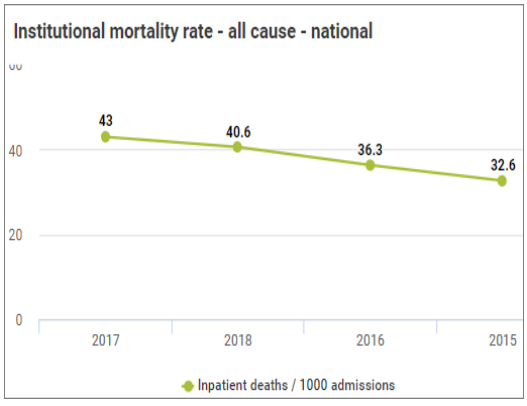
Mortality levels dashboard

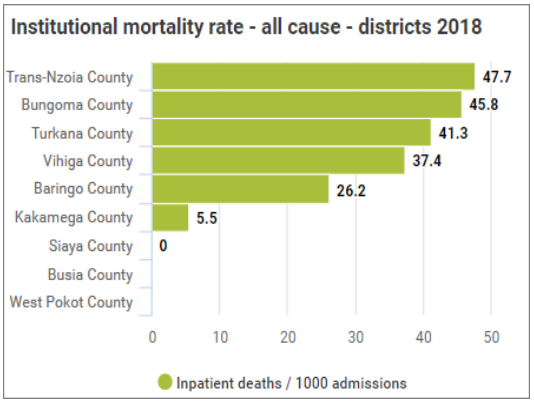
Indicator summary - Mortality - national

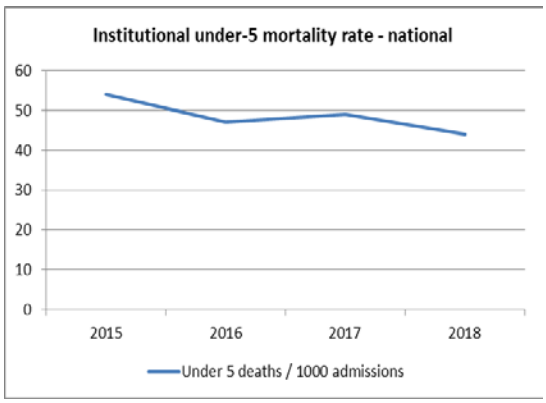
National				
Data / Period	2015	2016	2017	2018
Inpatient deaths / 1000 admissions	32.6	36.3	43	40.6
Neonatal deaths / 1000 live births in facilities	8.6	9.8	10.7	8.8
Stillbirths / 1000 births in health facilities	53.3	22.2	24.1	21.3
Maternal deaths in facilities	199	155	254	329
Maternal deaths / 100,000 deliveries in facilities	1.3	0.93	1.4	1.8

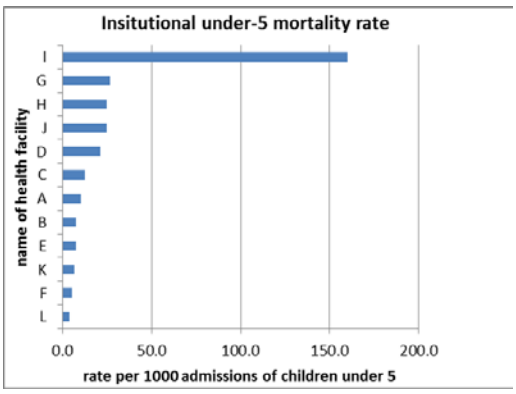
Indicator summary - Mortality - Districts 2018

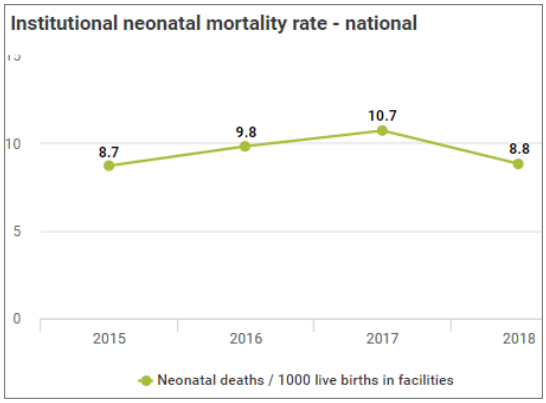
	2018								
Data / Organisation unit	Baringo County	Bungoma County	Busia County	Kakamega County	Siaya County	Trans-Nzoia County	Turkana County	Vihiga County	West Pokot County
Inpatient deaths / 1000 admissions	26.2	45.8		5.5	0	47.7	41.3	37.4	
Maternal deaths in facilities	18	39	85	49	29	22	37	17	33
Stillbirths / 1000 births in health facilities	22.7	15.5	26.2	19.7	21.3	22.1	22	23	35.5
Neonatal deaths / 1000 live births in facilities	6.5	9	8.3	7.1	8.9	13.5	11.6	5.9	11.3
Maternal deaths / 100,000 deliveries in facilities	1.5	1	5.1	1.2	1.2	1.6	3	1.6	3.1

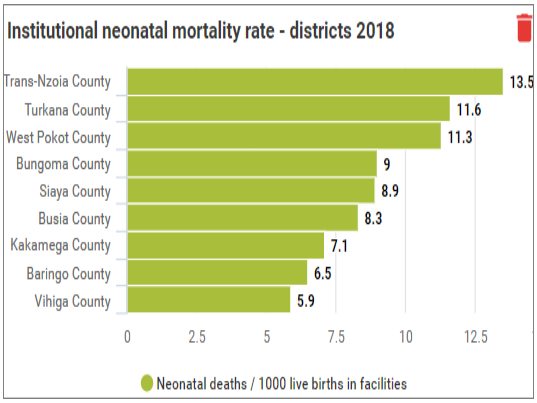


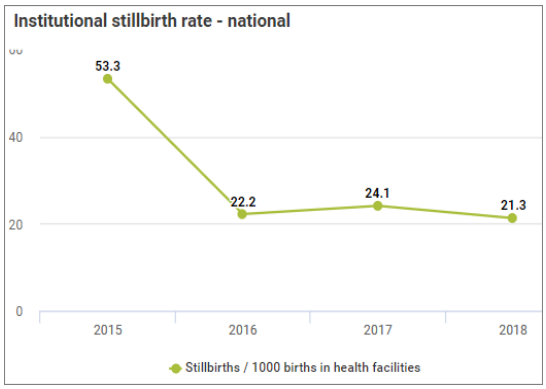


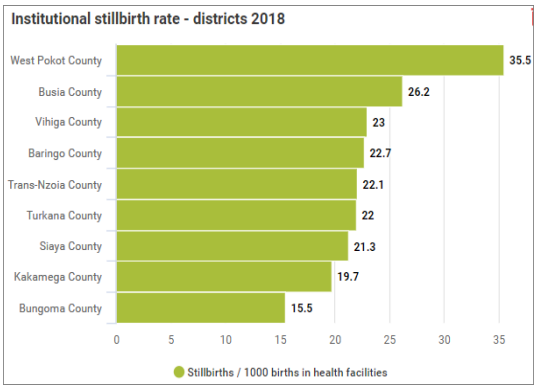

Institutional under-5 mortality rate - national
60
50
40
30
20
10
0
2015
2016
2017
2018
Under 5 deaths / 1000 admissions

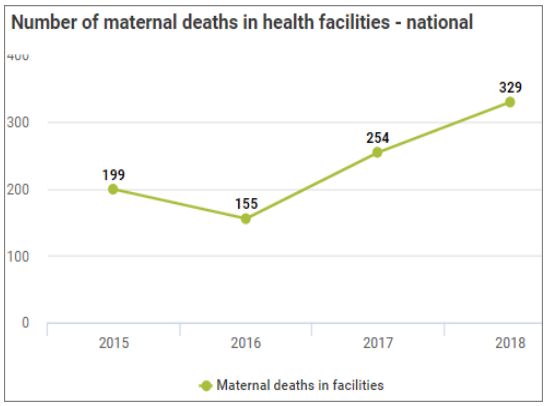

Insitutional under-5 mortality rate
name of health facility
I
G
H
J
D
C
A
B
E
K
F
L
0.0
50.0
100.0
150.0
200.0
rate per 1000 admissions of children under 5

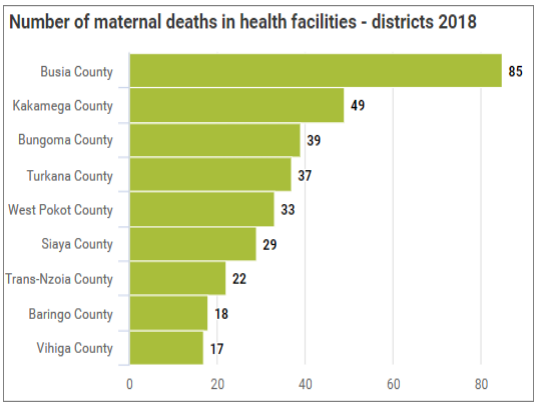

Institutional neonatal mortality rate - national
10
5
0
8.7
9.8
10.7
8.8
2015
2016
2017
2018
Neonatal deaths / 1000 live births in facilities


Institutional neonatal mortality rate - districts 2018
Trans-Nzoia County
Turkana County
West Pokot County
Bungoma County
Siaya County
Busia County
Kakamega County
Baringo County
Vihiga County
13.5
11.6
11.3
9
8.9
8.3
7.1
6.5
5.9
0
2.5
5
7.5
10
12.5
Neonatal deaths / 1000 live births in facilities

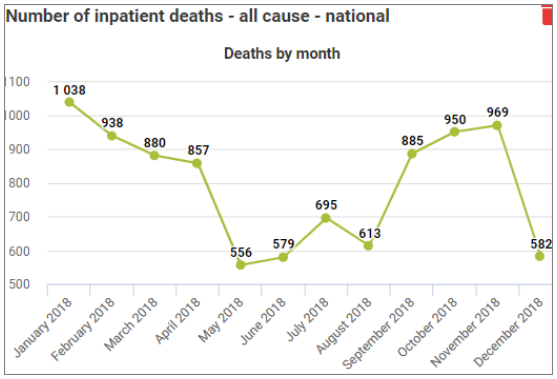

Institutional stillbirth rate - national
40
20
0
53.3
22.2
24.1
21.3
2015
2016
2017
2018
Stillbirths / 1000 births in health facilities

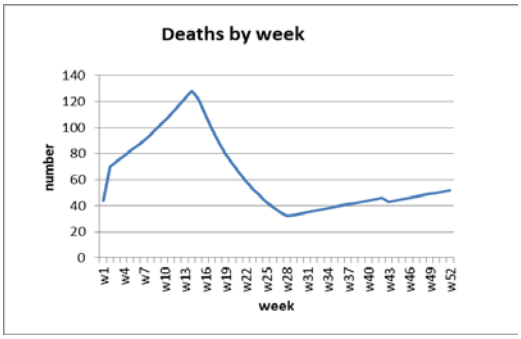

Institutional stillbirth rate - districts 2018
West Pokot County
Busia County
Vihiga County
Baringo County
Trans-Nzoia County
Turkana County
Siaya County
Kakamega County
Bungoma County
35.5
26.2
23
22.7
22.1
22
21.3
19.7
15.5
0
5
10
15
20
25
30
35
Stillbirths / 1000 births in health facilities


Number of maternal deaths in health facilities - national
300
200
100
0
199
155
254
329
2015
2016
2017
2018
Maternal deaths in facilities


Number of maternal deaths in health facilities - districts 2018
Busia County
Kakamega County
Bungoma County
Turkana County
West Pokot County
Siaya County
Trans-Nzoia County
Baringo County
Vihiga County
85
49
39
37
33
29
22
18
17
0
20
40
60
80

Additional mortality level trends

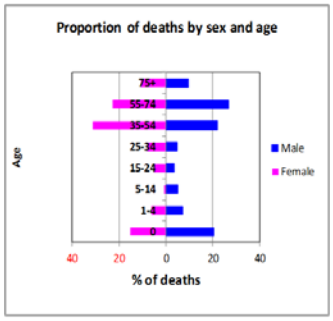




Mortality by age and sex

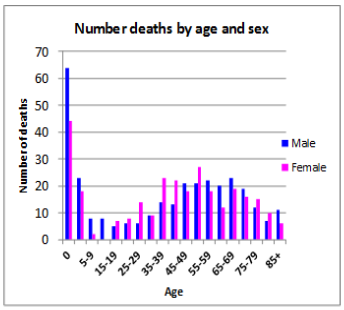
Proportion of deaths by age and sex

Age	Male	Female
0	20.5	15.3
1-4	7.4	6.3
5-14	5.1	0.7
15-24	3.5	5.2
25-34	4.8	8.0
35-54	22.1	31.3
55-74	26.9	22.6
75+	9.6	10.8



Number of deaths by age and sex

Age	Male	Female
0	64	44
1-4	23	18
5-9	8	2
10-14	8	0
15-19	5	7
20-24	6	8
25-29	6	14
30-34	9	9
35-39	14	23
40-44	13	22
45-49	21	18
50-54	21	27
55-59	22	18
60-64	20	12
65-69	23	19
70-74	19	16
75-79	12	15
80-84	7	10
85+	11	6
All ages	312	288



5.2 LEADING CAUSES OF DEATH DASHBOARD

Purpose

Information on the causes of inpatient deaths in health facilities is necessary for understanding what is happening in the facilities and for possible adjustments needed to service delivery. The causes of death dashboard should provide 10 to 20 leading causes of death, with age and sex disaggregation as noted below. Both the absolute number of deaths and deaths as a percentage of total facility deaths should be provided. The cause of death data should be presented and interpreted along with information on the data quality as described earlier.

Analysis

5. Distribution of leading causes of death

Distribution of the leading causes of death in health facilities as a percentage of all inpatient deaths (proportionate mortality)	N: Number of inpatient deaths by cause X 100 D: Number of inpatient deaths

The core analyses should include:

- Deaths by cause for all ages and both sexes;
- Deaths by cause, all ages, for males and females separately;
- Deaths by cause for children under five years of age (both sexes together);
- Comparison of deaths by cause among major geographic areas.

Proportional mortality for the top 10 causes of death is often shown as a pie chart. (Pie charts with more than 10 segments are difficult to read.) The top 20 (or top 10) causes may also be presented as a ranked list. It is useful to present multiple years, to show how ranking changes over time. (This is possible only if the same coding categories or groups are used over time.) The rankings are influenced by the extent to which codes are grouped, e.g. all cancers AS A GROUP, irrespective of type, will represent a larger percentage of deaths than deaths from a single cancer such as lung or breast cancer.

Assessment of monthly trends for leading causes of death is also important. For example, a month to month increase in the percentage of all institutional deaths due to malaria may indicate an outbreak. Seasonality should be examined for specific causes such as diarrhea, pneumonia and malaria by analyzing the number of deaths by month. Multiple years of data are needed to identify seasonal patterns.

The percentage of unknown and ill-defined causes can provide an indication of the quality of the data. Trends in the proportion of ill-defined causes should be assessed over time as changes will affect the proportions of diseases with known causes. A cause that ranks unusually among the top 10 causes of death may also point to data quality problems.

Age-sex patterns for specific causes of death can provide insights into the epidemiology of diseases. This is useful for causes of death such as HIV or malaria that have specific age patterns. If the numbers are large and individual data are available for analysis, age patterns by sex can focus on 5 or 10 year age groups, or larger age groups, e.g. <5, 5-19, 20-49, etc. Biases in the age distribution must be taken into account, e.g. systematic over-reporting of ages or digit preference for multiples of 5 or 10. The

latter however is not likely to affect the broad age-sex patterns for main causes. The age-sex patterns should be examined for at least the top causes (excluding neonatal deaths).

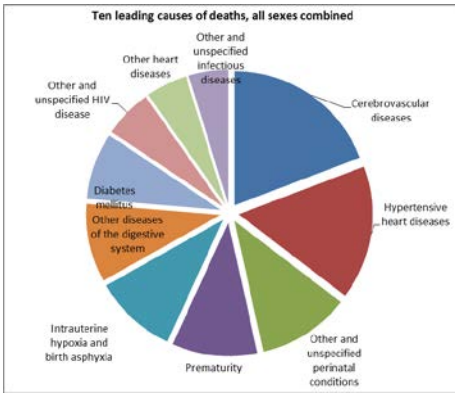
Significant differences between proportionate mortality in health facilities and the expected cause patterns based on population modeled estimates could mean:

- The cause of death is more or less commonly seen in hospitals because of special characteristics of the condition or disease. For example, injuries may be a less prominent cause of death in hospitals as many deaths occur before reaching the hospital; others causes may be more common in hospitals, especially chronic conditions;
- There may be data quality issues, e.g. biases in the certification and coding of causes of death; or
- There could be a true change in the frequency of occurrence of a certain cause of death that is not well-captured by the statistical models of causes of death in the population.

The overall list of top 10 or 20 causes of death can only focus on broad groups of causes. In order to generate further information that guides country policies and programmes, it is important to provide further details on, for example, neonatal causes (complications of premature births, intrapartum asphyxia, neonatal sepsis, etc.), cardiovascular diseases and specific cancers.

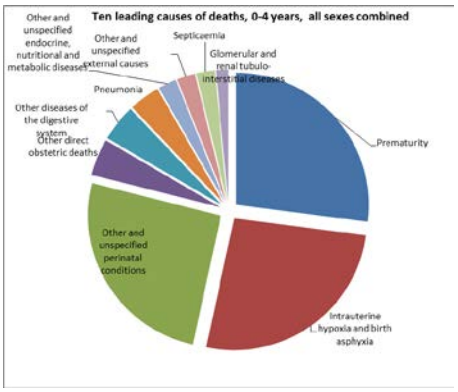
Leading causes of death, all ages

20 leading causes of death, all ages			
	Both sexes	Nos	% total
1	Cerebrovascular diseases	69	11.5
2	Hypertensive heart diseases	58	9.7
3	Other and unspecified perinatal conditions	40	6.7
4	Prematurity	37	6.2
5	Intrauterine hypoxia and birth asphyxia	36	6.0
6	Other diseases of the digestive system	34	5.7
7	Diabetes mellitus	29	4.8
8	Other and unspecified HIV disease	21	3.5
9	Other heart diseases	18	3.0
10	Other and unspecified infectious diseases	17	2.8
11	Pneumonia	17	2.8
12	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	14	2.3
13	Septicaemia	13	2.2
14	Malaria, parasitologically confirmed	13	2.2
15	Other direct obstetric deaths	13	2.2
16	Anaemias	12	2.0
17	Other and unspecified diseases of the respiratory system	12	2.0
18	Other and unspecified external causes	10	1.7
19	Other and unspecified malignant neoplasms	10	1.7
20	Other and unspecified endocrine, nutritional and metabolic diseases	10	1.7



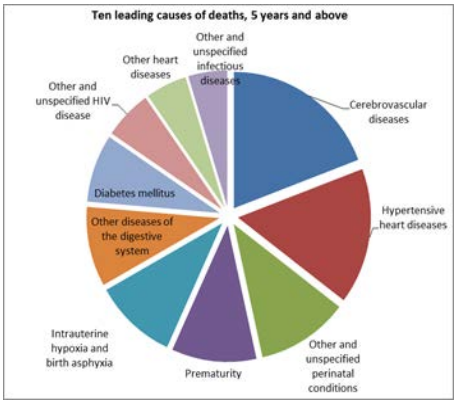
Leading causes of death, 0-4 years, both sexes

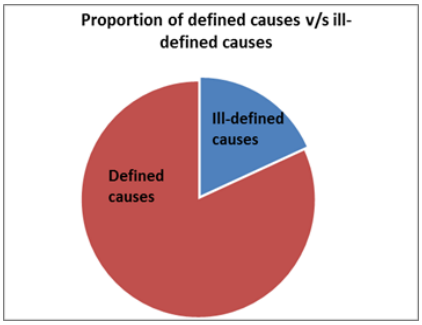
20 leading causes of death, 0-4 years			
	Both sexes	Nos	% total
1	Prematurity	36	24.2
2	Intrauterine hypoxia and birth asphyxia	35	23.5
3	Other and unspecified perinatal conditions	34	22.8
4	Other direct obstetric deaths	6	4.0
5	Other diseases of the digestive system	6	4.0
6	Pneumonia	5	3.4
7	metabolic diseases	3	2.0
8	Other and unspecified external causes	3	2.0
9	Septicaemia	3	2.0
10	Glomerular and renal tubulo-interstitial diseases	2	1.3
11	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2	1.3
12	Cerebrovascular diseases	1	0.7
13	Congenital hydrocephalus and spine bifida	1	0.7
14	Congenital malformations of the heart	1	0.7
15	Diabetes mellitus	1	0.7
16	Exposure to smoke, fire and flames	1	0.7
17	Hypertensive heart diseases	1	0.7
18	Malaria, parasitologically confirmed	1	0.7
19	Malignant neoplasm of pancreas	1	0.7
20	Other and unspecified congenital malformations	1	0.7



Leading causes of death, 5 years & above, both sexes

20 leading causes of death, 5 years & above			
	Both sexes	Nos	% total
1	Prematurity	36	24.2
2	Intrauterine hypoxia and birth asphyxia	35	23.5
3	Other and unspecified perinatal conditions	34	22.8
4	Other direct obstetric deaths	6	4.0
5	Other diseases of the digestive system	6	4.0
6	Pneumonia	5	3.4
7	metabolic diseases	3	2.0
8	Other and unspecified external causes	3	2.0
9	Septicaemia	3	2.0
10	Glomerular and renal tubulo-interstitial diseases	2	1.3
11	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	2	1.3
12	Cerebrovascular diseases	1	0.7
13	Congenital hydrocephalus and spine bifida	1	0.7
14	Congenital malformations of the heart	1	0.7
15	Diabetes mellitus	1	0.7
16	Exposure to smoke, fire and flames	1	0.7
17	Hypertensive heart diseases	1	0.7
18	Malaria, parasitologically confirmed	1	0.7
19	Malignant neoplasm of pancreas	1	0.7
20	Other and unspecified congenital malformations	1	0.7





5.3 MORTALITY DUE TO SPECIFIC CAUSES

The selection of specific diseases for further analysis depends on the public health situation of the country. In all cases, results should take into account the completeness of data and should also refer to additional data to try to differentiate between high mortality due to high case fatality and high mortality due to high admission rates (as a proxy for population incidence). Some cause-specific mortality estimates require specific considerations, e.g. rainfall patterns and endemicity for malaria.
The choice of diseases and conditions to analyze depends on the disease burden in the area and may include:

- Priorities for public health;
- Notifiable diseases;
- Diseases under surveillance;
- Those related to SDGs or national strategic goals.

6. Case fatality rates (CFR) for major causes

Cause-specific inpatient deaths per 100 admissions for major causes	N: Number of inpatient deaths by cause x 100 D: Number of admissions by cause (Number of admissions = number of discharges + number of deaths)

Calculations and considerations are similar to those for institutional mortality rate. The denominator is the number discharges plus number of deaths for a specific diagnosis. Discharges (rather than admissions) are used, as they are linked with the final diagnosis at discharge, while admission diagnoses are often presumed until confirmed by further investigation. This introduces additional uncertainty in the indicator as the quality of discharge diagnoses may be more variable than for the cause of death. Discharges include: authorized discharges, transfers out and unauthorized discharges ("absconders"). Case fatality rates may be difficult to interpret as they can vary based on numerous factors, e.g. age, nutritional status, other underlying illnesses, time since onset, etc. However, a sudden increase in CFR could represent a change in quality of care or in the mix of patients admitted. Any substantial change in CFR warrants further investigation.

7. Population incidence of inpatient deaths

Example: malaria

Inpatient malaria deaths per 100,000 population at risk of malaria	N: Number of inpatient deaths due to malaria x 100,000 D: Estimated total population of areas at risk of malaria

This indicator uses an estimated population denominator. In this case it is the population at risk of malaria. Often, however, the denominator refers to the entire population, e.g. indicators for population incidence of deaths from diarrheal diseases or acute respiratory diseases.

8. Perioperative mortality rate

All-cause death rate prior to discharge among patients that had one or more procedures in an operating theatre during the relevant admission	N: Number of deaths prior to discharge among inpatients that had a surgical procedure x 1000 D: Number of inpatients that had a surgical procedure

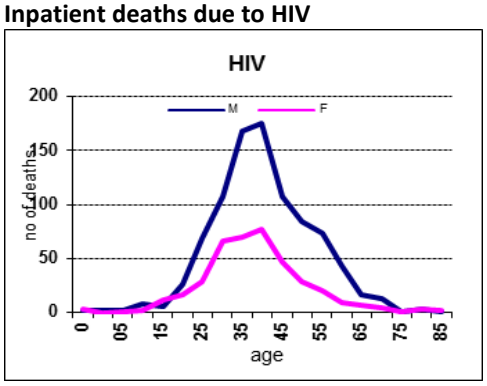
The denominator requires a register for major surgeries conducted in hospitals. For the numerator, the WHO International Form of Medical Certificate of the Cause of Death includes a question about surgery in order to identify whether or not the deceased had surgery. Perioperative mortality is an important indicator of quality and safety of care.

Cause-specific mortality analysis examples

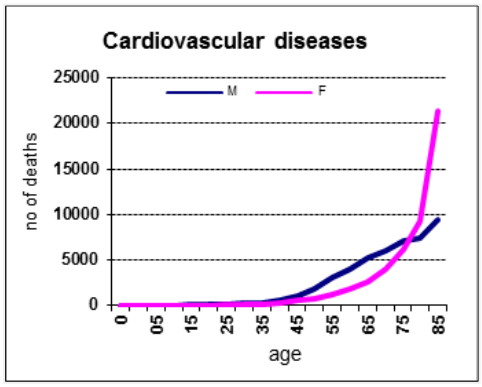
Inpatient malaria mortality as % of all inpatient deaths

Age	Region A	Region B	Region C	Region D	Region E	Region F	Region G
total	10.5	10.5	10.5	10.5	10.5	10.5	10.5
>5 yrs	20.5	20.5	20.5	20.5	20.5	20.5	20.5
5+ yrs	5.5	5.5	5.5	5.5	5.5	5.5	5.5

Inpatient deaths due to HIV



Inpatient deaths due to cardiovascular diseases



MORBIDITY

1. Introduction

Population-based data systems, e.g. population-based surveys, are the primary source of information on morbidity in the population. However, for many diseases and conditions, it is difficult to obtain population-based data, especially for acute conditions such as pneumonia and diarrhea. Therefore, routine facility health information systems are an important source of data and the combination of inpatient and outpatient data provides insights into population health.

However, it should be kept in mind that facility data are not representative of disease patterns in the overall population. Cases reported by the health facilities may only be representative of a subset of cases in the population, depending on treatment seeking behaviors. Therefore, in most settings, incidence rates computed from health facility data should be interpreted as crude measures of incidence. Refer to Section 1 for further details.

2. About the data

For outpatient morbidity data, the basis for analysis is often a standard list of common diagnoses that is provided to health facilities for reporting morbidity. Hospitals should preferably use ICD coding. The first OPD visit per diagnosis and revisits for the same diagnosis should be reported separately. New admission and re-admission for the same condition must also reported separately.

Hospital inpatient data usually reflect more severe morbidity and may also provide more accurate diagnoses than outpatient facilities. However, outpatient morbidity data provide information on a wide range of diseases and conditions from a much larger number of health facilities than hospitals.

Morbidity data should be collected according to accepted standards. For outpatients, the diagnosis (or ICD code) is determined by the health worker seeing the patient. For inpatients, the standard for collecting diagnoses is at discharge, not on admission. Where ICD coding is not used, standardized case definitions should be provided.

For inpatient data, information on the patient is ideally recorded as a single, individual record. The compilation of all the individual records into a data base is the starting point for analysis. The minimum variables required for analysis are: sex, age, facility identifier, date of admission, new or re-admission, date of discharge and discharge diagnosis. However, in many countries, databases of individual admissions do not exist. In this case, the morbidity analyses are based on the aggregate reports from health facilities and districts. Disaggregation are often limited to two age groups (under 5 years; 5 years and over) and sex disaggregation.

3. Assessing data quality

For outpatient morbidity data, the main data quality checks include the completeness of reporting, the consistency of diagnostic patterns over time and the percentage of diagnoses that are ill-defined or garbage.

For inpatient morbidity data, the key data quality checks include the completeness of reporting and the quality of the discharge diagnoses, notably the percentage of diagnoses that are ill-defined or "garbage".

The quality of morbidity data is assessed according to the four data quality review dimensions, using procedures similar to those followed for mortality and causes of death (Refer to the mortality section). Information on data quality should be presented in the same dashboard or report as the morbidity statistics, to help the reader understand the strengths and limitations of the data and to inform interpretation.

Completeness of reporting

- *Percentage of facilities reporting:*
  Completeness and timeliness of facility reporting (percentage of health facilities reporting) affects the ability to interpret trends in the numbers of people presenting with various illnesses or conditions. Completeness of reporting on specific causes of morbidity should also be assessed.
- *Availability of age and sex disaggregation;*
- *Separate reporting of outpatient* new visits and revisits;
- *Separate reporting of Inpatient n*ew admissions and re-admissions.

Internal consistency

- *Presence of outliers:* Extreme outliers often signal a data error.
- *Trends over time:* Analysis should include multiple years. Trends in the incidence of specific disease cases presenting to health facilities are expected to remain reasonably consistent over time, taking into account seasonal patterns. Unexpected variations may represent data quality problems, but may also, for example, indicate an outbreak of disease.
- *Consistency among data elements/indicators*: For outpatient data, where a specific laboratory test is required to confirm a diagnosis, the number of positive tests can be checked against the number of confirmed diagnoses, e.g. the number confirmed cases of malaria should equal the number of positive RDTs plus the number of positive microscopy examinations.
- *Discharge diagnosis plausibility:* Internal consistency issues to check include female diagnoses for male patients and vice versa, as well as diagnoses unlikely for age, e.g.
  - male discharges for maternal conditions, cervical cancer, uterine cancer and ovarian cancer;
  - female discharges with prostate cancer and benign prostatic hypertrophy.

External consistency

- *Comparison with disease-specific programme data:* Disease-specific data reported through routine facility morbidity reports should be compared with those reported through disease-specific programmes and surveillance systems.

Additional quality issues

The quality of morbidity data depends on the consistent use of case definitions and the capacity of health workers to accurately diagnose. For some common diagnoses, the extent to which the diagnosis has been confirmed by laboratory investigation is included, which could substantially improve the data quality. For example, malaria diagnoses are often specified as laboratory-confirmed diagnosis or clinical diagnosis only. The greater the proportion of laboratory-confirmed diagnoses, the better the quality of the data.

For additional details on morbidity data quality assessment , refer to Annex 1.

4. Core facility indicators for morbidity

Leading causes of morbidity		
1.Leading inpatient discharge diagnoses (rate per 1000 population and % distribution)	a. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities per 1000 population N: Number of discharges and deaths by diagnosis X 1000 D: Total population b. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities expressed as percentage distribution of total discharges N: Number of discharges and deaths by diagnosis x 100 D: Total number of discharges and deaths	Age (<5, ≥ 5) Sex
2.Leading outpatient diagnoses (rate per 1000 population and % distribution)	a. Diagnoses of first/new outpatient (OPD) visits expressed as rates per 1000 population N: Number of OPD new/first visits by diagnosis X 1000 D: Total population b. Diagnoses of first/new outpatient* (OPD) visits expressed as percentage distribution of total new/first visits N: Number of OPD new/first visits by diagnosis X 100 D: Total number of OPD new/first visits (*Only curative visits are included (i.e. excluding preventive care visits, e.g. ANC, immunization)	Age (<5, ≥ 5) Sex
Morbidity due to specific conditions		
3.Inpatient incidence rate and proportional contribution due to specific conditions	This indicator has the same definition as indicator 1, but presents a limited number of specific conditions as defined by the country, e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR-) notifiable diseases, neglected tropical diseases, cancer new cases, myocardial infarction new cases, stroke new cases, adverse events following immunization (number)	Age (<5, ≥ 5) Sex
4.Outpatient incidence rate and proportional contribution due to specific conditions	This indicator has the same definitions as indicator 2, but presents a limited number of specific conditions as defined by the country, e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR-) notifiable diseases, neglected tropical diseases, cancer new cases; hypertension new cases, diabetes new cases, adverse events following immunization (number), etc.	Age (<5, ≥ 5) Sex

*Geographic location is not presented as a disaggregation type in this table. All data are expected to be analyzed by geographic location
UHC: Universal Health Coverage indicator

5. Core analysis

LEADING CAUSES OF MORBIDITY DASHBOARD

Purpose

Institutional morbidity rates can provide insights into the disease burden among people presenting to health facilities and also provide some idea of population health challenges. Monitoring of morbidity trends is essential for policy-making, planning and management, as well as for timely reaction to changes in morbidity patterns.

Analysis

Analysis of morbidity data should provide the 10 to 20 leading diagnoses for both outpatients and inpatients both as percentages of all discharges and per 1000 population. The analyses should be presented for all ages (total) and for children under five years of age. Further age and sex disaggregation can be done if data are available and if relevant. The analyses should be presented along with information on the data quality, including the percentage of diagnoses classified as ill-defined or unknown ("garbage").

Three to five years of data should be presented to asses annual trends. This is important for assessing data quality and may also provide insights into epidemiological changes.

The leading diagnoses may be presented as a ranked list of rates per 1000 population or, where denominators are uncertain, as absolute numbers. Proportionate morbidity may be presented as a pie chart or a ranked list. For readability, pie charts should not include more than 10 segments. For both inpatient and outpatient proportionate morbidity data, the percentage distribution is affected by the way diagnoses are grouped and the percentage that are classified as unknown or ill-defined. For trend analysis, consistency in the grouping of diagnoses is important. (Refer to the mortality section for further detail.) Proportionate morbidity may also be affected by changes in the types of facilities reporting, e.g. whether or not referral facilities are included.

1. Leading inpatient discharge diagnoses

a. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities per 1000 population	N: Number of discharges and deaths by diagnosis X 1000 D: Total population
b. Discharge diagnoses of inpatients (main diagnostic categories) in health facilities expressed as percentage distribution of total discharges	N: Number of discharges and deaths by diagnosis x 100 D: Total number of discharges and deaths

This indicator has two components: The first provides the population rates per 1,000 population; the second is provides the percentage distribution of diagnoses for among the total discharges and deaths. Only discharges or deaths following the first admission for the specific diagnosis should be considered. Readmission for the same diagnosis should be excluded.

2. Leading outpatient diagnoses

1. Diagnoses of first/new outpatient (OPD) visits expressed as rates per 1000 population	N: Number of OPD* new/first visits by diagnosis X 1000 D1: Total population
2. Diagnoses of first/new outpatient (OPD) visits expressed as percentage distribution of total new/first visits	N: Number of OPD new/first visits by diagnosis X 100 D2: Total number of OPD new/first visits *Only curative visits are included (i.e. excluding preventive care visits, e.g. ANC, immunization)

The indicator has two components. The first provides the population rates per 1,000 population; the second provides the percentage distribution of diagnoses for outpatients first visits. For outpatient data analysis only diagnostic data related to the new/first visit for a disease episode should be included. Subsequent visits (re-visits) for the same diagnostic episode should be excluded. Preventive care visits are also excluded.

The inpatient- and outpatient-based population incidence rates are minimum or crude incidence rates – they are based on those who come to the health facility with the condition, but there are likely to be other cases in the population that have not been diagnosed.

Morbidity due to specific conditions

The methods used for analyzing specific diagnoses are the same as for the overall morbidity patterns. The choice of which disease to analyze and present depends on the public health priorities in the country.

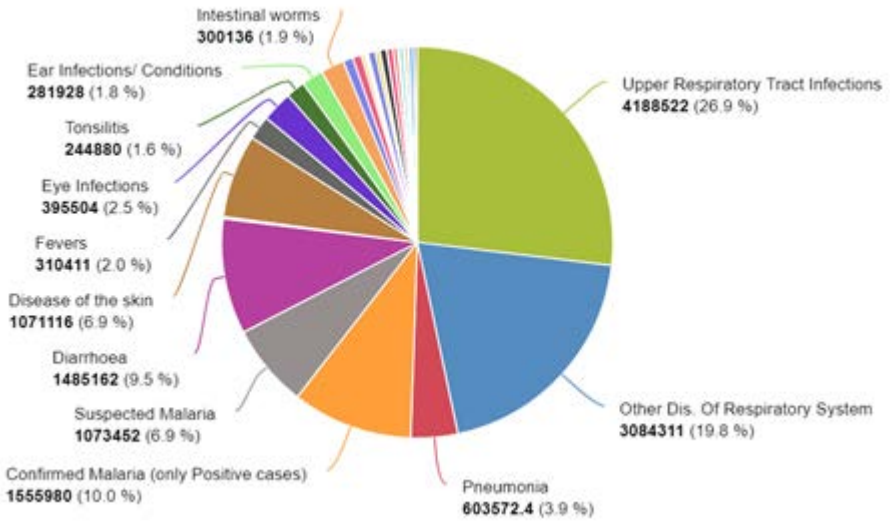
3. Inpatient incidence rate and proportional contribution due to specific conditions

This indicator has the same definition as indicator 1, but presents a limited number of specific conditions as defined by the country,
e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR-) notifiable diseases, neglected tropical diseases, cancer new cases, myocardial infarction new cases, stroke new cases, adverse events following immunization (number), etc.

4. Outpatient incidence rate and proportional contribution due to specific conditions

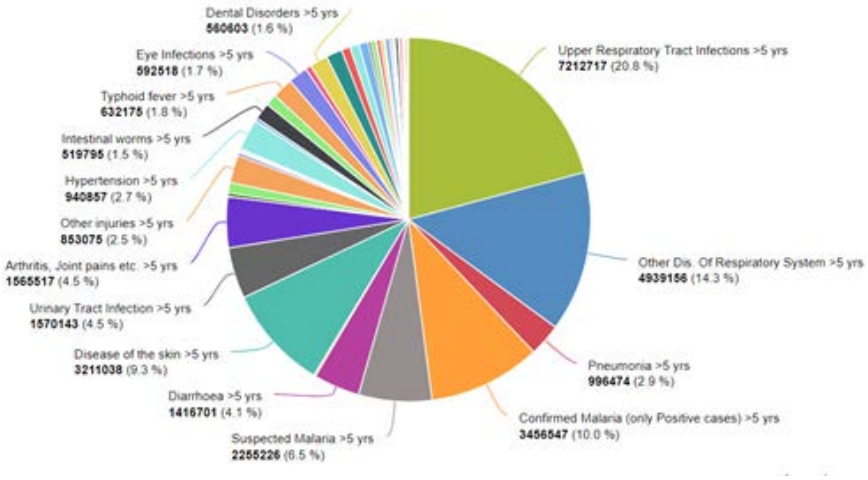
This indicator has the same definitions as indicator 2, but presents a limited number of specific conditions as defined by the country,
e.g. malaria (confirmed/ presumed diagnosis), vaccine-preventable diseases (new cases), (IHR-) notifiable diseases, neglected tropical diseases, cancer new cases; hypertension new cases, diabetes new cases, adverse events following immunization (number), etc.

Leading outpatient diagnoses, under five years of age, both sexes



Leading outpatient diagnoses, five years and older

, both sexes



ACCESS, COVERAGE and QUALITY OF ESSENTIAL HEALTH SERVICES

1. Introduction

This section focuses on a tracer set of access, coverage and quality indicators, including Universal Health Coverage (UHC) related indicators. The tracer set can be modified according to country priorities.

Access

The extent to which people are able to reach health services and use them, affects the coverage of interventions as well as morbidity and mortality. Access to health services involves a range of often complex factors, including availability of services, distance, transport, financial barriers, sociocultural factors, provider behaviors and patient preferences. Measurement of most of these factors requires data from sources other than the routine facility information system. However, some indicators obtained through the RHIS can be used to reflect access, e.g. indicators of service availability and service utilization.

Coverage

Coverage of services refers to the percentage of a population that receives the health services they need. It is influenced by access issues and can impact morbidity and mortality. Coverage indicators are central to monitoring UHC. UHC is a Sustainable Development Goal indicator (SDG 3.8) and underpins the concept that all people should receive the quality, essential health services they need, without being exposed to financial hardship.

Population data, e.g. population-based surveys, are the primary source of coverage data. Such surveys can also provide data that is disaggregated by socioeconomic status and other equity measures. However, facility-based coverage indicators can provide important insights into coverage trends between surveys, provided that the potential limitations are recognized. The service coverage indicators on the dashboards in this module provide a general picture of coverage across multiple services. For all these indicators, high levels of coverage are indicative of good access, even though some data quality challenges may still exist.

Quality, safety and efficiency

The quality (and perceived quality) of health services is an important determinant of health outcomes, as well as impacting utilization and coverage of services. Service quality is dependent upon the availability and functionality of key health service inputs (e.g. finance, workforce, medicines) but is also influenced by factors such as the working conditions, competence and behavior of health workers.

Quality encompasses multiple dimensions and adequate assessment of health service quality requires a variety of methods. However, some aspects of service quality can be assessed through routine facility data and can serve to highlight problems or the need for further in-depth assessment.

2. About the data

Access

Service-specific availability: Information on the availability of specific services at a health facility may be obtained through periodic facility surveys, e.g. the WHO Service Availability and Readiness Assessment (SARA), and the more recent Harmonized Health Facility Assessment. Periodic self-reporting by health facilities may also provide information on service availability. In the absence of such information, available service-specific output data may be used as proxies for assessing service availability, e.g. data on the number of patients on ART indicates the availability of ART services. Related indicators, such as the availability of infrastructure, health workforce and essential medicines, are discussed in Section 5 (Health service inputs). Population-based indicators such as physical distance to health facilities, travel time to health facilities and financial and cultural barriers, are also used as indicators of access. These indicators are obtained from household surveys or from geospatial modelling.

Utilization of outpatient and inpatient services: Utilization is an indirect indicator of access and includes outpatient department (OPD) visit rates and hospital admission/discharge rates. Low levels of service utilization may be a reflection of access barriers.

Surgical services: Two indicators of surgical care may also be used as access measures. If the number of surgical procedures (surgical volume) conducted in an area is relatively low, surgical services may not be available. Similarly, a low population proportion of births by caesarean section (well below 10% of all live births in the population) may indicate that women do not have adequate access to emergency obstetric care. The availability of surgical services should then be assessed.

Coverage

Coverage indicators require population estimates as denominators. Several coverage indicators, including some UHC indicators, can be based on RHIS data, e.g. the numerators for immunization and ART coverage. Furthermore, coverage statistics obtained from the RHIS can provide a picture of the local coverage of essential health services in the context of UHC. As such, RHIS is an important source of coverage data for managers and planners as it is collected more frequently and can be acted upon more quickly than data obtained from other sources. Equity is central to achieving UHC. RHIS data are also able to measure a number of equity dimensions: geographic location, age and gender (when relevant).

The set of indicators used to measure the UHC status at the local level may vary based on the country's epidemiological profile and data availability. The coverage section of this module highlights the UHC indicators that are collected through the RHIS and also provides RHIS-relevant proxies for selected UHC indicators.

Quality, safety and efficiency

Quality of care has multiple dimensions and adequate assessment requires other data sources in addition to routine facility data. However, the RHIS can provide data that allow an assessment of some aspects of quality, e.g. the extent to which timely and appropriate treatment was initiated (e.g. malaria, HIV) or treatment led to successful outcomes (e.g. TB), or the services succeeded in "retaining" the clients for preventive purposes (ANC/delivery, child immunization. Institutional mortality rates and complication rates, as well as the availability of essential resources, are also measures of the quality of health services. The quality indicators provided in this section represent a limited number of quality tracers across a range of programmes and services. These indicators should be complemented by data from other sources if an in-depth quality of care assessment is required.

3. Assessing the data quality

The access, coverage and quality indicators in this module span a wide range of programme areas and several indicators have specific data quality issues that are addressed in the programme-specific modules. For example, data quality issues specific to a TB indicator will be found in the data quality section of the TB module (Guidance for TB Managers). Data analysts, monitoring and evaluation staff and district managers therefore need to understand data quality issues across the range of different programme areas. Information on data quality should be presented in the same dashboard or report as the access, coverage and quality data, in order to help the reader in understanding the strengths and limitations of the data and the way it should be interpreted.

Access, coverage and service quality data are assessed using the standard data quality review dimensions:

Completeness and timeliness

- Completeness and timeliness of report submission
- Completeness of data elements

Internal consistency

- Presence of outliers
- Consistency of data over time, including seasonal variations, e.g. in service utilization
- Consistency between data elements/indicators, e.g. negative immunization dropout rates, vaccine doses given versus vials used

External consistency with other data sources

- Consistency between RHIS data and population-based surveys (access and coverage)
- Consistency between RHIS data and other methods of service quality assessment

External comparison of population data

- Consistency between the population estimates used to calculate facility-based access and coverage indicators, and other sources of population estimates

4. Core facility indicators for access, coverage and quality

Core Indicators	Definition	Disaggregation*
	ACCESS	
1.Service-specific availability	1) Number of health facilities offering specific services per 10 000 population N: number of facilities offering the service X 10 000 D1: total population OR 2) Percentage of facilities offering the service N: number of facilities offering the service X 100 D2: total number of facilities (Specific service may include: general outpatient curative services; specific services: e.g. HIV; TB; NCD; mental health; general maternal child health services, immunization, basic emergency obstetric and neonatal care (BEmONC), comprehensive emergency obstetric and neonatal care (CEmONC); basic and comprehensive surgical care, etc.)	Facility type Facility ownership
2.Outpatient service utilization	Number of outpatient department (OPD) visits per person per year N: Number of new and re-visits to OPD in a year D: Population	Age (<5, >5) Sex
3.Hospital admission rate (Inpatient utilization)	Number of hospital admissions per 100 population per year N: Number of hospital new and re-admissions in a year X 100 D: Population	Age (<5, >5) Sex
4.Caesarean section rates	Percentage of deliveries by caesarean section a) Population C-section rate: N: Number of caesarean sections X 100 D1: Estimated number of live births in the population b) Facility C-section rate: N: Number of caesarean sections X 100 D2: Number of deliveries in health facilities	Age (10-14;15-19; 20+)
5.Surgical volume	Number of surgical procedures undertaken in an operating theatre per 100 000 population per year N: Number of surgical procedures in a year X 100 000 D: Population (A surgical procedure is defined as the incision, excision, or manipulation of tissue that needs regional or general anaesthesia, or profound sedation to control pain.)	Procedure type; Emergency, elective

COVERAGE		
1. Contraception first time users (UHC proxy)	Persons who accept for the first time in their lives a contraceptive method N: Persons who accepts a modern family planning method for the 1st time	Age (10-14, 15-19, 20+) Sex
2. Antenatal client 1st visit before 12 weeks gestation	Percentage of antenatal clients with 1st visit before 12 weeks N: Number of antntenatal client 1st visits before 12 weeks D: Number of antenatal client 1st visits	Age (10-14, 15-19, 20+)
3. Deliveries in health facilities (UHC related)	Percentage of deliveries that take place in a health facility N: Number of deliveries in a health facility X 100 D: Number of live births in the population	Age (10-14, 15-19, 20+)
4. DPT3 coverage (UHC) Also coverage of other vaccines	Percentage of the target population that received the third dose of DPT3 containing vaccine N: Number of infants less than one year of age receiving the third dose of diphtheria-tetanus-pertussis vaccine X 100 D: Estimated number of infants less than one year of age (surviving infants)	
5. Antiretroviral therapy (ART) coverage (UHC)	Percentage of persons living with HIV that are currently receiving ART (at the end of the specified reporting period) among the estimated number of PLHIV N: Number of adults and children who are currently receiving ART at end of the reporting period X 100 D: Estimated number of adults and children living with HIV	Age (<15; 15+) Sex (m, f, TG) Key populations
6. TB notification rate (UHC related)	TB cases notified in a specified time period, usually one year, per 100,000 population N: Number of TB cases notified in a specified time period x 100,000 D: Estimated population in the same time period	By case type: pulmonary: bacteriologically confirmed or pulmonary clinically diagnosed; By treatment history: new and relapse (incident cases) or previously treated, excluding relapse
7. Malaria diagnostic testing ratio	Percentage of suspected malaria cases that had a diagnostic test for malaria N: Number of malaria tests performed x 100 D: Number of suspected malaria cases (Malaria tests = Number of RDT + number of microscopy Suspected malaria cases = Number of malaria tests performed + Number of presumed cases of malaria reported)	Microscopy , RDT Age (<5, 5-14, 15+)
8. Hypertension treatment initiation (UHC related)	INDICATOR PRESENTED AS DRAFT FOR DISCISSION: Number of people started on treatment for hypertension	Age Sex
9. Diabetes treatment initiation (UHC related)	INDICATOR PRESENTED AS DRAFT FOR COMMENT: Number of people started on treatment for diabetes	Agw Sex
10. Cervical cancer screening (UHC related)	RHIS INDICATOR IN DEVELOPMENT Number of women aged 30-49 years that were screened for cervical cancer in a reporting period	Age

QUALITY, SAFETY AND EFFICIENCY		
1. Antenatal client syphilis screening	Percentage of antenatal clients screened for syphilis N: Numbr of antenatal clients screened for syphilis X 100 D: Number of antenatal client 1st visits	Age (10-14, 15-19, 20+)
2.Immunization drop-out rates	Percentage of infants who received DPT1 but did not receive DPT3 vaccination N: (DPT1 doses – DPT3 doses) x 100 D: DPT1 doses Percentage of infants who received BCG but did not receive the first dose of measles vaccination N: (BCG doses – MCV1 doses) x 100 D: BCG doses Percentage of infants who received MCV1 but did not receive MCV2 N: (MCV1 doses - MCV2 doses) x 100 D: MCV1 doses	
3. HIV clinical cascade	Number of persons newly diagnosed with HIV vs Number of persons newly diagnosed with HIV that initiated ART vs Number of persons retained on ART after a specified time period among those that initiated ART	Age (<1, >1) Sex (M,F, TG) Special populations (KPs) Specified duration (current/ever, 12, 24, 36, 48, 60 months)
4. TB treatment success rate (UHC proxy)	Percentage of TB cases successfully treated (cured plus treatment completed) among TB cases notified to national health authorities during a specified time period, usually one year. N: Number of TB cases notified in a specified period time period that were successfully treated X 100 D: Number of TB cases notified in same period	Refer to TB module for recommended disaggregations
5. Confirmed malaria cases treated with ACT (UHC proxy)	Percentage of confirmed cases of malaria that receive first-line antimalarial treatment: artemisinin-based combination therapy (ACT) N: Number of confirmed cases of malaria treated with ACT x 100 D: Number of confirmed cases of malaria (Number of confirmed cases = number of RDT positive cases + number of microscopy positive cases)	RDT, microscopy; Age (<5, 5-14, 15+); Geographic area / residence / focus; Facility/community
6. Bed occupancy rate (BOR)	Percentage of available beds that were occupied over a specified time period N: Number of occupied bed-days X 100 D: Total number of available bed-days	Facility type
7. Average length of stay (ALOS)	Average number of days that patients spend in hospital over a specified time period N: Number of occupied bed-days D: Number of admissions (Admissions = discharges + deaths)	Facility type

5. Core analysis

5.1 ESSENTIAL SERVICES DASHBOARDS

Purpose

The access-coverage-quality dashboards provide a cross-cutting view of across a range of essential health services. The dashboards present a set of tracer indicators that intend to monitor key service delivery aspects and to highlight areas that may require further investigation. The tracer indicator set can be adapted to reflect country priorities, e.g. to include indicators used to monitor the national health strategic plan.

The dashboards can show trends for each service over time as well as the progress over time of different services in relation to each other. Such comparison allows a manager to see which programmes have achieved gains and where progress is lacking.

Dashboards can also be created to enable comparisons among geographic areas or facilities for a specific time period. Furthermore, the dashboards can be created for different levels of the service delivery system and adapted to the monitoring and management needs at each level: national level, subnational level (e.g. district), and individual facility.

Analysis

Summary table 1: Essential Health Services – National level

Indicator	2015	2016	2017	2018
Access				
OPD visits per person per year (n)	0.9	1.1	1	1
Admissions per 100 persons per year (n)	4.2	4.6	4	4
C-section rate - population (%)	2.6	3	3.4	3.6
C-section rate - facility %	6.1	6.2	6.2	6.9
Major surgeries per 100,000 population (n)	161	156	124	98
Coverage				
Contraception first time users (n)	19,783	20,652	18,601	21,714
Antenatal client 1st visit <12 weeks (%)	17	22	21	24
Delivery in facility coverage (%)	42	47	53	50
BCG coverage (%)	84	83	81	77
DTP3 coverage (%)	88	86	86	79
MR1 coverage (%)	84	85	73	67
MR 2 coverage (%)	10	23	27	25
ART coverage (% estimated PLHIV)	80	50	58	65
TB notification rate per 100,000 population	63	58	44	46
Suspected malaria cases tested (%)		52	90	65
Hypertension treatment initiation* (n)	141,598	159,117	168,738	178,032
Cervical cancer screening* (n)	13,468	15,876	20,853	25,981
Quality, safety and efficiency				
Antenatal client syphilis screening rate (%)	52	56	57	57
DPT 1-3 dropout (%)	9	9	9	9
BCG-MR1 dropout (%)	15	12	8	10
MR 1-2 dropout (%)	89	73	64	62
HIV tests positive - new (n)	208,407	161,479	152,353	128,856
New on ART (n)	59,569	99,596	77,338	102,363
Retained on ART for 12 months (n)			38271	75586
TB treatment success rate (%)	81	84	83	87
Confirmed malaria cases given ACT (%)			15	29
Bed occupancy rate (%)	45	55	51	42
Average length of stay (days)	2.7	2.9	2.8	2.2

*draft indicator for discussion

Summary table 2: Essential Health Services – District level 2018

Indicator	Baringo	Bungoma	Busia	Kakamega	Siaya	Trans Nzoia	Turkana	Vihiga	West Pokot
Access									
OPD visits per person per year (n)	1.2	0.8	1.4	1.4	1.4	1	0.36	1	1.2
Admissions per 100 persons per year (n)	2.4	4.6	4.4	4.9	10.6	2.4	1.3	3.6	2.9
C-section rate - population (%)	3.8	4	2.9	4	2.8	3.7	3.1	3.5	3.3
C-section rate - facility %	9	7	6	7	5	12	6	8	7
Major surgeries per 100,000 population (n)	59	165	143	87	128	148	31	88	60
Coverage									
Contraception first time users (n)									
Antenatal client 1st visit <12 weeks (%)									
Delivery in facility coverage (%)	43	56	51	59	59	30	56	44	42
BCG coverage (%)	62	72	72	81	66	62	146	59	94
DTP3 coverage (%)	82	76	81	83	86	75	83	81	67
MR1 coverage (%)	66	63	69	77	78	57	59	66	69
MR 2 coverage (%)	40	21	30	35	28	16	12	36	19
ART coverage (% estimated PLHIV)	47	91	98	87	55	37	25	73	50
TB notification rate per 100,000 population									
Suspected malaria cases tested (%)	44	74	53	66	62	74	69	74	68
Hypertension treatment initiation* (n)									
Cervical cancer screening* (n)									
Quality, safety and efficiency									
Antenatal client syphilis screening rate (%)	58	68	54	51	71	63	40	66	47
DPT 1-3 dropout (%)	8	9	5	7	5	11	11	4	16
BCG-MR1 dropout (%)	4	17	5	5	-4	17	7	-5	32
MR 1-2 dropout (%)	39	67	57	54	65	72	80	46	73
HIV tests positive - new (n)	1163	4016	4188	8401	13784	3535	2790	2504	808
New on ART (n)	835	4595	4930	9239	14161	2815	2533	2428	898
Retained on ART for 12 months (n)	709	2901	3410	5689	9838	4166	1561	1961	804
TB treatment success rate	75	78	84	89	87	81	85	80	75
Confirmed malaria cases given ACT (%)	5	28	13	10	77	53	86	31	101
Bed occupancy rate (%)	43	47	28	60	21	65	41	19	28
Average length of stay (days)	2.9	2.4	2.2	3.6	1	3.2	3	1.4	1.6

*draft indicator for discussion

5.2 ACCESS

Indicators of service availability and service utilization are used as measures of access.

1. Service-specific availability

Service-specific availability indicates the presence of a particular service and measures whether the service delivery system is able to meet the range of needs of the target population. Surgical volume and caesarean section rates may also provide a general indication of the availability of surgical services.

Sample list of health services for assessing service availability

Reproductive, maternal, newborn, child and adolescent health services:
- Family planning
- Antenatal care
- Basic emergency obstetric and neonatal care (BEmONC)
- Comprehensive emergency obstetric and neonatal care (CEmONC), post-abortion care
- Essential newborn care
- Immunization
- Child health preventative and curative care
- Adolescent health services

Infectious disease services:
- Malaria diagnosis or treatment
- Tuberculosis services
- HIV counselling and testing
- HIV/AIDS care and support services
- Antiretroviral prescription and client management
- Prevention of mother-to-child transmission of HIV
- Sexually transmitted infections diagnosis or treatment

Noncommunicable diseases services:
- NCDs diagnosis and management:
  Diabetes
  Cardiovascular disease
  Chronic respiratory disease
  Cervical cancer screening

Surgery services:
- Basic and comprehensive surgical care, including C-section, laparotomy, open fracture

Other services:
- Blood transfusion
- Laboratory capacity

Adapted from: WHO. 2018. Global Reference List of 100 Core Health indicators

The service availability indicators can be expressed in two ways:
(1) the percentage of health facilities that offer a specific service (e.g. 75% of all health facilities offer immunization services); OR
(2) the number of health facilities that offer a specific service per 10,000 population.

The population-based indicator is more meaningful if the denominator refers to the specific target population, e.g. the number of facilities offering antenatal care per 1,000 pregnant women is more meaningful than the number of facilities offering antenatal care per 10,000 population.

Different contexts may have different ways of expressing service availability, based on service delivery models and disease profiles. For some geographic areas, service-specific availability should match the disease profile. For example, service-specific availability for an area that is not endemic for malaria will be different from service-specific availability for an area with malaria. If HIV is highly concentrated in high-risk populations, a smaller proportion of facilities may be offering HIV services than in an area where HIV prevalence exceeds 2% in the general population.

Distribution of maternal and child health services, general outpatient curative services and services for noncommunicable diseases such as hypertension, diabetes, chronic respiratory disease and mental health conditions, should be fairly uniform across the country. However, in some contexts NCD and mental health services are often only provided at hospitals.

Percentage of facilities offering specific services: Afghanistan 2014

Service/Type of HF	HSC	BHC	CHC	DH
Blood Transfusion	2%	6%	50%	86%
Laboratory	5%	35%	90%	93%
BEmOC	68%	74%	73%	
CEmOC			7%	87%
DOTS service	47%	66%	87%	92%
Ambulance		4%	63%	83%
TB diagnosis and treatment			61%	86%
Approp. Waste Disposal	28%	47%	55%	69%
EPI (Penta)	32%	97%	100%	99%
ANC	85%	88%	97%	100%
Deliveries	62%	71%	87%	96%
Inpatient			28%	95%
Surgical Operations			6%	84%

HSC Health Sub-Centre
BHC Basic Health Centre
CHC Comprehensive Health Centre
DH District Hospital

Source: Mòdol X, Afghanistan Ministry of Public Health, European Union. Afghanistan Joint Health Sector Review 2015 (Afghanistan HMIS database)

2. Outpatient service utilization

Number of outpatient department (OPD) visits per person per year	N: Number of new and re-visits to OPD in a year D: Population

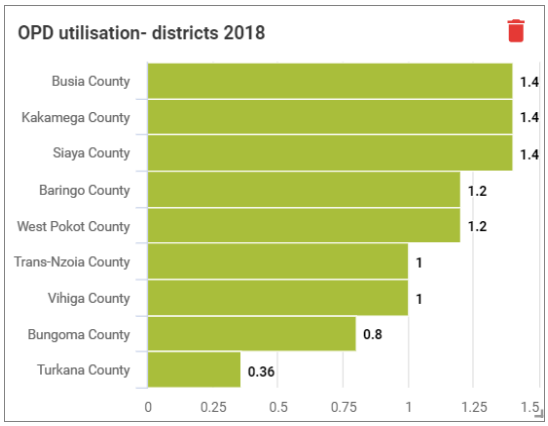
Utilization reflects the extent to which people use services for any purpose and is a crude measure of access. Utilization may be influenced by demographics, disease profiles and socio-cultural factors. Low rates, however, are usually indicative of poor access, availability and/or quality of services. For example, several countries have demonstrated that outpatient department rates go up when constraints to using health services are removed, such as by bringing services closer to the people or reducing user fees. In contrast, once rates exceed an uncertain threshold, the number of visits is no longer an indicator of the strength of the health services

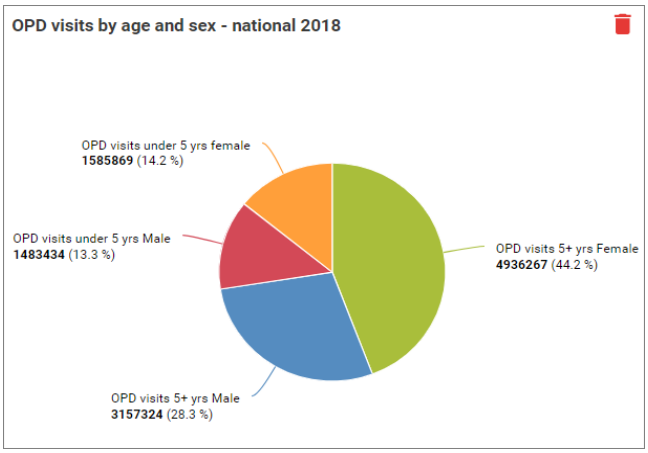
In general, OPD utilization rates should include all types of consultations for curative care, but should not include preventive care, e.g. antenatal care and immunization visits. The OPD utilization indicator usually represents the sum of both new and re-visits. However, the analysis should also present them separately, as the proportion of all visits that are re-visits may vary over time. Case definitions for new visit versus re-visit for specific diagnoses should be available. If the revisit proportion is large (e.g. 20%) but the overall OPD visit rate is low, this suggests that a large proportion of the population have very poor access, but some have good access. i.e. some individuals visit multiple times while others do not use the facility at all.

Benchmarking OPD visit data is difficult as both over- and underutilization may occur. In most European Union (EU) Member States, the number of physician consultations per person per year ranges between 4.1 and 9.9[5]. WHO's service availability and readiness assessment (SARA) uses five outpatient visits per person per year as a benchmark[6].

[5] Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_activities_statistics_-_consultations
[6] Available at: http://www.who.int/healthinfo/systems/sara_reference_manual/en/

Outpatient service utilization





3. Inpatient service utilization (Hospital admission rate)

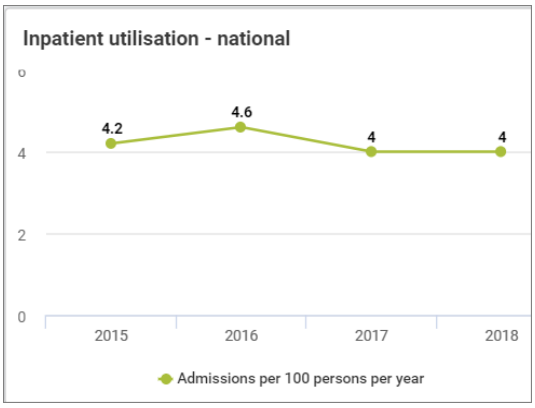
Number of inpatient admissions per 100 population per year	N: Number of new and re-admissions in a year X 100 D: Population

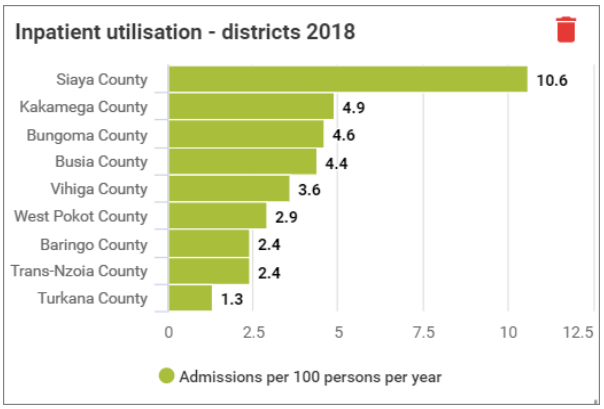
The number of admissions is calculated as the sum of discharges and deaths. Discharges are used, as they are linked with the final diagnosis at discharge, while admission diagnoses are often presumptive. Discharges include: authorized discharges, transfers out and unauthorized discharges ("absconders"). Inpatient admission rate includes all inpatient admissions except those for delivery. The proportion of admissions that are re-admissions is also useful information and if presented by diagnosis can provide information on the quality of care.

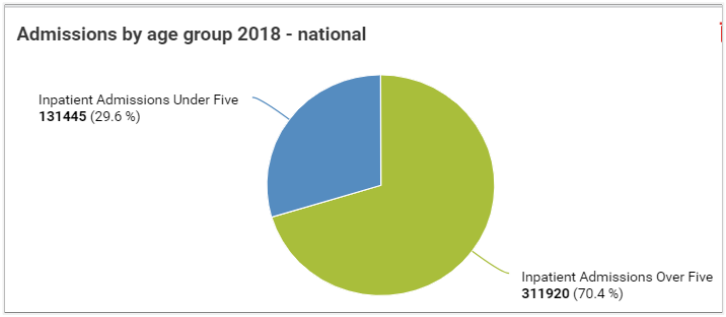
In low and middle income countries with high disease burdens, a low inpatient admission rate suggests limited access to inpatient services. In health systems that are hospital-oriented (e.g. Central Asian Republics and some eastern European countries) admission rates are generally high.

High inpatient admission rates can also indicate overall poor quality of care in primary care/outpatient settings, especially for those conditions that can be treated through outpatient care or where early intervention can prevent complications, e.g. diabetes, hypertension, asthma. Re-admission rates are a further indicator of the quality of care.

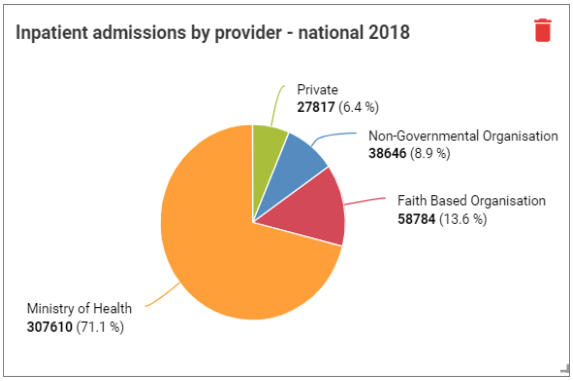
Similarly to outpatient utilization rates, it is difficult to benchmark inpatient admission rates. In OECD countries with ageing populations, there are about 15 discharges per 100 population per year.[7] WHO's SARA survey uses 10 discharges per 100 people per year as a benchmark[8].

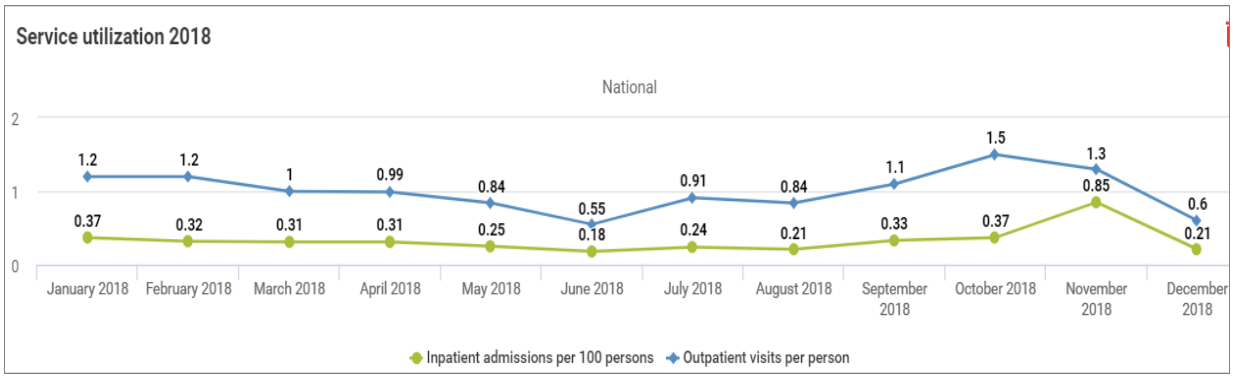






[7] Available at: http://data.euro.who.int/hfadb/
[8] Available at: http://www.who.int/healthinfo/systems/sara_reference_manual/en/


Inpatient admissions by provider - national 2018
Private
27817 (6.4 %)
Non-Governmental Organisation
38646 (8.9 %)
Faith Based Organisation
58784 (13.6 %)
Ministry of Health
307610 (71.1 %)


Service utilization 2018
National
2
1
0
1.2
1.2
1
0.99
0.84
0.55
0.91
0.84
1.1
1.5
1.3
0.6
0.37
0.32
0.31
0.31
0.25
0.18
0.24
0.21
0.33
0.37
0.85
0.21
January 2018
February 2018
March 2018
April 2018
May 2018
June 2018
July 2018
August 2018
September 2018
October 2018
November 2018
December 2018
Inpatient admissions per 100 persons
Outpatient visits per person

4. Caesarean section rates

Percentage of deliveries by caesarean section: a) Population C-section rate: b) Facility C-section rate:	 N: Number of caesarean sections X 100 D1: Estimated number of live births in the population N: Number of caesarean sections X 100 D2: Number of deliveries in health facilities

C-section rates may be calculated in two ways:
(1) *Population C-section rate* is calculated by dividing the total number of C-sections in a year by the estimated total number of *live births* in the population. (Live births are the standard denominator for this indicator, although sometimes deliveries or births are used. Deliveries are the most logical choice, as it requires only one caesarean section to deliver twins. However, the difference between delivery and live birth-based C-section rates is very small: the delivery-based C-section rate is about 2% lower, or even less. This difference is further reduced because some stillbirths are delivered by C-section, so the relative difference is likely less than 1%.)

(2) *Facility C-section rate* is calculated by dividing the total number of C-sections by the total number of deliveries in health facilities.

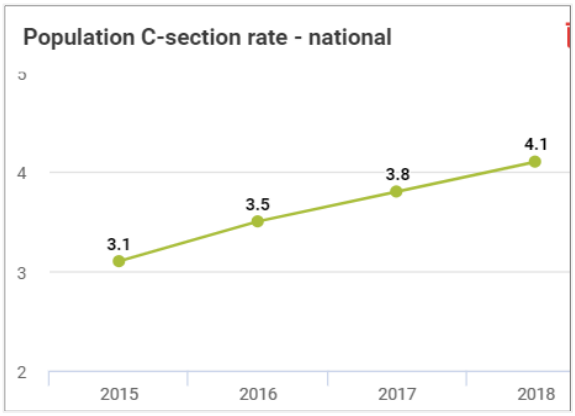
The population C-section rate can provide information on the access to C-section services: low rates may indicate access problems, often influenced by long distances between the women needing a C-section and the facilities. Population C-section rates greater than 15% may suggest overuse of the procedure for non-emergency reasons, i.e. elective C-sections. Excessive use unnecessarily exposes women to anesthesia and surgery with their concomitant risks.

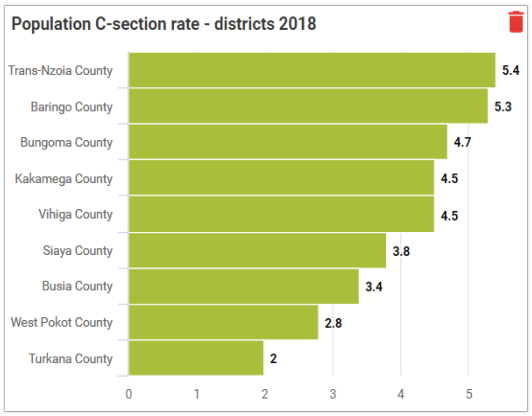
The facility C-section rate provides information on the capacity and practices of facilities to provide a C-section once a woman has reached the facility. For example, low population C-section rates with high facility C-section rates suggest that there are too few facilities, but those that can perform C-sections have high capacity. C-section rates of individual facilities require interpretation in relation to the facility level and the case mix, e.g. higher-level referral facilities are more likely to receive complicated cases requiring C-sections. However, comparisons of facility C-section rates among facilities and among managing authorities can serve as pointers to unacceptably high rates that require further investigation. Note the table showing a comparison of C-section rates by facility in Kakamega.

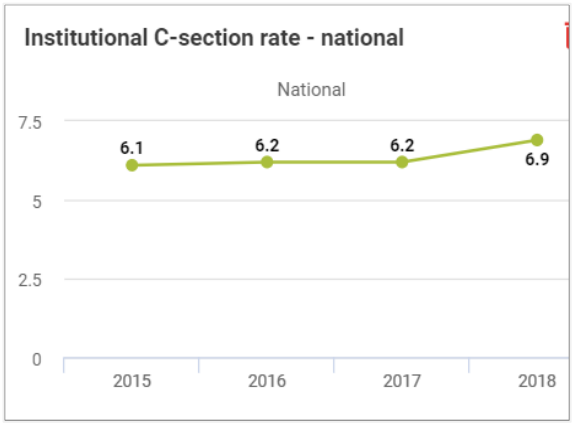
C-section rate by facility - Kakamega District 2018

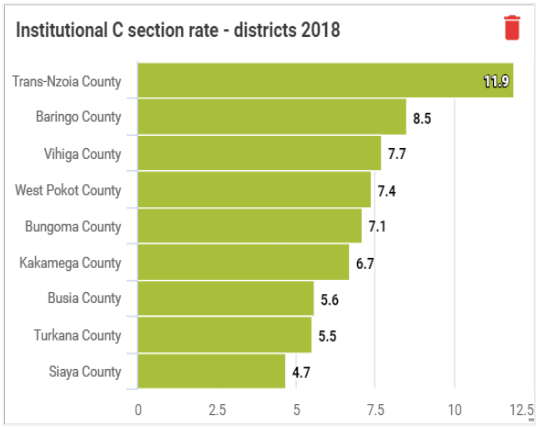
	2018		
Organisation unit / Data	C-section institutional	Caesarian Sections	Delivery in facility
Kakamega Central NH	43.5	74	170
Kakamega PGH	18.9	764	4 038
Nala Maternity and NH	33.2	263	792

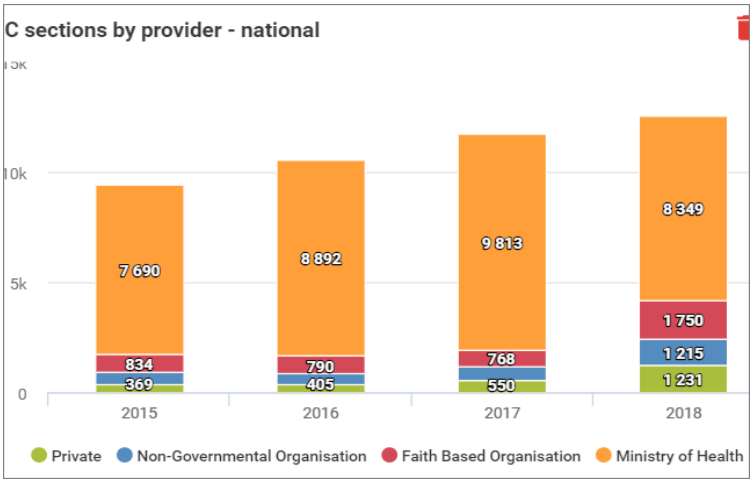
Caesarean section rates











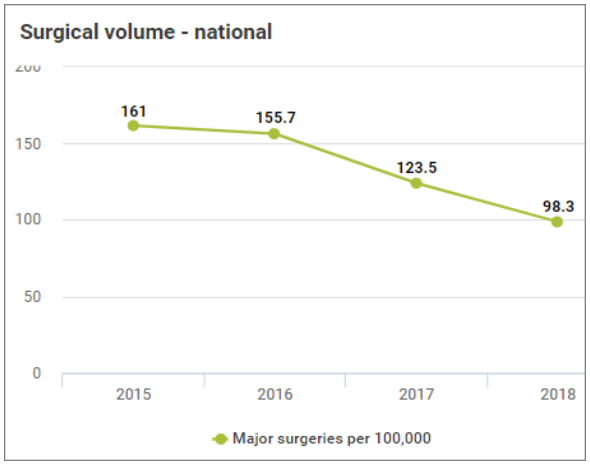
5. Surgical volume

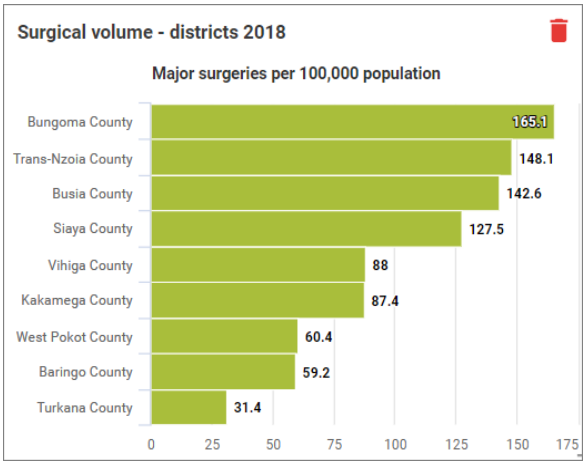
Number of surgical procedures in an operating theatre per 100,000 population per year	N: Number of surgical procedures in a year X 100,000 D: Population

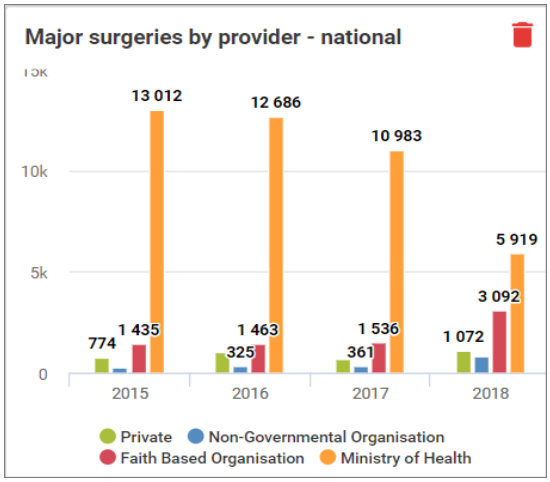
The numerator requires standardized reporting of the intervention: a surgical procedure is defined as the incision, excision, or manipulation of tissue that needs regional or general anaesthesia, or profound sedation to control pain. It usually involves an overnight stay in hospital. This may also be referred to as major surgery in some contexts. The most common surgical interventions in secondary hospitals are generally caesarean section, hernia operation and surgery related to fractures. The denominator is the total population.

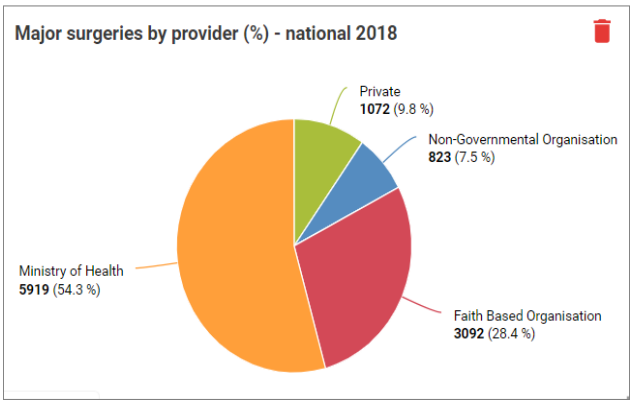
When availability of surgical care is low, conditions that can be treated easily can become conditions with lasting disability or high fatality rates. The Lancet Commission on surgery set a target for 5000 procedures per 100,000 population by 2040 (or 5%) as a met need for surgical and anaesthesia care.

Surgical volume









5.3 COVERAGE OF ESSENTIAL HEALTH SERVICES

Purpose

Coverage is the percentage of a target population that receives a particular service. Indicators of service coverage therefore measure the extent to which the target population has received the health services they need. High levels of coverage also reflect good access to services. Low coverage levels may reflect access problems and/or poor perceptions of service quality.

The indicators in this section reflect a tracer set for coverage of essential interventions across a range of health services. The set includes indicators that can contribute to UHC monitoring. Most of the UHC indicators are based on definitions developed for population-based surveys. However, similar indicators derived from routine facility data can provide useful information to assess coverage levels and trends in the time intervals between surveys, as well as showing subnational comparisons which surveys may not always provide. Furthermore, analysis of the facility indicators in conjunction with survey data may provide additional insights.

Analysis

This section describes basic coverage calculations using available population data and the related target group estimates.

The main challenge in coverage calculations involves obtaining the correct denominator – the target population. Official national population estimates are usually projections based on the last census and the official annual population growth rate. However, these projections may be problematic when, for example: the last census was conducted more than 10 years ago; the census methodology did not meet international standards or did not provide sufficient subnational estimates, e.g. for districts; there have been substantial increases or decreases in the total population, e.g. people migrating into or out of the country; changes in population distribution within the country, e.g. urbanization.

Denominators based on census population projections often result in coverage rates well over 100%, especially at subnational level. While such rates may in some cases be true (e.g. people living in one subnational area may use services in a neighboring area), the cause is often underestimation of the target population due to incorrect census projections. The opposite (coverage that is much lower than in reality) probably also happens, but is much more difficult to detect than coverage of over 100%.

In general, when using population-based indicators the following need to be noted:

- Population-based denominators should only be used at national level or sub-national levels that have accurate population data. (i.e. population based indicators are not recommended at health facility level as accurate target population estimate are rarely accurate at the level of facility catchment populations.)
- Accurate estimates of target denominators need to be available. (The formulae for calculating the target denominator population for certain age groups are often provided by the national statistical office.)
- Reporting from facilities that serve the target denominator population needs to have very high reporting rates (e.g. above 90%) and reflect all facilities serving that population;
- The quality of the data reported must be high and consistent over time.

Various methods have been proposed to improve denominator estimations and coverage calculations. These are discussed in Annex 1. Furthermore, Module 1 (General Principles) of the toolkit also addresses overall data quality assessment, adjustment and denominator estimation.

The population numbers not reached (e.g. unvaccinated children) are also an important instrument for public health planning and program implementation. The numbers not reached depend on coverage and population size and can be computed as:

Number not reached with a specific intervention = 100 – (Coverage x target population)

The numbers not reached should be presented by district or other subnational unit.

1. Contraceptive first time users

Number of persons who accept for the first time in their lives a modern contraceptive method

This indicator reflects the success of the health services in attracting new clients for contraceptive use. It excludes clients that switch contraceptive methods or change to a different provider of contraceptive services.

Visualizations:

- Line chart with annual trends
- Age group disaggregation

2. Antenatal client 1st visit before 12 weeks gestation

Percentage of antenatal clients with 1st visit before 12 weeks	N: Number of antenatal client 1st visits before 12 weeks D: Number of antenatal client 1st visits

In practice, the number of pregnant women with at least one ANC visit is the number of women that register for ANC for the first time in the current pregnancy. This number may be obtained by counting the new entries in the ANC register for the specified time period, or by using a tally sheet. (Daily tally sheets are often used.) The number of ANC visits before 12 weeks is counted in the same way.

Visualizations:

- Line chart with annual trends
- Bar chart with district comparisons
- Age group disaggregation

3. Deliveries in health facilities

Percentage of deliveries that take place in a health facility	N: Number of deliveries in a health facility X 100 D: Number of live births in the population

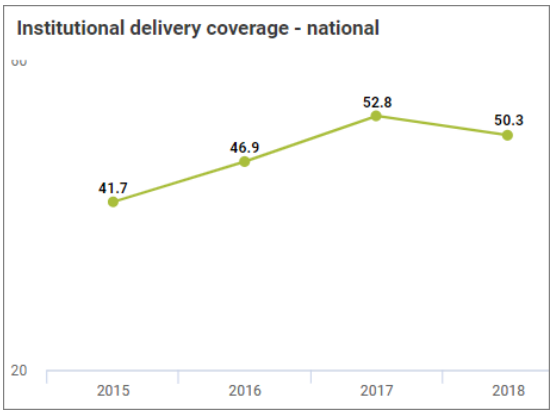
The percentage of deliveries in health facilities is one of the most objectively measurable indicators. The numerator is the number of deliveries in health facilities; the denominator is the estimated number of live births in the population.

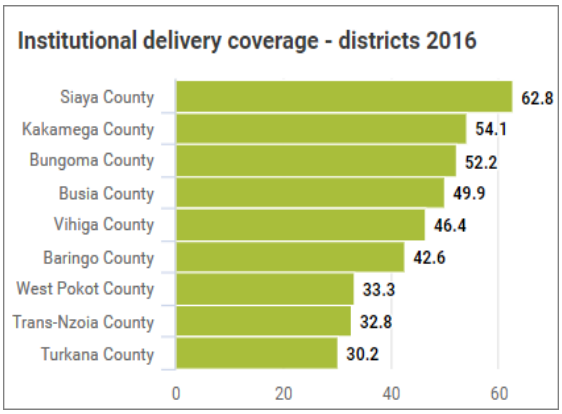
Increasing in the percentage of deliveries that take place in facilities is one of the strategies for reducing maternal and infant mortality and stillbirths.

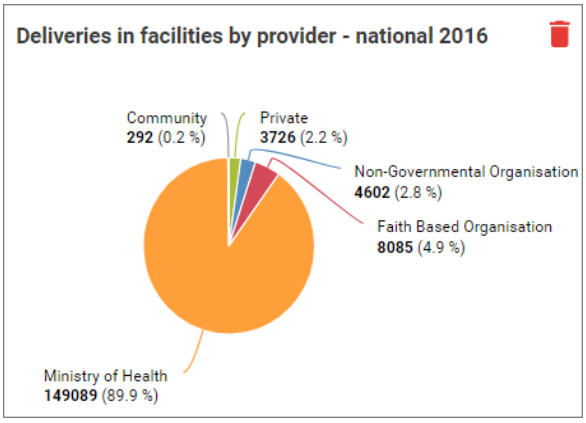
Skilled attendance at birth is often preferred as an indicator, but is less objectively measurable. Although health facility delivery does not equate fully with skilled attendance, and some community deliveries have skilled attendance, the institutional delivery and skilled attendance indicators are very

highly correlated in almost all countries. Facility delivery rates can therefore be used as a proxy for skilled attendance. Similar to other facility-based coverage indicators, it is important that deliveries in privately owned facilities are included in the calculation. If the data from these providers are not available, this should be clearly stated in reports on facility delivery coverage.

Deliveries in health facilities







4. Immunization coverage

DPT3 coverage*:* Percentage of the target population that received the third dose of diphtheria-tetanus-pertussis containing vaccine (DPT3) (Also coverage of other vaccines)	N: Number of infants less than one year of age receiving the third dose of DPT*3* X 100 D: Estimated number of infants less than one year of age (surviving infants)

The numerator is obtained from the immunization register or from a tally sheet that documents the number of children vaccinated each day per dose number. Doses administered during both fixed and reach services are included. Vaccination campaign data are not included in facility-based coverage calculations. The denominator is obtained by calculating the estimated number of surviving infants, based on population projections and a formula usually provided by the national statistical office. As noted previously, the accuracy of denominators may be problematic. (Refer to Annex 1 and Module 1 and Module 1 for approaches to adjusting denominators.)

The number of infants given DPT3 before the age of one year can be checked for consistency against other vaccinations, notably DPT first dose (DPT1). Comparison of the coverage of a number of tracer vaccine doses can also provide insights into factors affecting coverage at different points in the immunization schedule. Coverage for early doses, e.g. DPT1, is used as a measure of access to immunization services, while a drop out from DPT1 to DPT3 may reflect perceptions of service quality. Coverage of measles 1st and 2nd doses may reflect the quality of health education and public awareness as these doses are provided several months after the initial series of vaccinations. The charts provided here use BCG, DPT1, DPT3, Measles 1 and Measles 2 as tracers of immunization programme performance.

When denominator estimates are unavailable or potentially inaccurate, it may be useful to track the trends of doses administered over time, including comparison with the same month or quarter in previous years. This may be particularly useful at lower subnational levels and facilities. At facility level, an immunization monitoring chart is often used to track the numbers of doses administered against monthly and cumulative targets (based on the target population).

Comparison of facility-based DPT3 coverage data with survey data is also critical, as there may be widespread over-reporting, especially if there are incentives tied to programme performance.

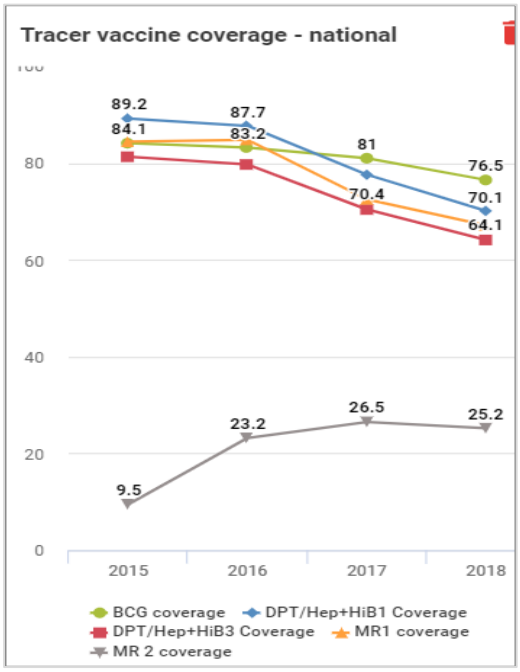
Example - Comparison of facility based DPT3 coverage with survey data:

Infant DTP3 Coverage, 1984-2011 (Official Country, WHO/UNICEF and Survey Estimates)

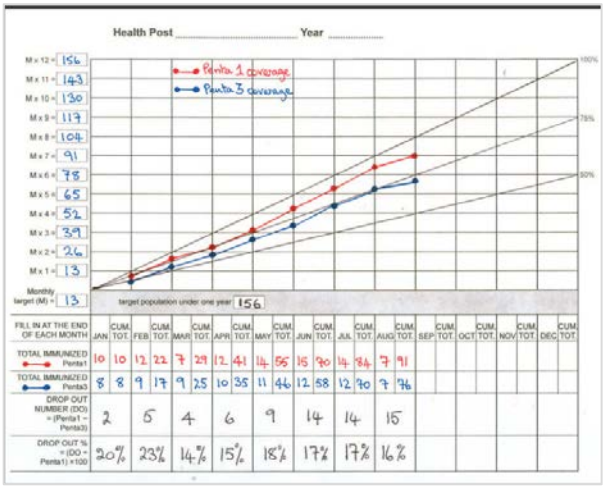
Source	1984	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
Official Country (3)	--	42%	84%	63%	76%	80%	81%	85%	75%	83%	88%
WHO/UNICEF (1)	**58%**	**84%**	**94%**	**82%**	**76%**	**80%**	**81%**	**85%**	**84%**	**83%**	**88%**

(4) 1993 DHS: 85%
(4) 1998 DHS: 76%
(5) 2000 MICS: 76%
(4) 2003 DHS: 71%
(4) 2007 DHS: 86%

Immunization coverage



Facility immunization monitoring chart:



Tracer vaccine coverage - districts

Organisation unit / Data	2016 BCG coverage	DPT/Hep+HiB1 Coverage	DPT/Hep+HiB3 Coverage	MR1 coverage	MR 2 coverage
West Pokot County	95.8	113.3	93.4	87.1	10.5
Bungoma County	95.3	92.8	84.7	88.8	25.9
Kakamega County	83.2	89.7	84.6	95.3	27.2
Busia County	77.1	85.8	80.7	91.8	30.8
Siaya County	77	83.2	78.7	82.6	24.4
Vihiga County	71.5	82.6	77.2	87.9	47.3
Turkana County	98.5	88.1	73.2	78.8	6.8
Baringo County	67.8	77	70.2	72.3	20.4
Trans-Nzoia County	73	76.6	68.7	66.5	14

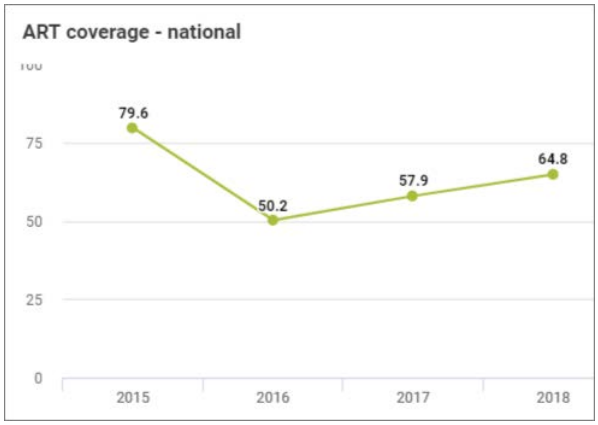
5. Antiretroviral therapy (ART) coverage

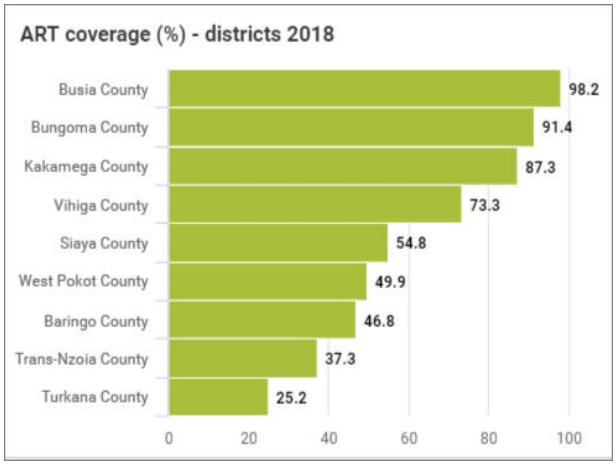
Percentage of persons living with HIV (PLHIV) that are *currently receiving ART (at end the of the specified reporting period) among the estimated number of PLHIV*	N: Number of PLHIV currently receiving ART X 100 D: Estimated number of PLHIV

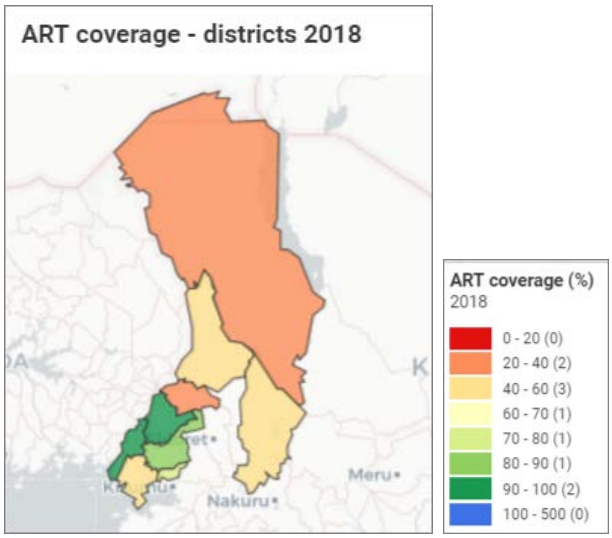
The numerator is the number of people currently receiving antiretroviral therapy (ART). It is critical to define the meaning of "currently receiving ART (or: currently on ART) at the end of the reporting period" and exactly how and from which document(s) this will be counted. The definition may depend on how often people on treatment are expected to visit the health facility to collect their ART medicines. For example, if the medicines are provided on a monthly basis, the number of ART medicine pick-ups for the month can be counted (if this excludes possible additional pick-ups during the month). For further details, please refer to the HIV module.

The denominator is based on estimates of the total number of persons living with HIV. Estimates of PLHIV for national and, increasingly, also for subnational levels, are provided annually by UNAIDS. The estimates are determined through use of a software product called Spectrum.

Antiretroviral treatment coverage







6. TB case notification rate

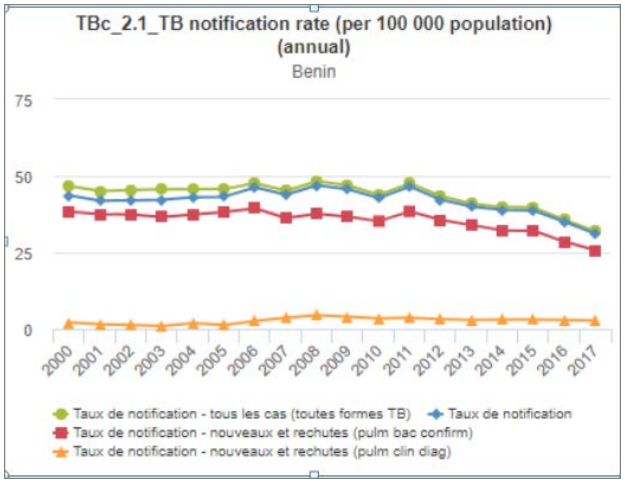
TB cases notified in a specified time period, usually one year, per 100,000 population	N: Number of TB cases notified in a specified time period *x* 100 000 D: Estimated population in the same time period

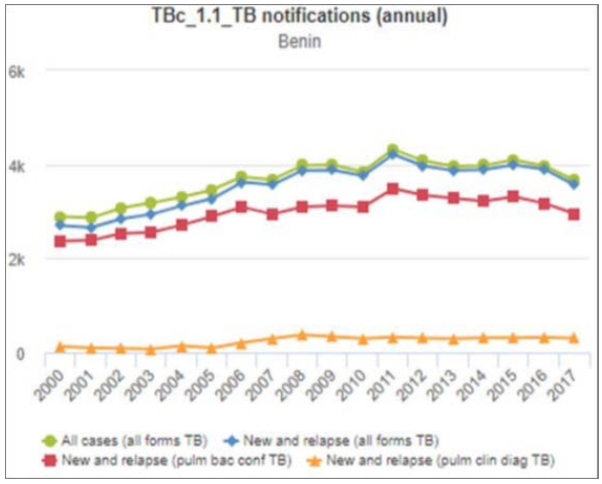
The numerator includes all TB cases notified during the year, including new, relapse and previously treated cases. The same population data issues as noted previously also apply to the denominator for this indicator.

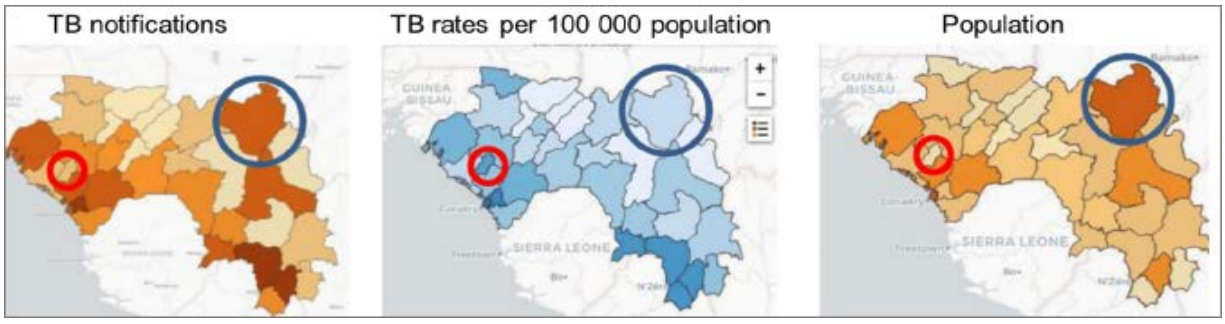
In most settings, this analysis is limited to national, regional and district levels as population estimates for health facility catchment areas are not available. When comparing geographic areas, case notification rates should be examined alongside the number of TB notifications. Notification numbers are important for understanding the overall TB burden and for resource planning, while rates per population provide a better indication of populations at high risk of TB and help to target interventions.

In the maps below, the blue circles indicate a district that has a high number of TB notifications (numerator) but a lower TB case notification rate due to a high population number (denominator). The red circles show a district with a low number of TB notifications but a high TB notification rate due to a low population number.

TB case notification rate







7. Confirmed cases of malaria treated with ACT

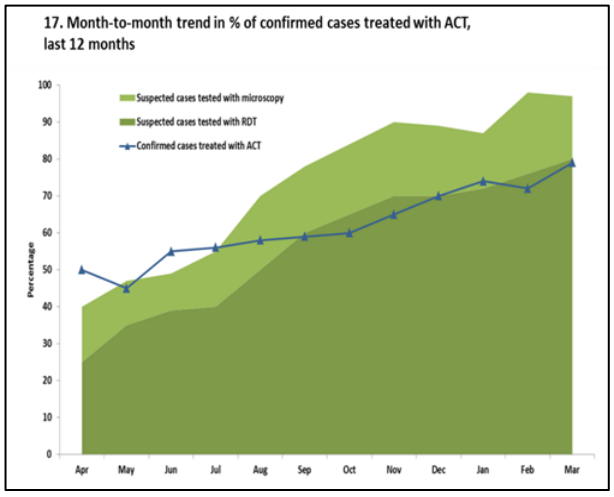
Percentage of confirmed malaria cases that receive first-line antimalarial treatment: artemisinin-based combination therapy (ACT)	N: Number of confirmed cases of malaria treated with ACT x 100 D: Number of confirmed cases of malaria

This indicator can provide information on quality of care and may also point to problems with the availability of ACT.

The number of confirmed malaria cases equals the number of RDT positive cases plus microscopy positive cases. Not all health information systems are able to generate reliable data on the percentage of confirmed cases treated with ACT. It is not sufficient to record total ACT treatments given and compare this with the number of positive cases, since it is possible that some patients who were given ACT were test negative while others were untested but suspected cases.

Reporting on this indicator should be possible if the register and the form for reporting aggregate data on each malaria test result (test positive, test negative, not tested) also disaggregate the data for each of these classifications into those given ACT and those not given ACT. Some countries have designed their general outpatient register and their general outpatient report to capture such data. Other countries have elected to introduce a separate register and a separate form for this. Gaps in such reporting may prevent the indicator from being calculated correctly.

Confirmed cases of malaria treated with ACT



8. Hypertension treatment initiation

Number of people started on treatment for hypertension

9. Diabetes treatment initiation

Number of people started on treatment for diabetes

The increasing global prevalence of NCDs such as hypertension and diabetes means that increasing numbers of people will require treatment. Most patients with hypertension can be treated in primary care or outpatient settings. Therefore it is important that routine health information systems start to address the need for NCD data.

The purpose of the indicators is to track the extent to which health services are detecting and treating people with hypertension and diabetes among people visiting health facilities. These indicators are presented as drafts for discussion. The limitations are recognized; however, they represent a starting point for contexts where little or no NCD data is reported from primary care/outpatient facilities.

Many countries capture the total number of OPD visits for hypertension and/or diabetes. However, this has limited value as the number of visits does not provide the number of patients receiving treatment as visit frequency may vary among patients and often depends on the frequency of medication supply. However, if the numbers of new hypertension or diabetes cases are captured separately from repeat visits (as is recommended for OPD morbidity reporting) it is possible to easily obtain the numbers of people started on treatment each month.

A limitation of this indicator is that people with NCDs may visit more than one health facility to obtain treatment and would therefore be counted twice. It is also important to track the number of people that are currently on hypertension/diabetes treatment. This requires a well-developed facility information system with individual patient records based on a system unique patient identifiers.

10. Cervical cancer screening

Number of women aged 30-49 years that were screened for cervical cancer in a reporting period

The UHC indicator refers to a woman ever having been screened and requires a population-based survey.

The RHIS can however provide reports on the number of women who have received a cervical cancer screening in the last year. Appropriate age disaggregation is needed for both numerator and denominator to be able to focus on the age group 30-49 years.

Work in developing a facility-based indicator for cervical cancer screening remains ongoing. There are challenges related to both the numerator and the denominator. The recommended frequency of screening may vary according to HPV status of the woman and is under discussion.

In the interim, reporting of trends in the numbers of women screened during a reporting period can be useful, especially if the country is working to expand availability and uptake of screening. The number of facilities that conduct screening is likely to be limited and high levels of completeness by those facilities is therefore essential.

5.4 QUALITY, SAFETY and EFFICIENCY OF HEALTH SERVICES

Purpose

The quality of health services is a critical component of UHC and is central to the effectiveness of interventions and their outcomes. Perceptions of quality also influence service utilization and coverage.

Quality of is a complex concept that encompasses multiple dimensions that can be assessed both directly and indirectly. Adequate assessment requires a variety of data collection methods other than the RHIS, e.g. health facility assessments for service availability and readiness, review of medication stock records, audit of clinical records, interviews and/or patient-provider observation. Some aspects of service quality can, however, be assessed through RHIS data and can highlight a need for further in-depth quality assessment.

Examples of quality related indicators that can be obtained through the RHIS:

- *Institutional mortality rates, case fatality rates* and *re-admission rates by diagnosis* are indicators of inpatient quality of care. Perioperative infection rates and incidence of adverse events following immunization (AEFI) are also measures of quality and safety of care. High-income countries use *admission rates for ambulatory conditions* such as diabetes and acute asthma as indicators of outpatient quality of care, as these admissions can be prevented through adequate outpatient care.
- Quality indicators also include those that measure the extent to which *standards of care* have been followed, e.g. the percentage of pregnant women that are tested for syphilis during antenatal care, or the percentage of HIV clients tested for TB.
- Another category of indicators that provides information on quality of care are those that consider the capacity of the health services to *retain patients and produce the expected results*, e.g. TB treatment success rate, ART retention rate and immunization drop-out rates.
- The *efficiency* of service provision may also be a reflection of the quality of services, for example, bed occupancy rate and length of stay in hospitals.
- Indicators that measure the *availability of health services resources* indirectly assess the quality of the service delivery system, e.g. if health facilities are understaffed or if there are prolonged stock-outs of certain medicines or diagnostics, it is unlikely that the quality of services is adequate.

The quality, safety and efficiency indicators presented in this section focus on standards of care, patient retention and treatment results. They represent a limited set of tracers across a number of programme areas.

Indicators for mortality and health services resources are discussed in Sections 2 and 5 of this module. This dashboard does not include impact indicators such as survival on ART, adverse effects following immunization and perioperative infection rates, all of which are indicative of the quality of care in health facilities. Further quality considerations are also presented in the programme-specific modules.

Analysis

1. Antenatal care (ANC) syphilis screening

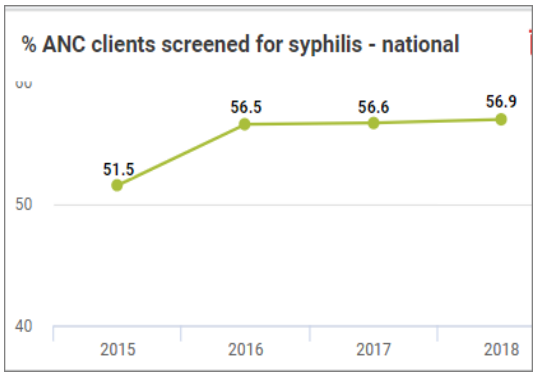
Percentage of antenatal clients screened for syphilis	N: Number of antenatal clients screened for syphilis X 100 D: Number of antenatal client 1st visits

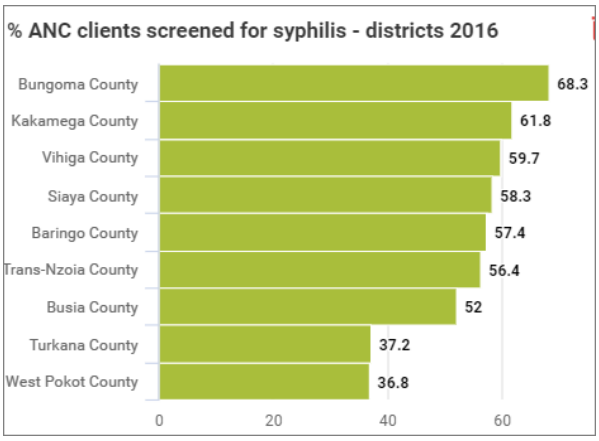
ANC syphilis screening may serve as a tracer indicator for quality of ANC services in all settings. Additional indicators may also be used in specific contexts as tracers for the quality of ANC, e.g. HIV testing during pregnancy and delivery, and intermitent preventive treatment of malaria during pregnancy (IPTp). (Refer to the HIV and Malaria modules for further information.)

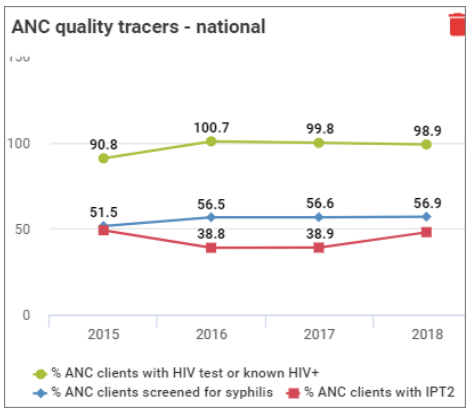
In addition to standard charts for ANC syphilis screening coverage, a chart presenting the three ANC quality tracers noted above is also provided to illustrate the potential for differences among these indicators. Poor performance in any of the above indicators could highlight failure to implement protocols and/or lack of essential commodities.

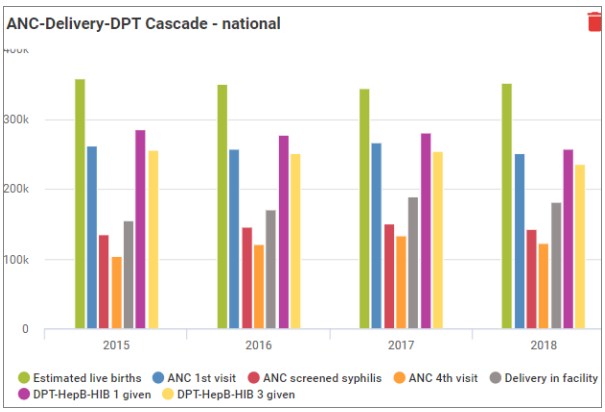
The ANC-Delivery-DPT cascade chart presents numbers of events in relation to each other, as well as trends over time. The relative consistency of the data across the four year period suggests good data quality. The accuracy of the estimated number of live births, however, depends on census projections that may be problematic, as discussed previously. In this chart, the apparent decline in the estimated number of live births 2017 requires investigation.

Antenatal care quality tracer indicators







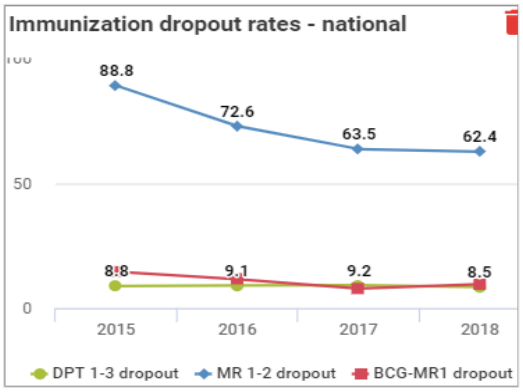


2. Immunization dropout rate

Percentage of infants who received the first dose of DPT but did not receive the third dose of DPT vaccination	N: (DPT1 doses – DPT3 doses) x 100 D: DPT1 doses
Percentage of infants who received BCG but did not receive the first dose of measles vaccination	N: (BCG doses – MCV1 doses) x 100 D: BCG doses
Percentage of infants who received the first dose but did not receive the second dose of measles vaccination	N: (MCV1 doses - MCV2 doses) x 100 D: MCV1 doses

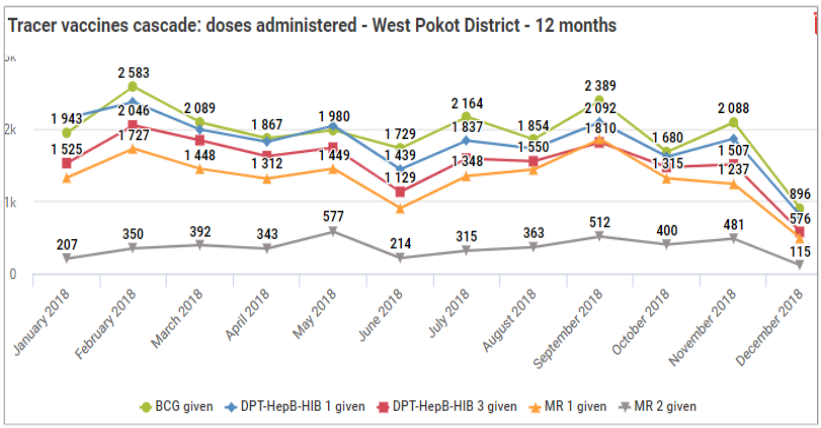
Refer to indicator 3: "Immunization coverage" in the coverage section for interpretation of dropout rates. In addition to presenting drop out percentages, it is also useful to show trends in the numbers of vaccine doses given in relation to each other. This provides a different way of looking at dropout rates.

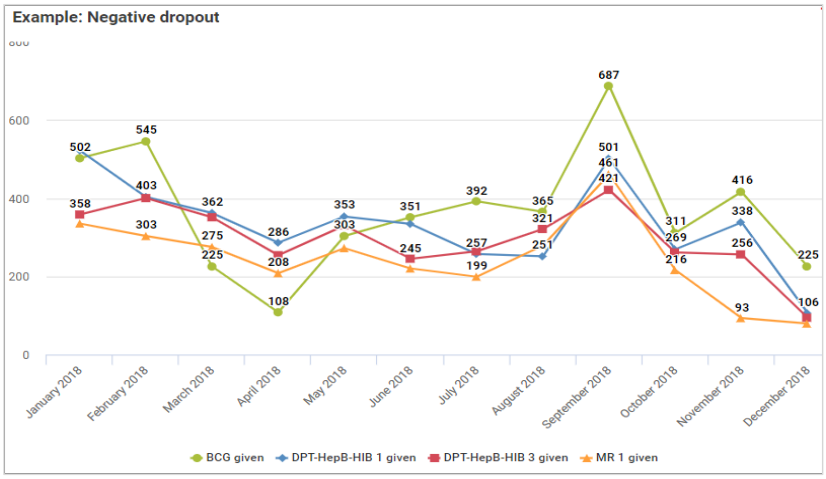
Immunization dropout rates



Immunization dropout rates - districts 2016

	2016		
	DPT 1-3 dropout	BCG-MR1 dropout	MR 1-2 dropout
Baringo County	8.8	8.8	71.8
Bungoma County	8.7	19.8	70.8
Busia County	5.9	-2.5	66.5
Kakamega County	5.7	-0.36	71.4
Siaya County	5.5	3.9	70.5
Trans-Nzoia County	10.4	20.7	78.9
Turkana County	16.9	29	91.3
Vihiga County	6.6	-5.6	46.2
West Pokot County	17.5	22.4	87.9





3. HIV clinical cascade

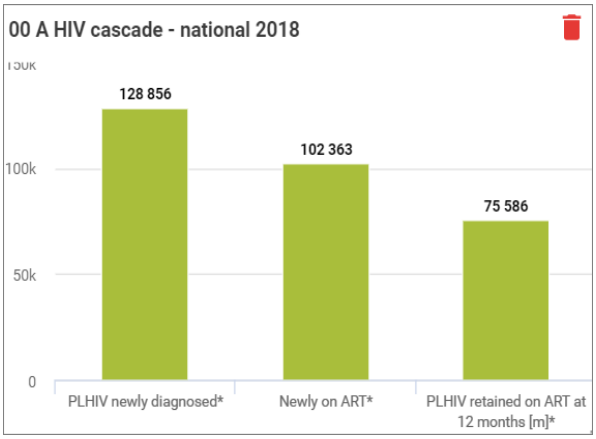
Number of persons newly diagnosed with HIV
Number of persons newly diagnosed with HIV that initiated ART
Number of persons retained on ART after a specified time period among those that initiated ART

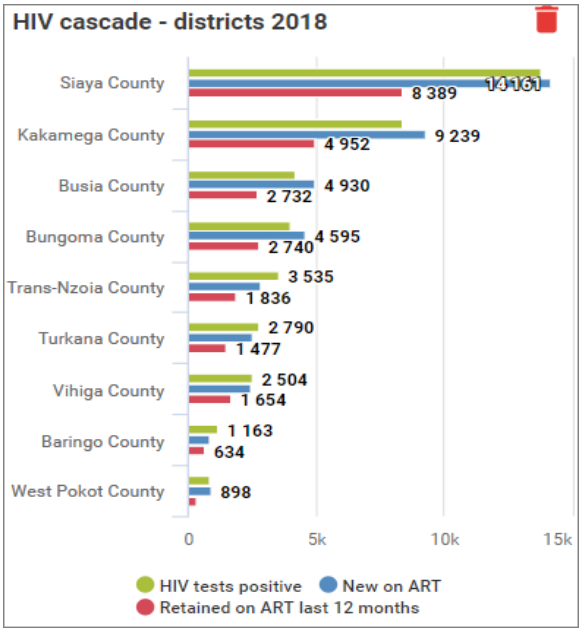
The purpose of the clinical cascade is to illustrate the extent to which PLHIV are retained in HIV care and the stages at which they may drop out of care.

The PLHIV newly diagnosed are not the same group (cohort) as the PLHIV retained on ART at 12 months (who would have been diagnosed the previous year). However, if HIV testing rates remain reasonably consistent from year to year, the cascade can provide a good indication of the extent to which PLHIV are retained in care for the first 12 months of ART.

In the district cascade chart below, for some districts the number of people newly on ART is greater than the number newly diagnosed with HIV (HIV tests positive). This may be a data quality issue, but could also be explained by other factors, e.g. shortage of ART medicines during the previous year, resulting in a backlog of people needing to start ART when medicines became available again in 2018.

HIV clinical cascade





4. TB treatment success rate (%)

Percentage of TB cases successfully treated (cured plus treatment completed) among TB cases notified to national health authorities during a specified time period, usually one year.	N: Number of TB cases notified in a specified time period that were successfully treated X 100 D: Number of TB cases notified in same period

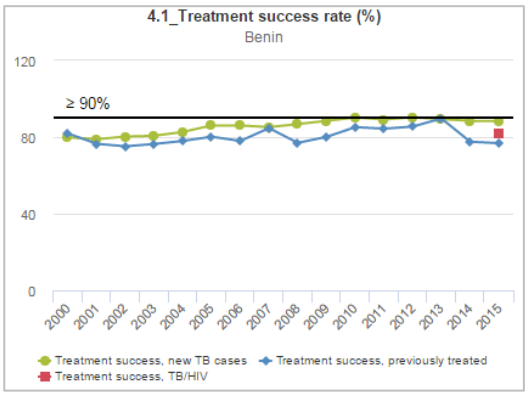
This indicator is based on analysis of cohort data, usually referring to cohorts of patients that started treatment during the previous year, as all persons on treatment have to complete 6 months of treatment before the outcome can be recorded. Treatment success includes cured plus treatment completed. Refer to the TB module for further information on important disaggregations.

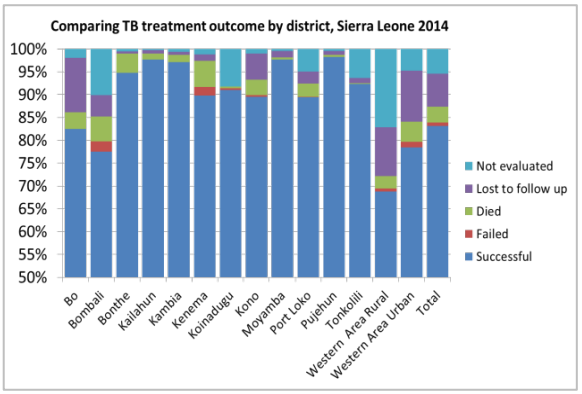
Treatment success is an important marker of disease control and service quality, as it measures the national TB programme's ability to maintain contact with patients over the course of six or more months. It allows countries to monitor progress towards meeting global and national targets and to determine whether more resources are required to improve treatment outcome by reducing death, loss to follow up and the proportion of cases with an outcome that is not evaluated.

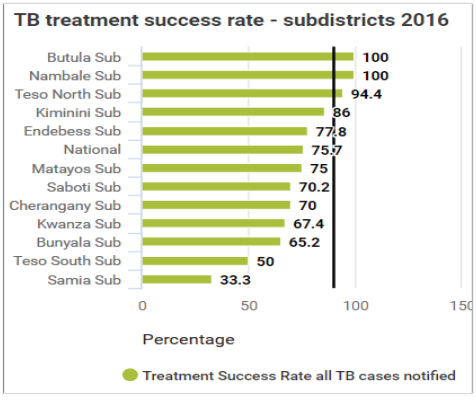
It is important to look at treatment outcomes also at the sub-national level (e.g. district, sub-district) as some areas may be under-performing and this may be masked when looking at national treatment success rates.

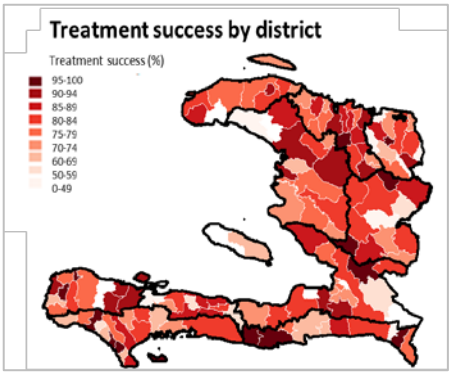
The stacked bar graph showing the proportion of TB notifications in each treatment outcome category is used to highlight the extent to which loss to follow up, death and treatment failure contribute to the inability to achieve treatment success.

TB treatment success rate









5. Malaria diagnostic testing ratio (% suspected malaria cases tested)

Percentage of suspected malaria cases that had a diagnostic test for malaria	N: Number of malaria tests performed x 100 D: Number of suspected malaria cases

Malaria tests = Number of RDT + number of microscopy
Suspected malaria cases = Number of malaria tests performed + Number of presumed cases of malaria

The purpose of this indicator is to track improvements in the percentage of suspected malaria cases that receive a laboratory test (RDT or microscopy) to confirm (or rule out) the diagnosis of malaria, rather than being diagnosed with malaria through clinical assessment only.

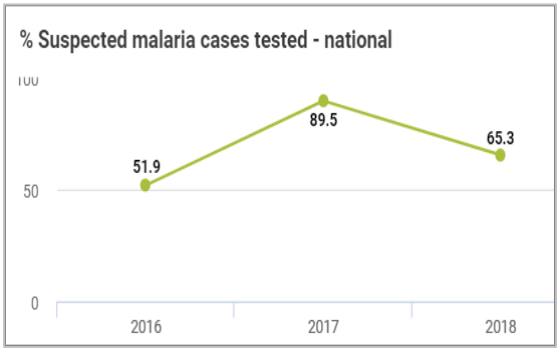
A "suspected case" of malaria is one that presents with signs (i.e. fever) and symptoms of malaria.
A "presumed case" of malaria is one that is diagnosed through clinical assessment only, i.e. without a laboratory test.

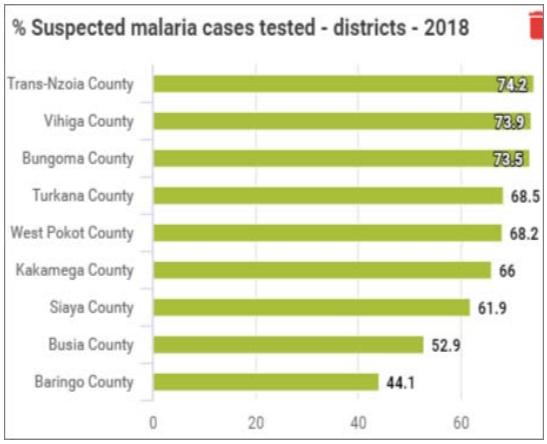
The numerator is equal to the number of rapid diagnostic tests (RDT) for malaria performed plus the number of microscopic slide examinations for malaria. The denominator is equal to the number of malaria tests performed plus the number of presumed cases of malaria.

The target for the diagnostic testing ratio is 100%. Diagnoses of malaria made without laboratory confirmation are difficult to meaningfully interpret. However, in contexts where the availability diagnostic testing is low, reporting of presumed cases can help in measuring the diagnostic rate and the estimated malaria caseload.

Population-based surveys assess the proportion of fever cases attending health facilities that receive a malaria diagnostic test. Large differences between the percentage of suspected cases recorded as receiving a test through routine facility systems compared to surveys need further investigation.

Malaria diagnostic testing ratio





6. Bed occupancy rate (BOR)

Percentage of available beds that were occupied over a specified time period	N: Number of occupied bed-days X 100 D: Number of available bed-days

Bed occupancy rate (BOR) is a measure of the utilization of the available bed capacity in an inpatient facility. It indicates the percentage of available beds occupied by patients over a defined period of time. Maternity and delivery beds are usually not included. Cots should be included.

The numerator is obtained from daily reports on the number of beds that are occupied on that day. The count is usually done at the same time in all wards every day, e.g. through a midnight census report. The denominator is the number of available beds for the specified time period multiplied by the number of days in the time period. For example:
BOR for 1 year = (sum of daily census report on occupied beds during the 365 days) x 100 / Number of available beds x 365

7. Average length of stay (ALOS)

Average number of days that patients spend in hospital during a specified time period	N: Number of occupied bed-days D: Number of admissions (Admissions = discharges + deaths)

Average length of stay (ALOS) is the average number of days that a patient spends in a facility as an inpatient during a specified time period. The numerator is the total number of days stayed by all inpatients (= occupied bed-days) during the time period. The denominator is the number of admissions (or discharges plus deaths) during the same time period.

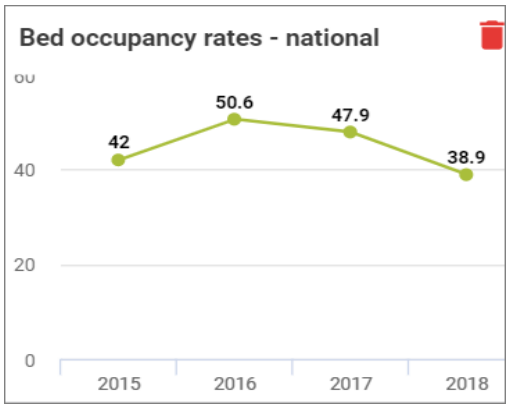
BOR and ALOS can reflect both the quality and the efficiency of services. However, both should be interpreted within the context of other information.

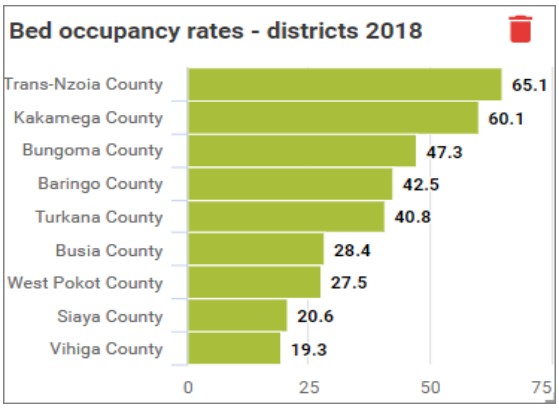
The optimal BOR is not known but rates above 85% are considered too high and a risk to safe and efficient delivery of health services. BOR rates above 100% mean that there were more inpatients than available beds. (This may happen in some circumstances where additional patients are placed on trolleys or on mattresses on the floor.) BOR should be reviewed along with hospital utilization. If the utilization is at "expected" levels and BOR is low, then fewer beds are necessary; if the utilization is at "expected levels" and BOR is high, more beds are needed.

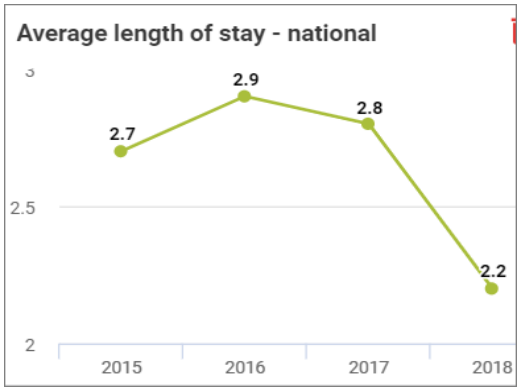
ALOS does not have a general standard either, because it depends on the type of case and type care provided. ALOS for psychiatric hospitals is close to 30 days per month, while ALOS for hospitals delivering mainly elective surgeries is often below 2 days per month. ALOS is used to compare similar hospitals or to make comparisons over time, in order to identify changes in utilization or delivery of services and, in particular, to link length of stay with cost. For analysis of a particular hospital, ALOS without data on causes of admission or output performance (e.g. number of procedures conducted) is not very useful.

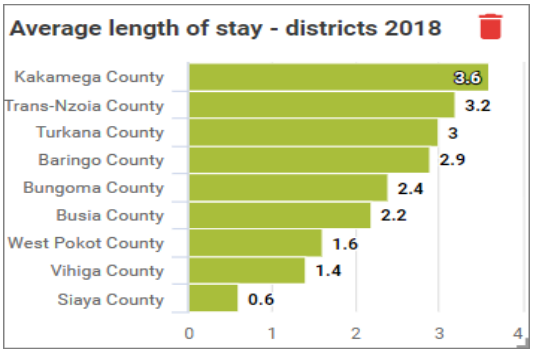
"The average length of stay in hospitals is often regarded as an indicator of efficiency. All else being equal, a shorter stay will reduce the cost per discharge and shift care from inpatient to less expensive post-acute settings. Longer stays can be indicative of poor-value care: inefficient hospital processes may cause delays in providing treatment; errors and poor-quality care may mean patients need further treatment or recovery time; poor care co-ordination may leave people stuck in hospital waiting for ongoing care to be arranged. At the same time, some people may be discharged too early, when staying in hospital longer could have improved their outcomes or reduced chances of re-admission". https://data.oecd.org/healthcare/length-of-hospital-stay.htm

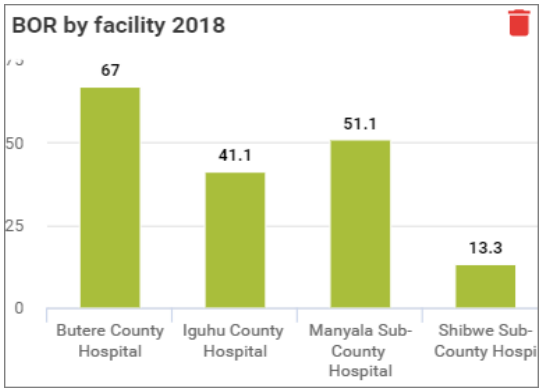
Bed occupancy rate and average length of stay

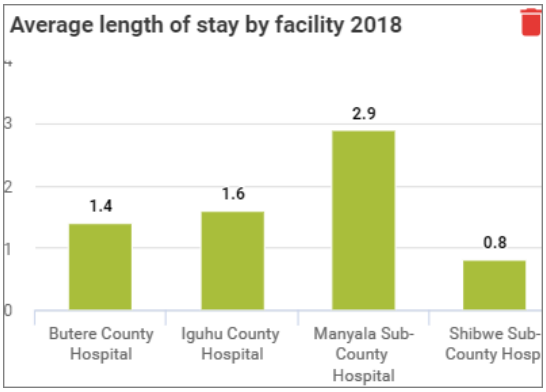












ALOS by ward

Organisation unit	Kabarnet District Hospital			
Data / Period	2015	2016	2017	2018
Average length of stay*	4.8	3.4	4.7	5.6
Average length of stay (Maternity ward)*	3.1	2	3.3	5
Average length of stay (Medical ward)*	5.6	4.1	4.8	4.5
Average length of stay (Paediatric ward)*	7	4.2	6	2.6
Average length of stay (Surgical ward)*			13.6	12.1

Beds and length of stay

National			
Data / Period	2015	2016	2017
00 Total occupied bed days	1 097 994	1 337 311	1 233 220.3
00 Available bed days	2 420 818.5	2 434 908	2 394 912
Bed Occupancy Rate (including cots)	42	50.6	47.9
Average length of stay*	2.7	2.9	2.8

UHC service coverage indicators (SDG 3.8)

Tracer area	Indicator definition
Reproductive, maternal, newborn and child health	
1. Family planning	Percentage of women of reproductive age (15–49 years) who are married or in union who have their need for family planning satisfied with modern methods
2. Pregnancy and delivery care	Percentage of women aged 15-49 years with a live birth in a given time period who received antenatal care four or more times
3. Full child immunization	Percentage of infants receiving three doses of diphtheria-tetanus-pertussis containing vaccine
4. Child treatment (care-seeking for symptoms of pneumonia)	Percentage of children under 5 years of age with suspected pneumonia (cough and difficult breathing NOT due to a problem in the chest and a blocked nose) in the two weeks preceding the survey taken to an appropriate health facility or provider
Infectious diseases	
5. Tuberculosis detection and treatment	Percentage of incidence TB cases that are detected and successfully treated in a given year
6. HIV treatment	Percentage of people living with HIV currently receiving antiretroviral therapy (ART)
7. ITN coverage for malaria prevention	Percentage of population in malaria-endemic areas who slept under an ITN the previous night.
8. Improved water and adequate sanitation source	Percentage of households using improved sanitation facilities
Noncommunicable diseases	
9. Treatment of cardiovascular disease	Age-standardized prevalence of non-raised blood pressure among adults aged 18+ years
10. Management of diabetes	Age-standardized mean fasting plasma glucose for adults aged 25 years and older
11. Cervical cancer screening	Percentage of women aged 30–49 years who report ever having been screened for cervical cancer
12. Tobacco control	Age-standardized prevalence of adults >=15 years not smoking tobacco in last 30 days
13. Hospital access	Hospital beds per capita, relative to a maximum threshold of 18 per 10,000 population
Service capacity and access	
14. Health workforce	Health professionals (physicians, psychiatrists, and surgeons) per capita, relative to maximum thresholds for each cadre
15. Access to essential medicines	Percentage of health facilities with essential medicines
16. Health security	International Health Regulations (IHR) core capacity index, which is the average percentage of attributes of 13 core capacities attained at a specific point in time

Note: Highlighted indicators/cells: potentially available through RHIS (including proxies)

HEALTH SERVICES INPUTS

1. Introduction

This section of the guidance document will focus on critical inputs needed for to enable service delivery: infrastructure, workforce, essential medicines and technologies and heath information systems. (Financing of service delivery is not addressed in this document.)

2. About the data

“Facility data” in this section encompasses both regular monthly/quarterly HMIS facility reports, as well as less frequent reports for certain inputs that are not likely to change significantly in the short term.

In order to achieve a comprehensive understanding of the service delivery system, input data should also be reviewed in relation to service outputs (service access, utilization and quality of care) as well as facility-based mortality and morbidity data. Furthermore, public facility data should also be interpreted in relation to data from other sources, including facility data from private and non-profit service providers, population-level data, as well as the health governance and finance contexts and information from other sectors.

The analyses in this section are intended to provide managers at various levels of the health system (facility, subnational, national) with core information to assist in the interpretation facility inputs in relation to performance and to guide resource allocation and management decisions. However, the factors influencing health service delivery are complex and informed decision-making often requires additional in-depth analysis that is beyond the scope of this module.

3. Core facility indicators

Core Indicators	*Definition*	*Disaggregations*
Infrastructure		
Health facility density	Total number of health facilities per 10 000 population (Total number of hospitals per 100 000 population)	• Facility type (hospital, health center, etc.) • Managing authority (public, private, etc.) • Geographic location • Specific services
Hospital bed density (UHC)	Total number of hospital beds per 10 000 population	• Type of bed • Managing authority (public, private, etc.) • Geographic location
Density of medical devices and essential technologies (UHC)	Density of medical equipment/essential technologies per million population	• By type (MRI, CT scanners, etc)
Health workforce		
Health worker density and distribution (UHC)	Number of health workers per 1000 population	• Cadre : core professionals (physicians, nurses, midwives); specific cadres: specialists (surgeons, psychiatrists, etc.); other cadres (dentists, pharmacists, laboratory technicians) • Distribution: Place of employment (urban/rural; PHC/hospital) • Geographic location
Medicines and commodities		
Availability of essential medicines and commodities (UHC)	Percentage of health facilities with no-stock of a set of tracer essential medicines and commodities	• Facility type (hospital, health center, etc.) • Managing authority (public, private, etc.) • Specific type of medicine/commodity (e.g. vaccines, family planning, TB, HIV, NCD, antibiotics, etc.)
Health information		
Completeness of reporting	Percentage of facilities that submit reports within the required deadline	• Facility type
Management		
Supervisory visits	Percentage of facilities that received a supervisory visit in the last 3 months	• Facility type • Geographic location

UHC – Universal Health Coverage indicator

4. Core analysis

HEALTH INFRASTRUCTURE

Purpose

The physical availability of health infrastructure is a key measure of access to health services and can be used to inform decision-making concerning investments in additional physical infrastructure and services. However, infrastructure indicators cannot be assessed in isolation. As discussed in Section 2, multiple factors may determine access to health services.

Health facility density is a crude indicator of access to outpatient services. It is expressed as number of facilities per 10,000 population. Hospital density per 100,000 population is a crude indicator of access to inpatient services. In addition, hospital bed density, expressed as the number of inpatient beds per 10,000 population, provides a further indication of access to inpatient services. Density of medical devices and essential technologies, expressed per million population, reflects the availability of diagnostic and treatment technologies and often refers to devices that require substantial investment by the health system.

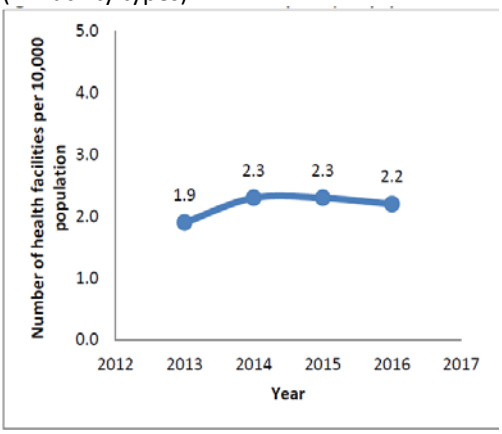
Additional analyses are needed to understand the equity and efficiency of distribution of available infrastructure.

The following analyses illustrate health facility density and distribution by various disaggregations, using line graph, bar chart, tables and maps.

Analysis – Assessing health facility density and distribution

1. **Trends in health facility density: Kenya 2013-2016**

(All facility types)

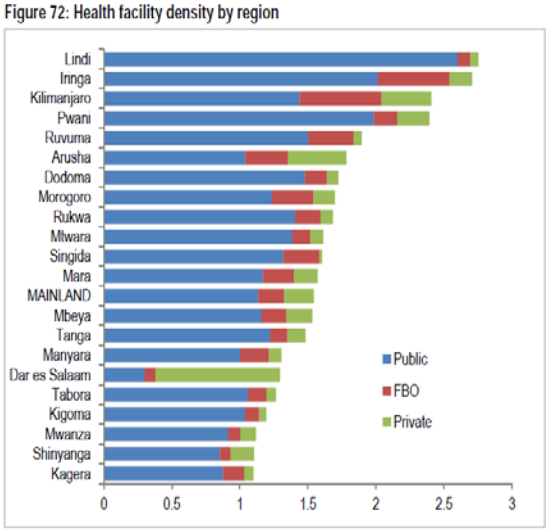


Source: Statistical Review of Progress Towards the Mid-term Targets of the Kenya Health Sector Strategic Plan 2014–2018

2. Health facility density by managing authority and geographic region: Tanzania 2013

(a similar graph can also be constructed for facility types)

Figure 72: Health facility density by region



Source: Midterm Analytical Review of Performance of the Health Sector Strategic Plan III. 2009 – 2015. Ministry of Health and Social Welfare, United Republic of Tanzania, June 2013

3. East Darfur – Population per health facility 2013

				FUNCTIONING			POP/WRKNG PHC	POP/RH	AVGE RADIUS
LOCALITY	POP. 2012	AREA (km^2)	Pop density	FHU	FHC	RH/SH	FACILITY	FACILITY	PHC FAC.
Central Darfur	1,022,741	47,370	22	23	20	8	23,785	127,843	19
East Darfur	1,022,734	49,725	21	76	16	5	11,117	204,547	13
North Darfur	2,507,911	296,420	8	106	80	15	13,483	167,194	23
South Darfur	3,485,826	77,575	45	167	51	12	15,990	290,486	11
West Darfur	1,247,506	32,090	39	51	22	6	17,089	207,918	12
EAST DARFUR	**9,286,718**	**503,180**	**18**	**423**	**189**	**46**	**15,174**	**201,885**	**16**

Source: 2013. Modol et al. Darfur Health Facility Survey. World Bank

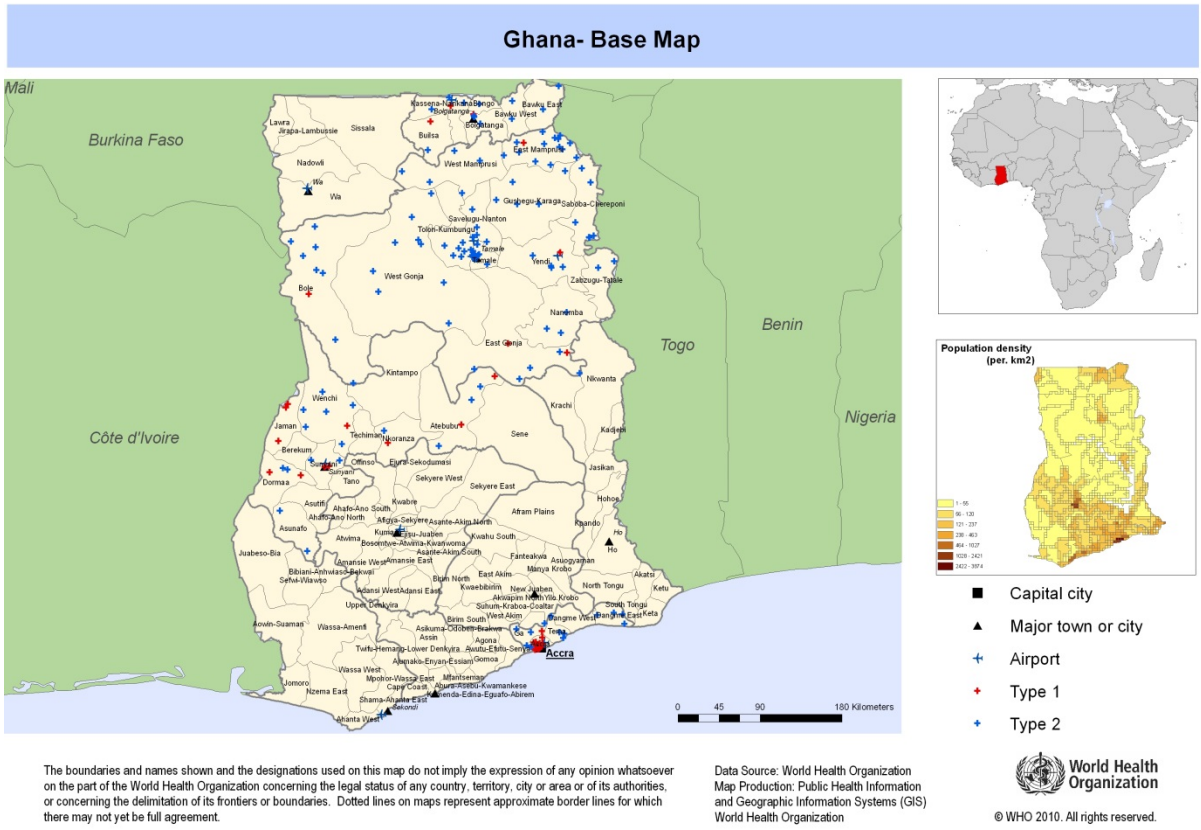
4. Distribution of PHC clinics by district, level and managing authority. West Bank. 2012

	MoH clinics by level						UNRWA	NGO	PMMS	Total
District	I	II	III	IV	Mobile	*Total*	Clinics	Clinics	Clinics	Clinics
Bethlehem		11	6	1	1	*19*	2	17	2	**40**
Hebron	20	6	17			*43*	3	16	1	**63**
Jenin	3	30	14	1		*48*	6	17	1	**72**
Jericho	3	4	1	1	1	*10*	4	4	1	**19**
Jerusalem	1	16	3	1	1	*22*	4	19		**45**
Nablus		37	6	1		*44*	4	16	4	**68**
Qalqiliya		16	4	1		*21*	3	14	1	**39**
Ramallah		40	17	1		*58*	6	9	2	**75**
Salfit	1	8	7	1		*17*	1	10	1	**29**
South Hebron	57	19	5	2	1	*84*	4	6	1	**95**
Tubas		7	2		1	*10*	2	2	1	**15**
Tulkarm		16	13	1		*30*	2	10	1	**43**
West Bank	**85**	**210**	**95**	**11**	**5**	***406***	**41**	**140**	**16**	**603**

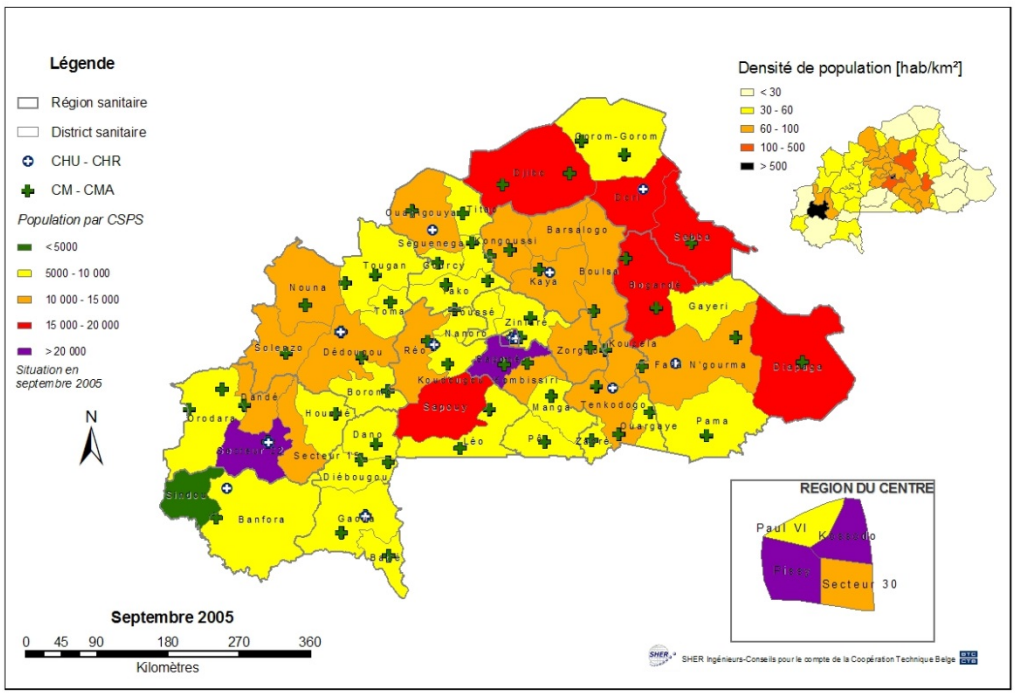
Source: MoH Annual Report 2012

Source: 2013. Modol, WHO. Assessment of the MoH Primary Health Care System in the West Bank

5. Ghana health facility distribution and population density 2015



6. Burkina Faso population per PHC facility (CSPS) 2005



Source: http://www.sante.gov.bf/apps/carteSanitaire/sante_bf/carte3.htm

CSPS Centre de Santé et de Promotion Social
CMA Medical Centres with Surgical Antennas
RHCs Regional Hospital Centres
RHU University Hospital Centres

Considerations/issues for interpretation

Health facility density may be used to guide decisions about construction of additional facilities. However, the limitations of density indicators should be considered and the indicators should be complemented by additional information.

Overall health facility density data should include facilities of all managing authorities (public, private for profit, private not-for-profit, military, etc.). This information may not be available through the HMIS or the master facility list. The data may be available from other sources, but identification of facilities that are not registered may be challenging. Where density data does not included all facilities or managing authorities, this should be clearly stated in the presentation of the analyses.

While health facility density is an important indicator of health service access, many other factors may also affect access, for example, distance, funds, availability of services, health worker attitudes and practices, and other socio-cultural factors. These factors should be kept in mind when interpreting facility density.

There is currently no global norm for overall health facility density and targets should be defined according to local contextual factors, e.g. urban or rural settings, population density, service delivery models.

Comparison of health facility density among different geographic areas can be used to broadly highlight underserved areas. However large, sparsely-populated areas might require relatively higher facility densities to ensure equity of access. For example, Kenya has set an overall minimum density target of 1.5 health facilities (regardless of the level) for every 10,000 people. This target has been surpassed but does not necessarily mean that all citizens have good access to health care: most of the health care facilities in Kenya are in urban areas where only 30% of the population live.[9] Therefore, decisions on whether or not to construct additional health facilities should not be based on health facility density alone.

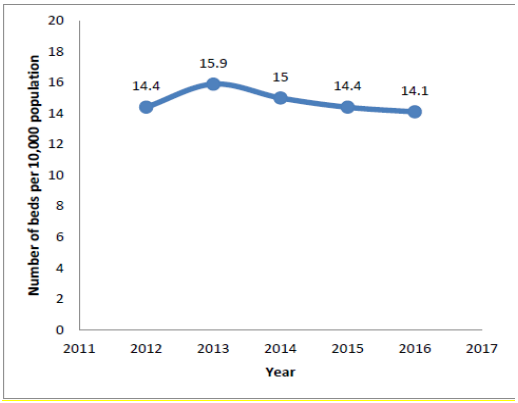
Geographic mapping of facility locations can further facilitate identification of access gaps for certain populations or sup-populations. However, when smaller geographical units such as districts are analysed, the population may not necessarily use the facilities in the designated area. Consequently, comparisons of densities between districts and subpopulations should be made with caution and with consideration of the specific context.[10]

A major limitation of health facility density is the assumption that all facilities provide the same amount of service, which is not the case. In many countries, care such as outpatient services for diseases such as TB, HIV or chronic noncommunicable diseases, is available only in hospitals or higher level primary care facilities. Therefore, facility density should also be assessed in relation to facility type/level and service availability.

[9] Statistical Review of Progress Towards the Mid-term Targets of the Kenya Health Sector Strategic Plan 2014–2018
[10] WHO. 2010. Monitoring the Building Blocks of Health Systems

Analysis – Assessing hospital bed density

1. Hospital bed density: Kenya 2012-2016



Source: Statistical Review of Progress Towards the Mid-term Targets of the Kenya Health Sector Strategic Plan 2014–2018

2. Hospital bed density and beds by managing authority: West Bank 2014

Governorate	Beds by sector					Beds per 10,000 population		
	MOH	NGO	PRV	UNRWA	**Total**	MoH	Non-MoH	**Total**
Bethlehem	131	157	27		**315**	6	9	**15**
Hebron	309	193	86		**588**	5	4	**9**
Jenin	160	16	37		**213**	5	2	**7**
Jericho	54				**54**	11	-	**11**
Jerusalem		545	32		**577**	-	38	**38**
Nablus	255	211	146		**612**	7	10	**17**
Qalqilya	58		10	63	**131**	5	7	**12**
Ramallah	185	36	168		**389**	6	6	**12**
Salfit	50				**50**	7	-	**7**
Tubas	42				**50**	7	1	**8**
Tulkarem	114	60			**174**	6	3	**10**
West Bank	1,366	1,116	506	63	**3,153**	5	7	**13**

Source: Assessment of the hospital sector in the West Bank and East Jerusalem Mòdol X, WHO. 2014

Considerations/issues for interpretation

Assessment of hospital bed density is based on all admission beds (including those for acute and long-term care, maternity beds and paediatric beds) but excludes labour and delivery beds.

There is currently no global norm for density of inpatient beds in relation to total population. The global average for inpatient bed density is 27 per 10,000 and the average in the African region is 10 beds per 10,000 population. The service availability and readiness assessment survey (SARA) suggests benchmarks of 18 and 39 inpatient beds per 10,000 for lower and upper-middle-income countries, respectively.

There are some key issues that should be kept in mind when analysing the bed density by population size. There can be considerable variation in hospital size, numbers of beds and beds per specialty, making comparisons difficult. In addition, when analysing smaller administrative units, e.g. districts, it is important to note that the population living in the districts might not be using the hospitals in the district for various reasons, including, logistics, sociocultural preferences and perceptions of quality.

Hospital bed density should also be assessed in relation to population density, geographic location of facilities, inpatient service types, as well as bed occupancy rates and average length of stay of individual hospitals.

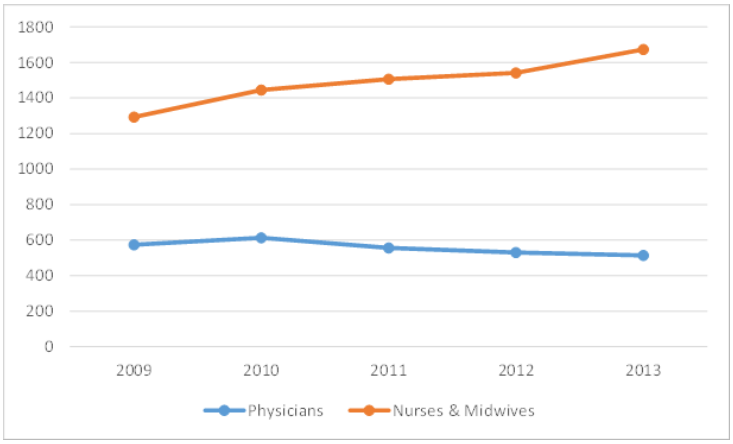
HEALTH WORKFORCE

Purpose

Effective health systems require a strong health workforce, i.e. an adequate number of health workers with knowledge, skills and motivation that are equitably distributed to deliver services across the country. Understanding of the health workforce situation requires assessment of density and distribution of health workforce by cadre and well as facility level and managing authority.

Analysis - Examining health worker density and distribution

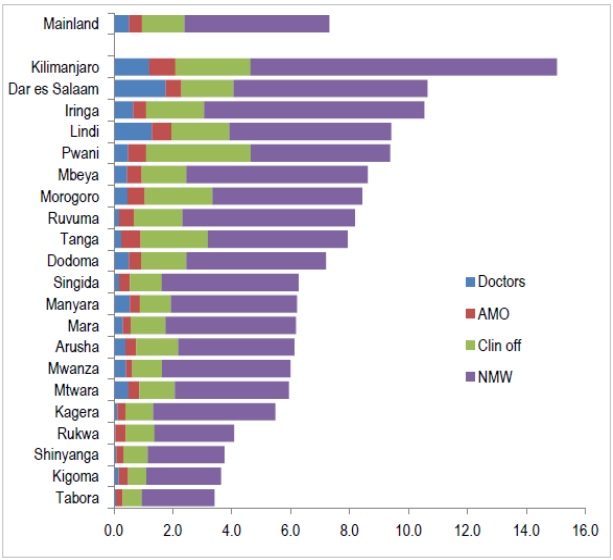
1. Number of staff working at MoH hospitals, by category. 2009-2013



Source: Assessment of the hospital sector in the West Bank and East Jerusalem Mòdol X, WHO. 2014

2. Health worker density per 10,000 population by cadre and geographic location

(a similar graph can also be constructed for facility type and by provider type



Source: Midterm Analytical Review of Performance of the Health Sector Strategic Plan III. 2009 – 2015. Ministry of Health and Social Welfare, United Republic of Tanzania, June 2013

Percentage of approved positions filled – Kenya, 2016

Table 5: Percent of approved positions that have been filled (County reports, 2016)

	Level 2	Level 3	Level 4	Tertiary	Kenya
Medical officers	N/A	5	14	43	17
Clinical officers	5	9	9	19	9
Nurses and specialist nurse	16	15	14	30	16
Total	**14**	**13**	**13**	**30**	**15**

Source: Statistical Review of Progress Towards the Mid-term Targets of the Kenya Health Sector Strategic Plan 2014–2018

Considerations/issues for interpretation

National-level health workforce data are collated from four main sources: population censuses, labor force surveys, health facility assessments and administrative reporting systems. These estimates should include workers of all managing authorities (public, private, faith-based, not-for-profit, military, etc.).

Equity of health workforce deployment remains a challenge in many countries, with an oversupply in urban compared with rural areas. When assessing geographic equity and comparing health worker density of different sub-national regions, the best practice is to exclude from the analysis health professionals engaged in administrative tasks rather than provision of clinical services. Some analyses also exclude staff of tertiary referral hospitals. Without such exclusions the analysis will exaggerate the access to health services of the national capital and other largest cities.

Routine HMIS systems may not necessarily include health workforce data. This data may however be available at subnational level through other sources (e.g. human resources data base, district payroll, district management reports). However, the data may be limited to public sector workers.

In some contexts, access to female providers is an important determinant of women's health service utilization patterns. Sex-disaggregation therefore represents an important additional analysis. Information on an appropriate ethnic mix to encourage utilization of services among underserved or marginalized communities may also be important in some contexts.

As noted above, assessment of overall density and distribution of health workforce may be complex and information may be updated only annually or less frequently. However, subnational authorities require updated information on availability of workforce in their health facilities in order to maintain the necessary deployment of staff. Routine health information systems can provide information on posts filled by facility and geographic location.

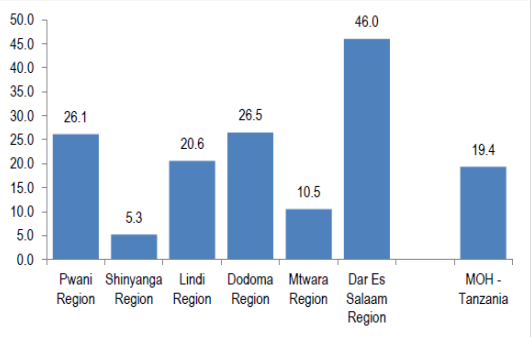
MEDICINES AND COMMODITIES

Purpose

According to the WHO framework for health systems, a well-functioning health system ensures equitable access to essential medical products, vaccines and technologies of assured quality, safety, efficacy and cost-effectiveness, and their scientifically sound and cost-effective use. Essential medicines are those that satisfy the priority health care needs of the population and are intended to be available within the context of functioning health systems at all times, in adequate amounts, in the appropriate dosage, with assured quality, and at a price that individuals and the community can afford.[11] While multiple factors affect access to medicines and commodities, monitoring stock-outs or, conversely, "no stock-out" provides one type of evidence on access to these medicines.

Analysis – Availability of tracer medicines ("No stock-out")

1. Percentage of facilities reporting "no stock-out" of tracer essential medicines by administrative unit for a specified period (e.g. 1 month) - Tanzania



Source: Midterm Analytical Review of Performance of the Health Sector Strategic Plan III. 2009 – 2015. Ministry of Health and Social Welfare, United Republic of Tanzania, June 2013

2. Stock-out of tracer NCD medicines in PHC clinics Jan-June 2013 Salfit District, West Bank

Clinic name	Thiazide diuretic	Ca Channel Blockers	Beta Blockers	ACE inhibitors	Statins	Metfor-min	Gliben-clamide	Furuse-mide	Salbuta-mol inh.	Predni-sone	Aspirin (ASA)
A	0	0	1	1	1	0	1	1	0	0	0
B	1	1	0	1	1	0	1	1	1	1	0
C	0	1	1	1	1	0	1	1	1	0	0
D	0	1	1	0	1	0	1	1	1	1	0
E	0	1	1	1	1	0	1	1	1	0	0
F	1	1	1	0	1	1	1	1	1	1	1
G	1	1	1	0	0	0	0	1	1	1	0
H	0	1	1	1	1	0	1	1	1	1	0
I	1	1	1	1	1	1	1	1	1	1	0
J	0	0	1	0	0	0	1	0	0	1	0
K	0	1	0	1	0	0	1	1	1	1	0
L	1	1	1	1	1	1	1	1	1	0	1
M	0	1	1	0	1	1	1	1	1	0	0
N	0	1	1	0	0	0	0	1	1	1	0
Total no stock-out	**5**	**12**	**12**	**8**	**10**	**4**	**12**	**13**	**12**	**9**	**2**
Maximum	14	14	14	14	14	14	14	14	14	14	14
% clinics with no stock out per medicine in 6 m period	**36%**	**86%**	**86%**	**57%**	**71%**	**29%**	**86%**	**93%**	**86%**	**64%**	**14%**

1	No stock-out
0	At least one stock-out

Source: Palestine Ministry of Health, WHO. 2013. Implementation of the WHO Package of Essential Noncommunicable Disease (PEN) Interventions for Primary Health Care in Salfit District: A review of the pilot

[11] WHO. 2010. Monitoring the building blocks of health systems

Considerations/issues for interpretation

Logistics management information systems (LMIS) designed expressly for logistics management can provide detailed data on the distribution and inventories of drugs, vaccines and other commodities.

However, the LMIS may not have yet been implemented at all health facilities or the LMIS data may not be readily available to analysts of routine facility data. Where there is a well-developed but separate LMIS, data on stock out as well as data on net consumption of commodities can be exported from the LMIS to be used by those analysing and interpreting other health data

In some cases the LMIS will track only a subset of health commodities or only those financed by particular partners. Where this is the case, those designing the HMIS could add a limited number of items to a monthly report submitted by every health facility to indicate whether or not there was a stock-out during the month of each of a set of tracer drugs. However, reporting on stock-outs of a limited number of tracer medicines and supplies should not replace the need for appropriate inventory management systems.

Some HMIS forms ask for detailed information including days of stock-out or quantities of commodities received/distributed/in stock. Unless this information forms part of a supply request form, such detailed information increases the reporting burden and may duplicate LMIS reporting.

Where stock-outs risk criticism of pharmacy store or health facility staff, a small amount of items may be kept in reserve to avoid reporting of a stock-out. Furthermore, attention may focus on the tracer items and neglect the management of other items. Intermittent facility visits are required to confirm the stock situation.

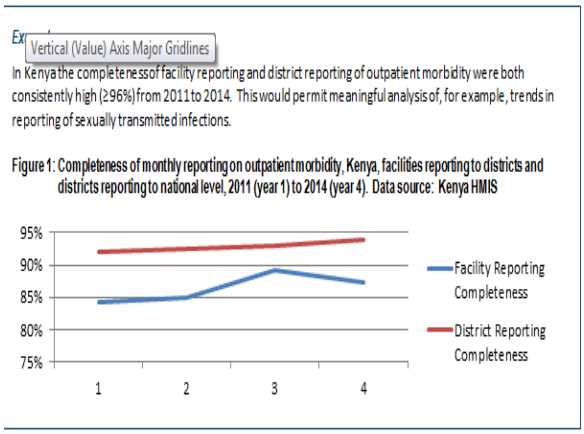
HEALTH INFORMATION

Purpose

The health information system has four key functions: (i) data generation, (ii) compilation, (iii) analysis and synthesis and, (iv) communication and use. A well-functioning information system is critical for decision-making as it links evidence with policy and planning and other data uses. However, in order for data to be fit-for-purpose, it has to be complete. This means that all the facilities that are expected to report data, are submitting reports as required. This completeness of reporting is a key indicator of the usefulness of the data reported through the routine health information system.

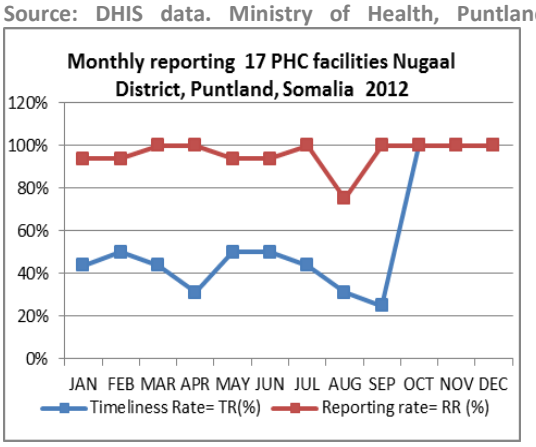
Analysis – Assessing trends in reporting completeness

1. Facility and district reporting completeness – Kenya



2. Facility reporting completeness and timeliness – Nugaal District, Puntland, Somalia 2012

Source: DHIS data. Ministry of Health, Puntland.



Considerations/issues for interpretation

Low levels of data completeness result in inaccurate aggregate data, which in turn results in inaccurate analyses of facility and district / national performance. Incomplete reporting therefore limits the usefulness of routine data for managers and policy makers.

In addition to examining reporting completeness of monthly forms, it is also important to check data element completeness, i.e. completeness of individual data elements for various programmes (EPI, malaria, TB, etc.)

There should be explicit timeframes and processes for updating completeness of data, in order to include late reports.

Annex 1. Additional data quality metrics

1. Quality of mortality data

Data quality checks for mortality include an assessment of the completeness of reporting, estimation of the proportion of all deaths that occur in health facilities/hospitals and computation of a core set of data quality metrics. The results on the data quality metrics should be presented in the same dashboard or report that presents the mortality and cause of death statistics, so that the reader can better understand the strengths and limitations of the statistics. The two main sections of the Mortality Data Quality Metrics dashboard are described here. We use the term hospitals as the generic term to describe all facilities that have inpatient services and report on admissions, discharges and deaths, realizing that the precise naming of facilities may differ between countries.

COMPLETENESS OF REPORTING

Routine reporting from hospitals is sometimes markedly incomplete. Hence, reporting completeness must be assessed and presented. Proportional mortality by cause is less sensitive to incomplete reporting but may still be affected by changes in the types of hospitals reporting (e.g. whether or not the referral hospitals are included). The report should explicitly indicate whether data come only from a selected group of sentinel hospitals. The following indicators should be included to assess completeness of hospital reporting:

A. Completeness of mortality reporting for most recent year

	N of hospitals	Percent reporting	Very poor	Poor	Suboptimal/ low	Good	Nearly complete
All hospitals		.. %	< 25%	25-49%	50-84%	85-94%	95% or more
Referral hospitals		.. %	< 25%	25-49%	50-84%	85-94%	95% or more
Private hospitals		.. %	< 25%	25-49%	50-84%	85-94%	95% or more

The second dimension of completeness refers to the percent of all deaths in a country that occur in hospitals. This indicator provides information on the extent to which the hospital deaths can be considered representative of the deaths in the population. The lower the proportion, the less representative the cause of death information.

The indicator is estimated from by dividing the total number of deaths in health facilities by the expected number of deaths in the country. The latter denominator is extracted from the UN Population Division projections (or the UNICEF/WHO IGME data base for under-5 deaths).[12] The number of deaths can also be estimated from local data using the local country population projection and the crude death rate.

[12] The UNPD provides five-year numbers which can be used to extract estimates of annual numbers of deaths, using linear interpolation.

B. Percent of all deaths in the country that occur hospitals (and are reported)

	Year 1	Year 2	Year 3
HOSPITAL REPORTING COMPLETENESS			
(a) Total number of hospitals in country			
(b) Number of hospitals reporting			
(c) Hospital reporting completeness (%)			
TOTAL NUMBER OF HOSPITAL DEATHS, ALL AGES			
(d) Reported number of deaths in hospitals, all ages			
(e) Adjustment factor k - all deaths*			
(f) Adjusted number of deaths in hospitals, all ages			
COMPUTE PERCENT OF DEATHS THAT OCCUR IN HOSPITALS, ALL AGES			
(g) Expected total number of deaths in country**			
(h) Percent of all deaths in hospitals and reported			
(i) Percent of all deaths in hospitals, based on adjusted deaths			
TOTAL NUMBER OF HOSPITAL DEATHS, UNDER 5 YEARS			
(j) Reported number of deaths in hospitals, under-5			
(k) Adjustment factor k - under-5 deaths			
(l) Adjusted number of deaths in hospitals, under 5 years			
COMPUTE PERCENT OF ALL DEATHS THAT OCCUR IN HOSPITALS			
(m) Expected total number of deaths in country, under 5			
(n) Percent of all under-5 deaths in hospitals and reported			
(o) Percent of under-5 deaths in hospitals, based on adjusted deaths			

*Adjusted for incomplete reporting (for method see Section X); **Data from UN Population Division projections: https://esa.un.org/unpd/wpp/Download/Standard/Mortality/

If more detailed distributions of deaths by age and sex are available, it is possible to assess the completeness or coverage of deaths by health facilities in greater detail for specific age-sex groups.

Trends in the numbers of deaths over time provide additional information on the quality and completeness of reporting, as one would not expect very large variation between years. Presenting 3 to 5 years of data is recommended. Seasonality by month is also useful to examine, especially if done in association with admissions.

INTERNAL CONSISTENCY

If the system for recording causes of death or discharge diagnosis does not include any checks at the data entry point, then there is a need to identify any incorrect sex-specific causes. For example:

Male deaths from maternal conditions, cervical cancer, uterine cancer and ovarian cancer
Female deaths from prostate cancer and benign prostatic hypertrophy
Male discharges with maternal conditions, cervical cancer, uterine cancer and ovarian cancer
Female discharges with prostate cancer and benign prostatic hypertrophy

Identify also the implausible causes of death at certain ages:

Deaths from maternal conditions below age 10 years or above 49 years
Deaths from suicide below age 5 years
Deaths from perinatal conditions at age 5 years and above

If potential errors are identified, review the medical certificate of the cause of death and correct the data as appropriate before proceeding further with the analyses.

QUALITY OF CAUSE OF DEATH DATA

There are several steps between a death occurring in hospital and the ultimate cause of death reports based on all data: (1) certification of the cause of death (2) coding of the cause of death (3) checking and editing of the cause of death data (cleaning) (4) analysis of all data (5) reporting.

If the system for recording causes of death does not include sufficient checks at data entry point in facilities and at district levels, then there is a need to identify any incorrect sex-specific and age-specific causes. This may be:

- Improbable causes by sex: for example, male deaths from maternal conditions, cervical cancer, uterine cancer and ovarian cancer or female deaths from prostate cancer and benign prostatic hypertrophy;
- Implausible ages for specific causes of death: for instance, deaths from maternal conditions below age 10 years or above 49 years, deaths from suicide below age 5 years and deaths from perinatal conditions at age 5 years and above.
- If such errors are identified, review the medical certificate of the cause of death and correct the data as appropriate before proceeding further with the analyses. This will have to be done at the source by coders. If this cannot be done, these deaths should be recoded to ill-defined causes.

The following data quality metrics on mortality and causes of death are useful to help interpret the data and can be summarized in one measure, based on the unweighted average of the scores on DQ metrics 1-7.

DQ metric 1 and 2: completeness of reporting and disaggregation
DQ metric 1 refers to completeness of hospital reporting as discussed above. If no detailed data are available, an estimate of completeness can be made. DQ metric 2 measures the extent to which the data on causes are disaggregated by age and sex.

DQ metric 3 and 4: Quality of certification
The quality of the information on causes of death is highly dependent on the accuracy of the certifiers (usually physicians) in providing the sequence of causes that lead to the death. It is critical that the WHO Medical Certificate of Cause of Death (or a minor adaptation) is used. Poorly completed death certificates make it much more difficult for the coders to select properly the underlying cause of death, using the ICD rules. Data quality items 3, 4 and 7 aim to measure the quality of certification.

For DQ metric 3, the use of WHO medical certificate of death is estimated as a proportion of all reported hospital deaths (not all deaths in the country), based on the proportion of referral and other hospitals that reported and used the WHO medical certificate of death in the most recent year. Metric 4 refers to the percent of physicians of all physicians in hospitals that have been trained to certify properly using the ICD principles.

DQ metric 5 and 6: Coding based on the ICD
If there is an accurate medical certificate, the quality of coding depends the level of training and accuracy of coders. WHO has developed the Startup Mortality List (ICD-10-SMoL) (see above) to facilitate coding. Data quality items 5 and 6 measure the (potential) quality of coding. 5 is an estimate of the proportion of coders that have been trained in using the ICD for coding, while 6 refers to the actual use of ICD for coding.

DQ metric 7 Unknown and ill-defined causes (garbage causes)
Even in countries where causes are assigned by medically qualified staff members, there is often substantial use of coding categories for unknown and ill-defined causes. These are often referred to as garbage codes. The proportion of such garbage codes is an indicator of the quality of the data. A large percentage of deaths with garbage causes (e.g. as high as 25%) is indicative of poor quality of the cause of death data. A small percentage of deaths with garbage codes however is not always an indication of good quality of data, as there may still be many errors in the assigned causes of deaths. The proportion will need to be computed from a review of the cause of death reports.

Data quality: mortality and cause-of-death data reported by health facilities (most recent YEAR)

	Indicator	Very poor quality	Poor quality	Suboptimal quality	Good quality	Very good quality
All	Mortality and cause of death data quality index	< 25%	25-49%	50-84%	85-94%	95% or more
1	Completeness of hospital reporting	< 25%	25-49%	50-84%	85-94%	95% or more
2	Disaggregation by age and sex	None	Under 5, 5+; not by sex	Under 5; 5+; by sex	Multiple age groups, by sex	Five year age groups, by sex
3	WHO medical certificate: % of reporting hospitals using it	< 25%	25-49%	50-84%	85-94%	95% or more
4	Certification practices: % of certifiers trained	< 25% trained	25-49% trained	50-84%	85-94%	95% or more
5	Coding practices: % of coders trained	< 25% trained	25-49% trained	50-84%	85-94%	95% or more
6	ICD use: percent of reporting hospitals that submit data with ICD codes	< 25%	25-49%	50-84%	85-94%	95% or more
7	Use of codes: % with ill-defined or unknown codes	>=33%	25-32%	15-24%	5-14%	<5%

There are WHO tools to edit and analyse cause of death data, primarily intended for CRVS system data. (Box)

Box: WHO Tools for editing and analysing cause of death data

- **Performing Basic Checks on cause of Death Data (CoDEdit)** - The CoDEdit tool is intended to help coders of cause-of-death statistics to conduct routine checks on their data in order to minimize errors. CoDEdit tool is applied at data compilation stage, its primary purpose is to warn and flag basic gross errors, alert about possible misuse of codes and finally provide a summary of the data set. http://www.who.int/healthinfo/civil_registration/COD.zip?ua=1
- **Mortality statistics: a tool to enhance understanding and improve quality** and **Analysing Mortality Levels and Causes-of-Death (ANACoD) -** The CoDEdit tool should not be confused with ANACoD tool, which is intended for a comprehensive analysis of cause-of-death data. These tools have been developed to facilitate checking the quality of mortality data, including cause-of-death data, from complete civil registration systems. However, they can be used to identify possible problems with hospital-based mortality data. http://www.who.int/healthinfo/anacod/en/

EXTERNAL CONSISTENCY

Assessment of external consistency involves comparison of findings from two different data sources. The cause distribution obtained from the hospital data can be compared to the estimates for the whole population, obtained through statistical modeling, such as WHO's Global Health Estimates and the IHME Global Burden of Disease. This is not necessarily a data quality assessment but can simply provide further insights into the extent to which the hospital-based causes of death are indicative of what people die of in the general population. The main challenge is to make sure that the cause categories derived from the hospitals are comparable to those of the estimates. An example is given in the analysis section.

Box 1: Adjusting for ill-defined and unknown causes

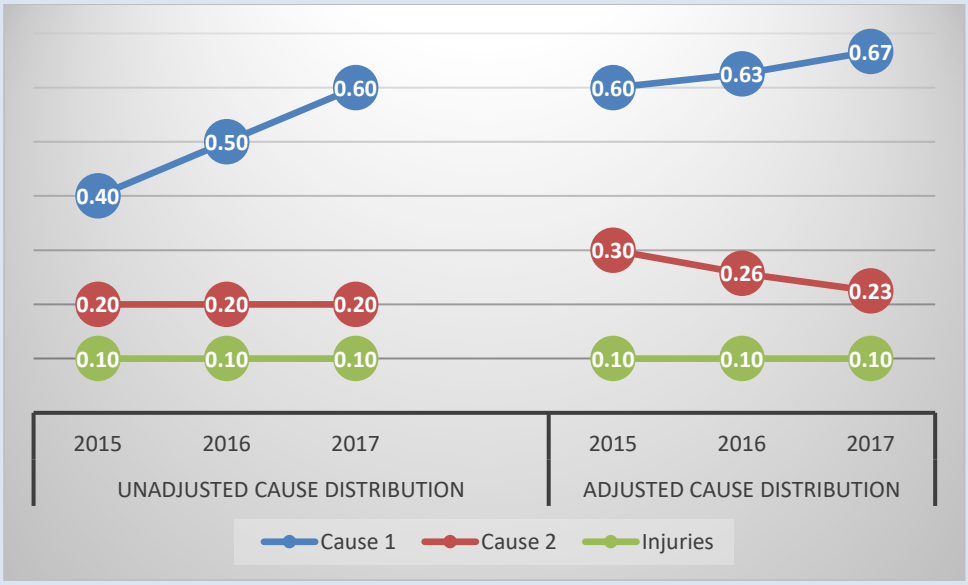
The example below (table and graph) shows a hypothetical country cause of death distribution. Cause 1 increases from 40% to 60% during 2015-2017, the other two causes remain constant at 20% and 10%, while the proportion ill-defined goes down from 30% to 20% and 10% in 2017. Re-distributing the unknown/ill-defined causes to the three specified causes can be done as follows (p stands for proportion due to a given cause category):

$p_{adjusted,\ cause(n)} = p_{unadjusted,\ cause(n)} * (1 + p_{garbage}/(1-p_{injuries} - p_{garbage})$.

The garbage causes should not be redistributed to non-natural deaths. It is assumed that non-natural deaths such as drowning or road traffic accidents have a low risk of being misclassified as such deaths are generally ascertained by the police or medico-legal institution.

The impact on the trends assessment in the example is large: the increase in cause 1 is much less pronounced after adjustment, while cause 2 and cause 3 are declining when we take the adjustment into account.

	Unadjusted cause distribution			Adjusted cause distribution		
	2015	2016	2017	2015	2016	2017
Cause 1	0.40	0.50	0.60	0.60	0.63	0.67
Cause 2	0.20	0.20	0.20	0.30	0.26	0.23
Injuries	0.10	0.10	0.10	0.10	0.10	0.10
Garbage	0.30	0.20	0.10	0.00	0.00	0.00
Total	1.00	1.00	1.00	1.00	1.00	1.00



Box 2: Comparing causes of death distributions between health facilities and estimates for the population

The table shows an illustrative comparison between the leading causes of death in the WHO Global Health Estimates for 2016 for all ages of the population in Kenya and the distribution of causes derived from the health facility data. National estimates are generally modelled, and their purpose is for driving overall health policy. In contrast, the real-time health-facility cause-of-death data can provide more immediate insights of what is actually killing the population in a country and can potentially be broken down to small geographic areas. It is useful to indicate the percent garbage codes that were re-distributed for the purpose of this analysis (bottom of the table).

Kenya, WHO Global Health Estimates for population deaths, all ages, broad cause groups, 2016 (N=284,100 deaths)

Rank, WHO-GHE	Cause of death	Percent of all deaths, WHO - GHE	Rank among hospital deaths	Percent of institutional deaths
1	Diarrheal diseases	13.3		
2	HIV	12.6		
3	Neonatal deaths	10.2		
4	Neoplasms	9.6		
5	Injuries	9.6		
6	Cardiovascular disease	7.6		
7	Acute respiratory disease	6.9		
8	Malaria	3.4		
9	Digestive system diseases	2.6		
10	Congenital anomalies	2.4		
	All other causes	21.8		
	Total	100.0		
	Garbage codes	0.0		N.N (re-distributed)

2. Quality of morbidity data

Refer to the Mortality Data Quality Metrics dashboard in the mortality section. Data quality metrics for morbidity should include completeness of morbidity reporting and the quality of diagnoses, both for inpatient facilities and outpatient facilities.

Quality of morbidity data reported by health facilities

	Very poor quality	Poor quality	Suboptimal quality	Good quality	Very good quality
Overall score	< 25%	25-49%	50-84%	85-94%	95% or more
D1 Discharge diagnosis for new admissions and re-admission separated	< 25% of deaths	25-49%	50-84%	85-94%	95% or more
D2 ICD used for coding of discharges	< 25% of cases	25-49%	50-84%	85-94%	95% or more
D3 Percent with ill-defined or unknown codes among inpatients	>=33%	25-32%	15-24%	5-14%	<5%
D4 OPD health facility reporting rate	< 50%	50-74%	75-84%	85-94%	95% or more
D5 OPD new and re-visit to OPD separated	< 25%	25-49%	50-84%	85-94%	95% or more
D6 OPD: ICD used for coding of diagnoses	< 25% of cases	25-49%	50-84%	85-94%	95% or more
D7: OPD Percent with ill-defined or unknown codes	>=33%	25-32%	15-24%	5-14%	<5%

Annex 2. Further considerations for analysis and interpretation

Analysis of survey- and facility-based statistics for key indicators

It is good practices to present survey and facility-based statistics together, in tables or graphs. These comparisons can be done for national and provincial/regional/county levels, depending on the levels of disaggregation offered by the surveys.

Survey statistics are often considered the "gold standard" because the data are collected in a random sample of the population through structured interviews and biomarkers. As such surveys provide representative information on the whole population, including those who do not use health services. There are also limitations. First, all surveys have sampling errors which become larger at the subnational levels. The 95% confidence intervals are however often available for several indicators from DHS reports in the annexes. Second, survey data are often retrospective – the respondent is asked about events in the past. Table 1 shows commonly used reference periods in surveys for selected key indicators. Third, surveys are not good at providing reliable results about rare events (such as maternal mortality), as the sampling errors simply become too large. Fourth, surveys may have systematic errors that affect the data quality.

Indicator	Survey reference period
Outpatient services	Last 2 weeks, last 4 weeks, last 6 months, last year
Antenatal delivery and postnatal care	Three years before the survey
Contraceptive prevalence	Current, at the time of the survey
Immunization coverage	Current status, reported for children 12-23 months, refer to year before survey
Childhood illness treatment	Last 2 weeks before the survey
Cervical cancer screening	Last 3 years, ever

Summary measures or indexes

In the context of UHC it is useful to summarize the information contained in multiple indicators. The annex of this chapter lists 16 UHC indicators in four groups – RMNCH, infectious disease control, NCD preventive measures and health system capacity – which has been used to compute a UHC service coverage index by WHO for all countries. UHC coverage index is an example that uses health system, health facility and survey data. Another example is the Countdown RMNCH composite coverage index (CCI) based on FP, maternal and newborn care, immunization and treatment coverage which has been used extensively to monitor progress and inequalities in RMNCH. This coverage index is usually entirely derived from surveys, but first three intervention areas can also be obtained from facility data.

The health facility data can contribute to the computation of the WHO UHC index for several indicators. It is also possible to obtain an idea of the status of UHC using a select set of indicators that include access (availability and utilization), coverage and quality of services. The general principle of the computation of the index is to use an unweighted average if the indicator is measured on a scale of 0 to 100% where 100% is the maximum. For other indicators such as service utilization there is no such scale. A threshold value will have to be used to determine the maximum (100%). For instance, for OPD visits per year a threshold value of 5 has been proposed and for discharge rates 10 per person per year, both based on an assessment of levels in OECD high income countries. The rates are computed as: actual value / threshold value * 100%, where the value is reset to 100% if it exceeds 100%.

Facility-data-derived access / coverage / utilization statistics can be summarized into an index which is useful to compare districts. The following principles are useful to consider:

- Use intervention areas rather than individual indicators. An intervention area such as antenatal and delivery care can have multiple indicators, but in the overall index, all indicators are combined to produce on score for antenatal and delivery care that contributes to the overall index.
- Use simple weighting schemes that are easy to communicate. Users tend to distrust summary measures, even though they are often necessary to see the big picture, and if they can be explained easily, it may help.
- In general, an unweighted average between intervention areas is the most straightforward method. Here, the (arithmetic) mean is taken for each intervention area. In some cases, however, the ranges of the coverage indicators may vary considerably between coverage indicators. For instance, immunization coverage may vary from 50% to 90% while hypertension treatment coverage ranged from 1-20%. In this case, the geometric mean is a more useful way to compute the scores.[13]

District comparisons

Comparison tables or charts of districts or other subnational units can be used for single indicators and summary indicators. All districts are often ranked, but the focus of users is often only on the very top or bottom. Much of the criticism is focused on the unfairness of the comparisons, e.g. poor district with wealthy districts. Stratified rankings may be more useful, especially if there are large differences within country.

Districts can be grouped according to administrative regions and provinces (which also has the advantage that household survey statistics can be brought into the picture), urban – rural character of the district, socio-economic quintiles and epidemiological characteristics (e.g. with and without malaria, HIV severity).

The socio-economic stratification is particularly useful. Districts can be classified into socioeconomic quintiles, according to an official classification from National Bureau of Statistics. If no such classification is available, or it is not recent, a socioeconomic index can be computed from recent DHS data based on education and wealth characteristics or derived from special studies on subnational poverty (e.g. where district income levels are estimated).

Estimating the community maternal mortality ratio (MMR)

The MMR among births at home is often unknown and difficult to measure. A rough estimate of this community MMR can be obtained and reported based on the following information:

- An estimate of the population-based maternal mortality ratio (e.g. from a recent DHS or from the UN estimates): $MMR_{national}$
- Institutional maternal mortality ratio: $MMR_{hospitals}$
- Proportion of live births that occur in health facilities (institutional delivery rate): ID

The formula to compute MMRcommunity is: MMRcommunity = (MMRnational - MMRhospitals * ID) / (1-ID)

For example, if the national MMR is estimated at 400 per 100,000 live births, the MMR in health institutions is 200, and 75% of live births are in health institutions, then the community MMR is: (400-200*0.75)/0.75 = (250)/0.25 = 1000 per 100,00 live births.

[13] The *Geometric Mean* is a special type of *average* where we multiply the numbers together and then take a square root (for two numbers), cube root (for three numbers) etc.

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