TOOLKIT FOR ANALYSIS AND USE OF ROUTINE HEALTH FACILITY DATA

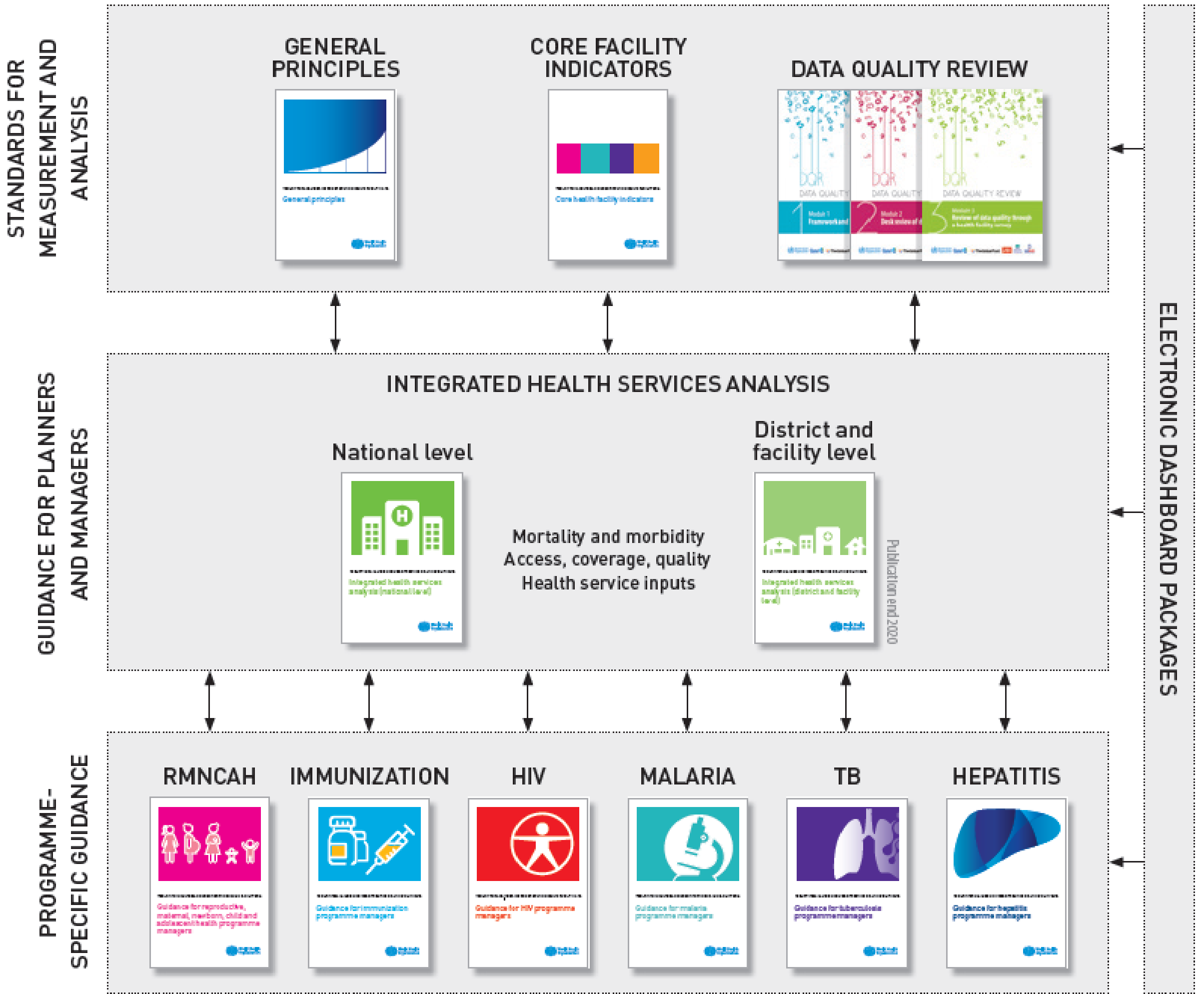
Integrated health services analysis: national level

WORKING DOCUMENT JANUARY 2021

World Health Organization

WHO TOOLKIT FOR ANALYSIS AND USE OF ROUTINE HEALTH FACILITY DATA

This document is part of the WHO Toolkit for analysis and use of routine health facility data – a set of capacity-building resources to optimize the analysis and use of data collected from health facilities through routine health information systems (RHIS). The Toolkit is a collaborative effort by multiple WHO technical programmes and partners. It promotes an integrated, standards-based approach to facility data analysis, using a limited set of standardized core indicators with recommended analyses, visualizations and dashboards.



The Toolkit consists of a series of modules that can be used individually or together:

- *General principles* introduces key concepts in routine facility data analysis that are applicable to all modules.
- *Core facility indicators* is a compendium of the indicators from the various modules.
- The Data quality review (DQR) toolkit includes guidance and tools for systematic review of the quality of routine facility data.
- *Integrated health services analysis* targets general health service managers, providing a comprehensive, integrated analysis of tracer indicators across multiple health service components and programmes.
- The *programme-specific guidance modules* are customized according to the needs of the programme. Each module contains a guidance document, training materials and an electronic configuration package for automated dashboard production.

The materials within the Toolkit will be periodically updated and expanded.

Further details: https://www.who.int/healthinfo/tools_data_analysis_routine_facility/en

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Contents

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Abbreviations

ACT	artemisinin-based combination therapy
ALOS	average length of stay
ANC	antenatal care
ART	antiretroviral therapy
BCG	*Bacille Calmette-Guerin* (vaccine)
BOR	bed occupancy rate
C-section	Caesarean section
CFR	case fatality rate
CRVS	civil registration and vital statistics
DHIS2	district health information software 2
DHS	Demographic and Health Surveys
DTP	diphtheria–tetanus–pertussis (vaccine)
DQR	data quality review
FTE	fulltime equivalent
GIS	geographic information system
HHFA	harmonized health facility assessment
HIV	human immunodeficiency virus
HMIS	health management information system
ICD	international classification of diseases
IPTp	intermittent preventive treatment for malaria during pregnancy
LMIS	logistics management information system
MCV	measles-containing vaccine
MICS	Minimum Indicator Cluster Survey
NCD	noncommunicable disease
NGO	nongovernmental organization
OPD	outpatient department
Penta	pentavalent vaccine
PHC	primary health care
PLHIV	persons living with human immunodeficiency virus
RDT	rapid diagnostic test
RHIS	routine health information system
SARA	service availability and readiness assessment (WHO)
SDG	sustainable development goal
TB	tuberculosis
UHC	universal health coverage
WHO	World Health Organization

Guidance overview and references

This document provides guidance on integrated analysis and use of health service data collected from health facilities though routine health information systems (RHIS).

The integrated approach provides general health service planners and managers with an overarching or "cross-cutting" view of health services, based on a limited set of core indicators that represent multiple health programmes and service components. This approach recognizes that the various components of a health service delivery system are interdependent and should not be viewed in isolation. Such an integrated approach is essential for the comprehensive strengthening of health services towards improving primary health care (PHC), achieving universal health coverage (UHC) and contributing to the health-related sustainable development goals (SDGs).

The core indicators for integrated analysis are organized into three groups, with subgroups:

Group 1 indicators: Health status and epidemiological profile

- Mortality (institutional)
- Morbidity (inpatient and outpatient)

Group 2 indicators: Health service performance

- Utilization and access
- Coverage and quality

Group 3 indicators: Health service resources

- Availability, distribution and efficiency of resources required by health facilities: infrastructure, health workforce, medicines and medical products, and financial resources.[1]

The data analysis approach in this guidance is based on five principles:

1. Integration – of health programmes and services
2. Focused analysis – using core indicators
3. Standardization – of indicators, analyses and visualizations
4. Data quality assessment – along with analysis
5. Purpose-oriented analysis – for management and planning

Chapter 1 discusses these principles and provides a basis for understanding the chapters following. Chapter 2 provides a summary list of the core indicators. The Chapters 3, 4 and 5 each discuss one of the main indicator groups, organized into sections according to the indicator subgroups. Each section follows a similar structure:

- "Core indicators" presents the indicators with their definitions, calculation and disaggregations.
- "About the data" describes the rationale, data collection, analysis and use specific to the subgroup.
- "Assessing data quality" addresses data quality issues according to four data quality dimensions.
- "Analysis of core indicators" discusses analysis and interpretation issues for each indicator and provides examples of recommended visualizations (charts, tables, maps).

The guidance focuses on the analysis of aggregated routine facility data, including national level trends as well as comparisons among sub-national administrative units. The Toolkit module "Integrated health services analysis: district and facility levels" addresses similar concepts but adapted to these levels.

The "General principles" module provides additional details on foundational concepts for analysis of routine facility data and should be used along with the integrated guidance. Further details are also

[1] Health service resource data are complex and often not available in RHIS; however, selected concepts and indicators are briefly discussed to highlight the importance of reviewing routine health service data in relation to the resources needed to produce the services.

found in the programme-specific Toolkit modules. (Refer to the inside front cover for an overview diagram of the comprehensive set of Toolkit resources.)

This document includes hyperlinked text which is underlined and in blue font. Click once on the hyperlinked text to go to another place in the document to review a selected figure or to find additional information. After finishing the review, in order to return to the original place in the document, hold the alt button down and click on the left arrow.

Learning objectives

This guidance will promote an understanding of:

- the concept of integrated analysis of health services, using RHIS data;
- the advantages of using standardized indicators and visualizations;
- analysis and presentation of the data in ways that are easily understood and useful to health service planners and managers;
- the importance of and approaches to assessing data quality;
- some considerations for interpretation of RHIS data.

The guidance assumes that users will already have a basic level of understanding of routine health information systems, indicators and analytical concepts.

Audience

The guidance targets workers in ministries of health as well as other organizations, including:

- decision-makers that use RHIS data for general planning, management and review of health services;
- programme staff that want to share key programme findings with a general audience;
- staff responsible for the analysis and presentation of health data, including analysts and monitoring and evaluation officers;
- health information systems staff involved in data management and data quality improvement;
- research institutes and academic institutions involved in the analysis of RHIS data and/or efforts to improve data quality.

Suggested references

Toolkit for analysis and use of routine health facility data. Geneva: World Health Organization; 2020 (https://www.who.int/healthinfo/tools_data_analysis_routine_facility/en/))

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1 Introduction

1.1 CONTEXT FOR INTEGRATED HEALTH SERVICES ANALYSIS

1.1.1 UHC, the SDGs and PHC

All countries are working toward attaining UHC. UHC means that all people receive the health services they need at a level of quality that is good enough to improve their health, and without suffering financial hardship. It includes the full spectrum of essential health services, from health promotion to prevention, treatment, rehabilitation and palliative care. A global set of indicators for monitoring country progress toward UHC is linked to SDG 3.8.1[2] and represents coverage for a range of health care and related services. Most of these UHC indicators are measured through population-based surveys. However, as health facilities make a critical contribution to achieving the UHC targets and the health-related SDGs, it is essential to also specifically monitor health service performance using facility-based data across the spectrum of health services.

PHC is foundational to achieving UHC. In 2019, global leaders renewed their commitment to PHC at the Global conference on PHC in Astana, Kazakhstan. Strong PHC systems provide comprehensive, integrated care across the spectrum of a population's health needs over the life course. Monitoring the performance of PHC services therefore also requires a comprehensive, integrated approach.

The integrated or "cross-cutting" approach to analysis of RHIS data that is taken in this guidance can provide planners and managers of PHC and referral services with a quick but comprehensive overview, on a regular basis, of health service performance and the health status of the people using these services.

1.1.2 Country health information systems

This document provides guidance on integrated analysis of health services using data **regularly** collected from health facilities through routine health information systems (RHIS).[3]

Routine facility data should also be considered within the context of the overall country health information system (HIS). The HIS brings together data from multiple sources, including the RHIS, health facility assessments, household surveys, censuses, civil registration systems, surveillance systems and other administrative data sources.[4] Other data sources are mentioned briefly in this section and are needed for calculation of some of the indicators in this guidance. Some of these other data sources may also produce data on a regular or "routine" basis (e.g. surveillance systems, logistics management information systems) and may use facility-generated information; however, in most health systems they tend to remain as separate data sources that are not fully integrated with the RHIS.

- **Routine health information systems (RHIS)**

Data are generated in health facilities on an ongoing basis during the processes of service delivery. Facilities routinely collect data on the diseases and other health conditions for which people seek care, as well as on facility activities (outputs such as the number of outpatient department visits, the number of vaccine doses given) and the results of these activities (outcomes such as the number of tuberculosis (TB) patients cured, the number of inpatient deaths). These data are aggregated and regularly reported through the RHIS to higher levels of the health system and ultimately to the national level. While RHIS

[2] https://unstats.un.org/sdgs/metadata/files/Metadata-03-08-01.docx

[3] The "RHIS" is also called the health management information system (HMIS); the terms often used interchangeably. HMIS is also sometimes used to describe the system for routine data that are not reported through programme-specific systems. For consistency, "RHIS" is used throughout this document.

[4] For further details on the components of a HIS, refer to the Health Metrics Network Framework (http://www.who.int/healthmetrics/documents/hmn_framework200803.pdf)

data are commonly reported each month, the frequency of reporting may vary according to the data type, information needs and system capacity, e.g. daily, weekly, monthly, quarterly, annually. Data are analyzed and used at all the levels of the health system.

The RHIS is a primary source of data for assessing health service performance and therefore essential for improving health service delivery. RHIS have the advantage that data are collected and analyzed regularly, providing updated information across a wide range of services and for all service delivery units throughout the country, thus enabling timely assessment of performance and identification of problems.

RHIS data often focus on PHC components such as outpatient consultations, maternal health, immunization, HIV, TB, etc. Depending on the facility level and health system characteristics, the RHIS may also report service components such as inpatient care (e.g. number of discharges, number of inpatient days); main outpatient and inpatient diagnoses and causes of death; surgical activity (e.g. number of caesarean sections); and special investigations (e.g. number of laboratory tests by type).

RHIS data sources are individual patient/client records (e.g. antenatal care cards, outpatient registers). Data are typically aggregated on tally sheets or counted from registers and then consolidated in monthly hard-copy report forms. In most health systems, aggregate data from the monthly reports are entered into an electronic database which keeps an electronic copy of the report of each facility and each month.[5] This data entry may occur at various levels of the system, e.g. health center, hospital, district office, etc. In some RHIS, aggregate data from all programmes are entered into the same electronic system; in other cases, specific programmes have separate systems. Some programmes (e.g. immunization, TB, HIV,) use tracking systems to record information on individual patients over time. Sometimes these tracking systems are electronic (e.g. electronic registers) and may be integrated with the RHIS but are often separate systems with only selected aggregate data extracted and submitted to the RHIS.

- **Surveillance systems**

Surveillance systems may report daily, weekly and/or monthly on selected diseases and conditions of public health importance. Some surveillance systems are integrated into the RHIS but in many contexts they use separate reporting systems.

- **Health facility assessments**

Data are also collected from facilities through **periodic** health facility assessments/surveys that are usually conducted at intervals of several years. Such assessments provide information that usually cannot be collected through the RHIS but serve to complement RHIS data. The surveys are also used to validate the data reported by facilities. Health facility assessments are addressed through a separate set of WHO resources, the *Harmonized Health Facility Assessment (HHFA).*[6]

- **Health service resource data**

Resource data may be part of the overall HIS in different ways. Some data sets may be recorded in electronic databases while others may remain in paper format. The availability, distribution and use of these resources are important for understanding health service performance.

- A **master facility list (MFL)**[7] contains a list of all health facilities in the administrative unit, with their location and level. The MFL should include public, private-for-profit, military, police, nongovernmental organizations (NGOs), faith-based and any other providers.

[5] Some health systems or programmes rely on manual aggregation of paper-based data from multiple facilities before these aggregated values are entered into an electronic database (e.g. at district office level).

[6] https://www.who.int/data/data-collection-tools/harmonized-health-facility-assessment

[7] Master Facility List Resource Package: guidance for countries wanting to strengthen their Master Facility List. Geneva: World Health Organization; 2017. (https://www.who.int/healthinfo/country_monitoring_evaluation/mfl/en/#)

- **Health workforce / human resources information systems** maintain updated records of all health workers, including occupation and location. (Sometimes these databases are operated by the civil service authority rather than by health authorities.)
- **Logistic management information systems (LMIS)** support the management of stocks of medicines and other medical products. A well-developed LMIS records all movements of items from origin to destination as well as movements within warehouses and facilities.
- **Financial management information systems** record all transactions related to budget execution.

Population data

Population data serve as denominators for many RHIS indicators, e.g. utilization rates, coverage. It is important that managers and analysts have estimates of the populations the system is expected to cover. However, obtaining reliable population data is often challenging. Census-based estimates may be out-of-date or inaccurate; in general, the smaller the geographic area, the less reliable the population data.[8]

Other information sources

Other sources include community information systems, civil registration systems, population-based surveys, supervision reports, data from other sectors and informal sources. Information from these various sources can provide insights into the service context and help in interpretation of RHIS indicators.

Integrated data management systems

A country HIS often consists of many, disconnected data management systems, including multiple systems for collection and management of routine facility data. Programme-specific systems may be the result of partner requirements and, in some cases, the data elements and indicators in these systems are not consistent with the national indicator list. Furthermore, RHIS managers may not have access to the programme-specific systems.

Comprehensive, integrated analysis of routine facility data requires access to data from all programmes and service components. While it is possible to extract data from different systems to conduct an integrated analysis, this requires substantial time and effort and is rarely feasible for regular analysis.

Integration of all routine facility data systems into a single, common RHIS platform enables efficient, integrated analysis and avoids duplicate data entry. Where such integration is not feasible, systems can be designed for interoperability, to allow easy transfer of data between them. Such integration and operability require standardization of meta data across the various systems.

Interoperability can be extended to include data from sources other than the RHIS. For example, interoperability of the RHIS with health workforce information systems and LMIS would facilitate analysis of resource distribution and use in relation to facility activities. This would also support assessment of equity and efficiency. Furthermore, a common data platform can be expanded to create a repository of data from various sources (e.g. health facility assessments, population-based surveys, community health information systems), to facilitate triangulation of data from various sources and comprehensive review of heath sector information.

Establishment of integrated or interoperable data systems requires high-level buy-in, commitment of financial and technical resources and strong coordination from the ministry of health, as well as partner collaboration and support.

[8] Refer to the Toolkit document "General principles" for further discussion on population estimates.

1.2 PRINCIPLES OF THIS GUIDANCE

The data analysis approach of this guidance is based on five principles, listed in Box 1.

Box 1 - Principles of this guidance

1. Integration - across programmes and services
2. Focused analysis – using core indicators
3. Standardization – of indicators, analyses and visualizations
4. Data quality assessment – along with analysis
5. Purpose-oriented analysis – for management and planning

1.2.1 Integration – across programmes and services

In this guidance, integrated analysis refers to the presentation of indicators from multiple programmes and service components in ways that they can be reviewed together easily. An integrated data perspective reinforces the need for attention to the comprehensive health needs of individuals and populations, in addition to programme-specific perspectives.

An integrated approach also recognizes that the various components and processes of a service delivery system are interconnected and may influence each other. It allows assessment of indicators from various programmes in relation to each other, helping to check the consistency of the data between programmes and enabling identification of imbalances in programme performance. Indicators that use data from more than one programme (e.g. TB and HIV, RMNCAH and malaria, RMNCAH and HIV) provide further insights into the relationships among programmes. As discussed in the previous section, integrated analysis is greatly facilitated by integration or interoperability of data collection and analysis platforms.

1.2.2 Focused analysis - using core indicators

General health planners and managers do not require detailed information on all aspects of health services each time they review data. A limited set of core indicators serving as “tracers” can enable users to quickly identify potential problems that can be explored further through in-depth analysis if necessary. A summary list of core indicators is provided in Chapter 2 of this guidance. Further descriptions of each indicator are found in the core indicator tables and analysis sections of the relevant chapters. All the programme-related indicators are also found in the programme specific modules of the *Toolkit*.

The indicators in this guidance are intended as an example of an integrated indicator set, for countries to adapt according to their context and priorities.

The core indicators are presented in three main groups, with subgroups:

- **Group 1- Health status and epidemiological profile:**
  - Mortality (institutional)
  - Morbidity (inpatient and outpatient)
- **Group 2 - Health service performance:**
  - Utilization and access
  - Coverage and quality
- **Group 3 - Health service resources:**
  - Availability, distribution and efficiency of resources required by health facilities: infrastructure, health workforce, medicines and medical products, and financial resources.[9]

[9] Health service resource data are complex and often not available in RHIS; however, selected concepts are briefly discussed to highlight the importance of reviewing RHIS data in relation to the resources needed to produce the services.

While some indicators may not always fit neatly into a group or subgroup, the groups are helpful in organizing the analysis and providing a focus on key aspects of service delivery.

The indicator groups represent key service aspects that should be considered in management and planning processes. For sound decision-making, managers need to assess all the groups. Performance in one group may be influenced by that of other groups, e.g. measles vaccine shortage can result in low vaccination coverage which can in turn result in a measles outbreak.

The following paragraphs briefly describe how the indicators could be used by planners and managers.

- **Group 1 indicators - Health status and epidemiological profile:**

- **Institutional mortality** indicators measure the total number of inpatient deaths and the illnesses and conditions from which people die while admitted to a health facility.
- **Inpatient and outpatient morbidity** reflect the diagnoses for which people are admitted as inpatients or visit outpatient services.

While RHIS data are not representative of the entire population, facility deaths and morbidity data provide some information on the types of health problems occurring in the population. For example, an increase in the number of admissions and inpatient deaths for malaria, along with an increase in malaria cases in OPD, point to a malaria outbreak that demands immediate action. This information is also important for planning the types of health service and public health interventions needed (including screening, preventive and promotive interventions) as well as the staffing, training, and medicines and supplies required. Mortality and morbidity data can also inform evaluation of the coverage and quality of disease control programmes.

- **Group 2 indicators – Health service performance:**

- **Utilization** refers to how often the population uses health services and is measured through inpatient discharges, outpatient visits and use of surgical services. **Access** refers to whether people are able to reach the services and use them. Utilization is often used as a proxy measure for access but is also influenced by whether people choose to use the services. Thus, a perception of poor service quality may result in low utilization.
- **Coverage** refers to the percentage of a target population that received a specific service that they need.
- **Quality** refers to how well a service is delivered: whether it is provided according to required standards. RHIS indicators can serve as proxy quality measures that may highlight the need for in-depth quality assessments.

The indicators in this group are important for assessing performance and for the identification of inequities. For some of the indicators there are well-defined targets. For example, administrative areas (such as provinces and districts) have defined coverage targets, based on their populations. For several indicators of service quality, the accepted target is 100%, e.g. antenatal syphilis testing or malaria diagnostic testing. Regular monitoring of such indicators shows whether services are on track to meet their targets and enables comparisons of performance among sub-national areas. Such findings can help to inform decisions about supervision needs and allocation of resources.

For other indicators, a target is not well defined. For example, there are no defined targets for outpatient or inpatient service utilization, surgical volume, the number of new cases of hypertension or diabetes or the number of TB notifications. Interpretation of such indicators relies mainly on assessment of trends (both short-term and long-term) to identify improvements or disruptions of service. In addition, for indicators defined as rates per population (e.g. inpatient and outpatient utilization rates) it is possible to compare the performance of sub-national areas.

- **Group 3 indicators - Health service resources:**

  Health service resources are the inputs needed to deliver the services, such as infrastructure, workforce, medicines and medical products, and finances. Resource data are usually managed through specific information systems that are not linked to the RHIS. However, it is important to consider these data in relation to RHIS data, as they can help managers to assess performance and to make informed decisions about distribution and re-distribution of resources. For example, comparing the numbers of health workers per population among different districts can guide decisions about deployment of additional staff to under-served areas.

1.2.3 Standardization – of indicators, analyses and visualizations

Standardization of data elements[10] and indicators enables a common understanding of what is being measured and allows comparison of data over time and across programmes, places and populations. Indicator standardization involves agreeing on standard definitions of indicators, data elements and metadata[11], including disaggregations, e.g. age groups. Standardization of data collection tools and training of staff are essential to ensure that the data are collected in the same way in all locations.

The ways in which the indicators are visualized can also be standardized. This guidance uses the following visualizations:

- Line charts or column charts to show trends over time
- Column or bar charts to show comparisons, e.g. between activities or subnational areas
- Maps to show differences among subnational areas
- “Cascade” charts to show a sequence of related events
- Tables to show multiple indicators across time or across subnational areas

A set of standard visualizations can be agreed upon and grouped in a standard dashboard to provide an easily-accessible overview of key indicators. Dashboards can be presented on a computer screen (in an electronic database) or in hardcopy documents.

After a core set of indicators and their visualizations have been defined, the production of standard dashboards at required intervals can be automated in the data management system, e.g. the district health information software 2 (DHIS2).

Such a standard set of indicators and their visualizations, organized into standard dashboards, can be used across administrative units (e.g. districts) and across different levels of the health system. This provides a consistent approach to data analysis, focuses the analysis on priorities and can assist in building capacity.[12]

Health systems vary in their policies, priorities and data systems. For example, a country may currently not collect data on all the core indicators presented in this guidance or may use different names for the data elements and indicators. Therefore, countries need to adapt the indicators and analyses according to their needs. This will usually require a process for reaching consensus on a set of indicators among the various stakeholders who will analyze and use the data (e.g. health programmes, HIS staff, subnational managers, hospital authorities, partner organizations).

[10] A data element is the numerator or denominator used in the calculation of an indicator.

[11] Metadata provide information about an indicator or data element, e.g. definition, calculation, disaggregation, frequency of reporting, form to be used for reporting.

[12] RHIS databases sometimes contain multiple unrelated tables and charts, while lacking visualizations of key indicators. This document aims to provide guidance on the most useful and reliable analyses and visualizations. The *Toolkit* module “*General principles*” provides further details on visualizations.

1.2.4 Data quality assessment – along with analysis

Data cannot be interpreted without an understanding of the data quality and should always be assessed for completeness, consistency and errors. The data quality findings should be presented in the same dashboard or report that presents the indicators, to provide the user with insights into the strengths and limitations of the data. Data quality assessment involves four main dimensions, summarized in Table 1.

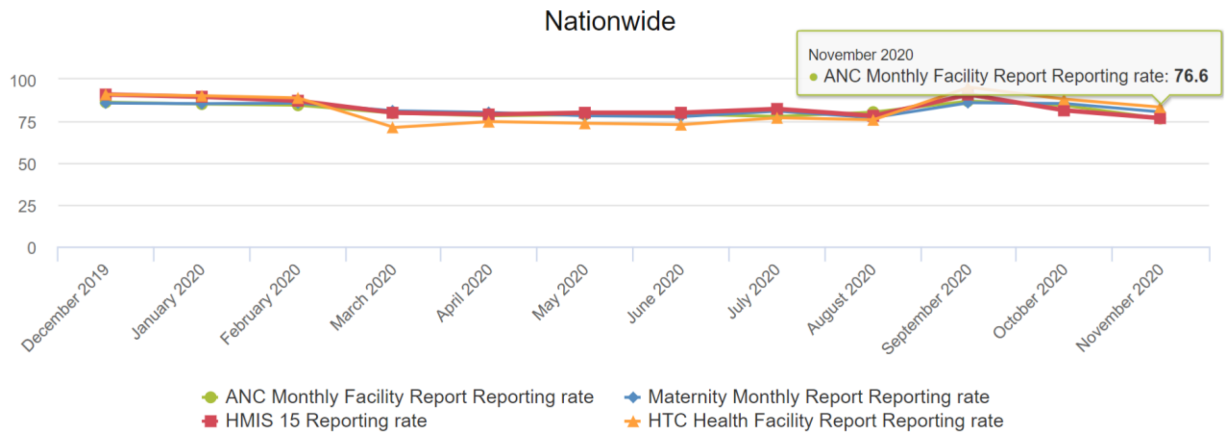
Table 1 : Data quality dimensions

Data quality dimension	Description
1. Completeness and timeliness	Completeness and timeliness of report submission
	Completeness of specific data elements
2. Internal consistency	Presence of outliers[13] Consistency over time Consistency between related data elements / indicators Consistency between reported data and original records
3. External consistency with other data sources	Consistency between RHIS data and sources such as population-based surveys, special studies
4. External comparisons of population data	Consistency between population data used for calculating facility indicators and other sources of population estimates

RHIS data quality assessment should be conducted both routinely and periodically as a part of ongoing data quality assurance.

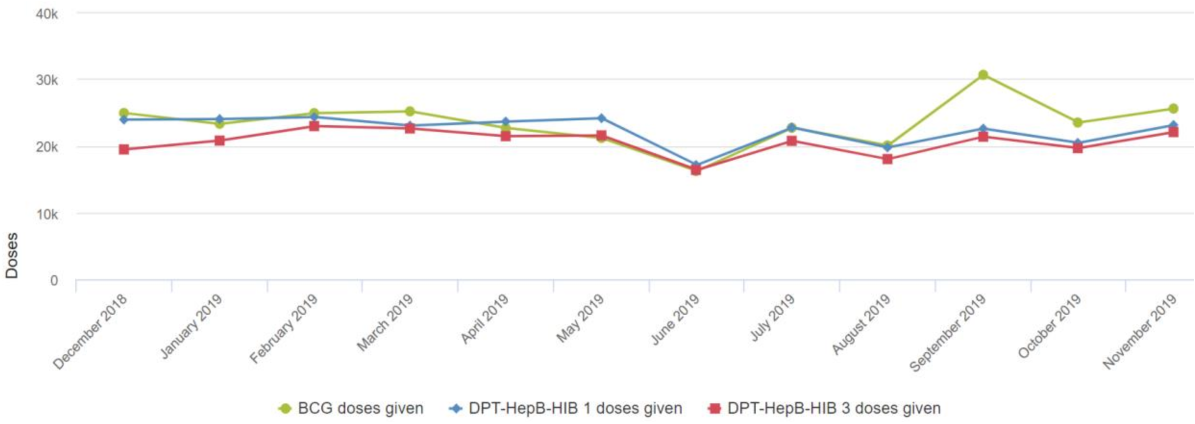
Routine data quality assessment should take place regularly, e.g. monthly or quarterly, at the time that the data are submitted. Dedicated data quality dashboards can be created as part of a set of analysis dashboards. Data quality visualizations can also be included within an analysis dashboard. For example, the following charts should appear in an immunization data dashboard: Figure. 1 shows the trend in completeness of reporting for multiple datasets. Figure 2 can be used to review the consistency of the data over time and can also reveal any extremely large outliers (as seen in September 2019 for BCG).

Figure 1: RHIS reporting rates – selected data sets, nationwide, last 12 months



[13] Outliers are values that differ substantially from the average reported value. Sometimes outliers are the result of true variations, but often they are the result of a data error.

Figure 2 : Doses given for select vaccines, nationwide, last 12 months



Periodic data quality reviews are more extensive than routine assessments and consist of two components: a desk review and a data verification survey. The desk review involves quality checks on the data available in the electronic system. The data verification survey involves visits to health facilities and assesses a sample of districts and facilities for the extent to which the RHIS data match the source documents (e.g. facility registers and tally sheets). A data verification component may be included in general health facility assessments such as WHO's HHFA.

Standardized methods for data quality assessment are important for understanding whether data quality improves over time and for comparing subnational areas, to enable targeting of support to where it is most needed. WHO has developed a set of resources to support standardized data quality review: the *Data Quality Review (DQR) Toolkit.*[14]

This toolkit includes an Excel-based tool which, when populated with key data from health facilities and other sources, analyzes the completeness, internal consistency and external consistency of the data. For countries using the DHIS2, WHO has developed an application that can be installed on the national DHIS2 system for automated generation of a data quality desk review report at national or sub-national level.[15]

1.2.5 Purpose-oriented analysis - for management and planning

Dashboards for visualizing key findings

Calculation of indicators and production of dashboards and analysis reports are essential first steps in the process toward using data for decision-making. Standard dashboards can be produced for different health system levels (e.g. national, district, facility) and for different analysis timeframes, linked to the data needed for different management processes. For example:

- **Short-term dashboards** (e.g. monthly/quarterly): for ongoing, regular monitoring of the health situation and service performance, to identify issues where immediate action may be needed.

- **Long-term dashboards** (e.g. annual): for periodic reviews of progress, equity and efficiency and to inform planning and resource allocation

This guidance provides examples of visualizations (charts, tables and maps) presenting mainly annual, national level statistics.[16] The indicators and related model visualizations are organized according to the three indicators groups previously discussed.

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

[15] WHO Data Quality Tool. https://play.dhis2.org/appstore/app/rFDeB5LLQmi

[16] District and facility dashboards are addressed in a separate *Toolkit* document "*Integrated health services analysis: district and facility levels".*

Interpreting the data

After the production of the dashboards and analysis reports, the next step is interpretation: looking at the data in a systematic way to uncover the underlying meaning or the "stories" that the data tell. Box 2 provides steps to guide the interpretation process.

Analysis and interpretation of RHIS data can provide insights into what is happening in health facilities and in the communities using the services. However, while these data can provide a description of a situation, they cannot explain why it is happening. The dashboards with their tracer indicators can therefore be used to identify issues that may need further investigation to find out the underlying causes.

Box 2 - Steps for interpreting RHIS data

1. **Assess data quality first:**
   - Review the short-term dashboards: assess completeness and internal consistency; look for errors.
   - Review the long-term dashboards: as above, plus assess external consistency with other data sources (e.g. population-based surveys) and consistency of denominators where relevant.
2. **Assess trends over time:**
   - Look at the data over time (e.g. consecutive months, quarters or years)
   - Compare with data for the same period in previous years
   - Ask:
     - Do the data remain consistent over time, or are there large or unexpected variations?
     - Are there any steady upward or downward trends?
     - Are there any seasonal variations?
3. **Assess progress against targets:**
   - Ask:
     - Have targets for been reached? (e.g. number of children vaccinated per quarter)
4. **Compare subnational areas:**
   - Are there significant differences among geographic areas / administrative units?
   - Compare the data for one subnational area with the average for all the areas.
   - Identify areas with significant differences in mortality and morbidity, compared with other areas and with the national average.
   - Identify areas that consistently underperform as well as those that consistently perform well.
5. **Compare different programmes:**
   - Do some programmes show more activity that others?
   - Are some programmes performing better than others?
6. **Compare related data elements**:
   - Do related data elements show the expected relationships? (e.g. are the numbers of vaccine doses given consistent with the number of vials used?)

2 Core indicators

I. Health status & epidemiological profile	**MORTALITY (institutional)**		
	Mortality levels	1. Institutional mortality rate 2. Stillbirths in health facilities 3. Neonatal deaths in health facilities 4. Maternal deaths in health facilities	
	Leading causes of mortality	5. Leading causes of inpatient deaths	
	Mortality due to specific causes	6. Case fatality rates (CFR) for major causes 7. Population incidence of inpatient deaths 8. Peri-operative mortality rate	
	MORBIDITY (outpatient and inpatient)		
	Leading causes of morbidity	1. Leading inpatient discharge diagnoses (percentage distribution) 2. Leading outpatient diagnoses (percentage distribution)	
	Morbidity due to specific causes	3. Inpatient incidence rate 4. Outpatient incidence rate	
II. Health service performance	**UTILIZATION and ACCESS**		
		1. Outpatient attendance per capita 2. Hospital discharge rate 3. Caesarean section rate at population level	4. Surgical volume 5. Service-specific availability
	COVERAGE		
		1. Contraception first time users 2. Antenatal client 1st visit before 12 weeks 3. Antenatal care 1ST visit coverage 4. Antenatal care 4th visit coverage 5. Institutional delivery coverage	6. DTP3 coverage 7. Antiretroviral therapy (ART) coverage (current) 8. TB case notification rate 9. Hypertension new cases 10. Diabetes new cases
	QUALITY		
		1. Antenatal client syphilis screening 2. PMTCT testing 3. Intermittent preventive treatment for malaria during pregnancy (IPTp3) 4. Caesarean section rate at facility level 5. Immunization dropout rates 6. HIV care cascade	7. HIV tested new and relapse TB cases with a documented HIV status 8. Drug susceptibility test (DST) for TB cases 9. TB treatment success rate 10. Malaria diagnostic testing ratio 11. Confirmed malaria cases treated with ACT
III. Resources	**HEALTH SERVICE RESOURCES (availability, distribution and efficiency)**		
	Infrastructure	1.Health facility density and distribution 2. Hospital bed density	3. Bed occupancy rate (BOR) 4. Average length of stay (ALOS)
	Health workforce	5. Health worker density and distribution 7. Vacancy rate	6. Health worker productivity
	Essential medicines	8. Availability of essential medicines and commodities: health facilities with no stockout of essential items 9. Medicines expenditure per capita	
	Finance	10. Health services expenditure per capita 11. Budget execution	

Detailed metadata including definition, calculation, recommended disaggregation and level of use are found at the beginning of the guidance sections for each indicator group.

3 Group I indicators - Health status and epidemiological profile

3.1 MORTALITY (institutional)

3.1.1 Core mortality indicators

Indicator	Definition	Calculation	Disaggregation
Mortality levels			
1. Institutional mortality rate	Deaths in health facilities (all causes) per 1000 discharges	N: Number of deaths in health facilities x 1000 D: Number of discharges Discharges include deaths	Age (minimum: 0-4 and 5+ years) Sex; Cause of death Facility type Managing authority
2. Stillbirths in health facilities	Stillbirths* as a percentage of all births in health facilities *baby born with no sign of life and weighing at least 1000g 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	Fresh, macerated
3. Neonatal deaths in health facilities	Number of newborns who die in the health facility in the first 28 days This 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	N: Number of neonatal deaths in health facilities	Cause of death (classified by ICD-PM) Facility type Managing authority
4. Maternal deaths in health facilities	Number of women who die in a health facility while pregnant or within the first 42 days of the end of pregnancy This *i*ncludes women who gave birth outside a facility but who die in the health facility.	Number of maternal deaths in health facilities	Age (10-14, 15-19, 20+) Cause of death (classified by ICD-MM) Facility type
Leading causes of mortality			
5. Leading causes of inpatient deaths (percentage distribution)	Percentage distribution of the leading causes of death in health facilities (Proportional mortality)	N: Number of inpatient deaths by cause x 100 D: Total number of inpatient deaths	Age (0-4, 5+) Sex
Mortality due to specific causes			
6. Case fatality rates (CRF) for major causes	Cause-specific inpatient deaths per 100 discharges for major causes	N: Number of inpatient deaths due to cause "X" x 100 D: Number of discharges due to cause "X"	Age (0-4, 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 (0-4 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	Emergency vs elective Procedure Age

Notes: Facility type: provincial hospital, district hospital, health center, etc.
Managing authority/facility ownership: public, private, NGO, etc.
Geographic location is not presented as a disaggregation type in the indicator tables as all data are expected to be analyzed by geographic location.

3.1.2 About the data

This chapter discusses the analysis of data on deaths that occur while patients are admitted in hospitals and other inpatient facilities (also called facility deaths, inpatient deaths, institutional deaths or hospital deaths).

Sources of mortality data

Mortality data can come from multiple sources, including systems for Civil Registration and Vital Statistics (CRVS).[17] Strong CRVS systems are required to provide reliable information on all deaths in a country, including those that do not occur in health facilities. However, many countries do not yet have CRVS systems that capture all deaths or provide cause of death data for a large percentage of deaths.

Hospitals and other inpatient facilities typically report routinely on inpatient diagnoses and deaths and are often the only source of available mortality data. In these facilities, doctors are likely to have the skills and diagnostic support required for reliably assigning the causes of deaths. Therefore, hospital reporting is a good starting point for the collection of data on mortality, including causes of death. In many settings, however, only a small percentage of all deaths occurs in health facilities. Inpatient deaths are therefore usually not representative of all deaths in the population. Box 3 (later in this section) describes some methods for comparison of inpatient mortality data with estimates of deaths in the entire population, based on modeling of data from multiple countries.

Standardized classification of Cause of Death (CoD)

It is essential that CoD are classified in a standard way – in particular, in accordance with the International Classification of Diseases (ICD).[18] Some countries use CoD lists that do not align with the ICD classification. In some cases, the CoD list may even vary within a country or between types of facilities (e.g. referral hospitals and district hospitals). Use of non-standardized CoD lists makes it very difficult, if not impossible, to compare mortality data: from year-to-year; among subnational areas; between types of health facilities; or with global estimates. Furthermore, such lists may include many ill-defined categories to which a large percentage of deaths may be assigned (e.g. "Other metabolic diseases"; "Other gastro-intestinal"). This limits the usefulness of CoD data for decision-making. Non-standardized lists also tend to change more frequently than the ICD. These shortcomings of non-standardized CoD lists make it difficult to assure that doctors and other staff (e.g. "coders") receive the required training to ensure that CoD are reliably assigned, and that the data are coded in a consistent manner.

WHO guidance on standardization of mortality data

WHO has developed guidance for certifying deaths with the WHO International Form of Medical Certificate of the Cause of Death (MCCD) and coding of deaths according to ICD.[19] The ICD contains large numbers of codes and details that may be challenging to use in some settings. WHO has developed an ICD-based tool that is easier to use than comprehensive ICD coding: the Start-Up Mortality List (SMoL).[20] The SMoL may be considered a first step toward standardized reporting of causes of death.[21]

Recommendations for analysis of inpatient mortality data

For the reasons discussed above, it is a priority for countries to invest in strengthening the CRVS as well as introducing or reinforcing the certification of inpatient deaths according to international standards.

[17] https://www.who.int/healthinfo/civil_registration/en/

[18] https://www.who.int/classifications/icd/en/

[19] https://apps.who.int/iris/handle/10665/40557

[20] World Health Organization (2014a). WHO application of ICD-10 for low-resource settings initial cause of death collection: The startup mortality list (ICD-10-SMoL). Vol 2.0. Geneva. http://www.who.int/healthinfo/civil_registration/ICD_10_SMoL.pdf

[21] A SMoL electronic module is available for capture of information on individual deaths using the DHIS2. The mortality data from the SMoL should be aggregated and incorporated into the overall RHIS, e.g. the DHIS2. The SMoL module should be interoperable with the aggregate DHIS2 data base. https://who.dhis2.org/documentation/index.html#epi

The indicators and visualizations presented in this chapter can be applied to any inpatient mortality data, including when only a small percentage of the inpatient deaths may be certified according to the required standards. However, any potential limitations of the data must always be acknowledged, including non-standardized CoD lists.

Even if hospitals have not reported mortality data by cause, the total numbers of deaths (disaggregated by sex and by broad age groups) should still be reported and analyzed to provide the all-cause levels of mortality.

Furthermore, analysis of non-standard mortality data can be used to highlight the problems of non-standard CoD lists and the need to introduce international standards for certification and coding of inpatient deaths.

3.1.3 Assessing data quality

The quality of inpatient mortality data can be assessed according to the data quality dimensions of completeness, internal consistency and external consistency. In addition, these data can be assessed for their representativeness of all deaths in the population and for whether standards are met in classification, coding and disaggregation of data on deaths.

- **Completeness**
  - **Percentage of hospitals reporting.** In some countries, routine reporting from hospitals is often erratic and significantly incomplete. Assessment of completeness of reporting is therefore essential. If the completeness is reasonably constant over time, mortality data can show trends based on those facilities which are reporting. If, however, there is significant variation in completeness over time or among geographic areas, the trends and any geographic comparisons should be interpreted with caution. For example, if a few large hospitals in a particular geographic area reported for a certain year, but failed to report for the following year, the total number of deaths reported for the area may be substantially reduced in the latter year. This may be interpreted incorrectly as a decrease in actual inpatient deaths.
  - **Disaggregation by type of facility.** It is important to disaggregate the completeness data by type of facility (e.g. referral hospitals; district hospitals). Referral facilities are often larger, admit more serious cases and have higher numbers of deaths compared with other hospitals. Consequently, incomplete reporting from such facilities can significantly influence the overall numbers of inpatient deaths. Proportional mortality is less sensitive to incomplete reporting than institutional mortality levels but may still be affected by the types of facilities reporting, e.g. referral hospitals usually have different proportional mortality profiles compared with district hospitals.
  - **Disaggregation by ownership** is also useful, as reporting by private-for-profit facilities is problematic in many settings and these facilities often provide a significant proportion of health services. In some countries, reports are expected only from a selected group of sentinel hospitals; this should be stated clearly in the analysis report.
- **Internal consistency**
  - **Trends over time.** Consistency over time (month-to-month and year-to-year) should be assessed for deaths from all causes as well as for deaths from selected causes (e.g. malaria). Large year-to-year variations (e.g. more than 10%) in the numbers of deaths are not expected and should be investigated. Review of the trends in the numbers of deaths by month for multiple years is useful to understand whether variations represent data quality problems or expected seasonal variations.
  - **Outliers.** Outlier values in inpatient mortality data are especially suspicious when they are not accompanied by related outlier values in inpatient discharges.
  - **Consistency between inpatient mortality and morbidity data.** The trends in total inpatient deaths and in the distribution of causes of death are expected to be reasonably consistent with the trends

in total inpatient discharges and the distribution of leading inpatient diagnoses. There should also be consistency over time in the distribution of total inpatient deaths by sex and by age-group.

An example is provided by Figures 3 and 4 which show trends in inpatient statistics of Tanzania.[22] **Question:** For the period covered, were the trends in the distribution of deaths consistent with the trends in the distribution of inpatient discharge diagnoses? Which disease(s) declined in importance and which disease increased in importance?

Figure 4 : Trend in the distribution of causes of inpatient deaths, 0 - 4 years, Tanzania, 2009 – 2012

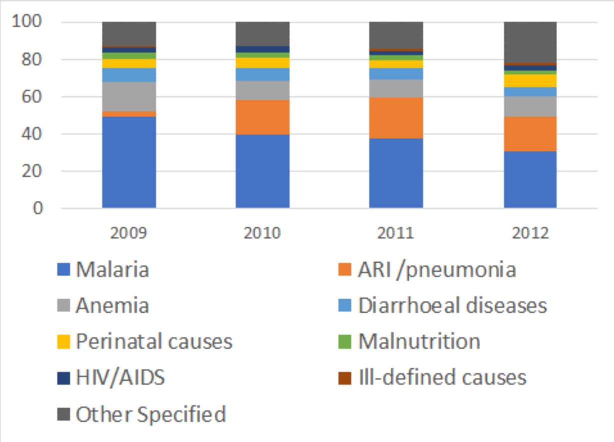
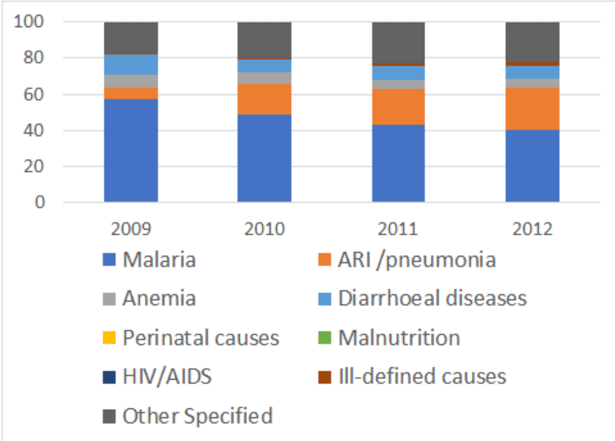


Figure 3 : Trend in the distribution of discharge diagnoses, 0 - 4 years, Tanzania, 2009 – 2012



External consistency with other data sources

Mortality data obtained from routine inpatient reports can be compared with mortality data from disease-specific programmes which monitor treatment outcomes (e.g. TB, HIV).

Quality of classification, coding and reporting of inpatient mortality data

The quality of inpatient mortality data can also be assessed based on whether the system meets global standards, as discussed above, for cause of death certification (i.e. use of the MCCD), coding (i.e. by trained coders using ICD) and reporting (e.g. data of good completeness; inclusion of age and sex disaggregations).

Even when causes of death are assigned by medically qualified staff, there is often substantial use of coding categories for unknown and ill-defined causes ("garbage" codes). These refer to conditions that are vague, including where only the terminal event or mode of dying is captured (e.g. "cardiac arrest"), as there is no information on the condition that led to the terminal event. These ill-defined causes are of no value for informing public health policies and actions. The percentage of deaths with garbage codes is a key measure of the quality of mortality data.

Representativeness of inpatient mortality data

The **percentage of deaths occurring in health facilities** suggests the extent to which hospital deaths can be considered representative of all deaths in the population. The lower the percentage, the less representative the institutional cause of death data. The numerator is the total number of reported inpatient deaths in a given year. The denominator is the expected number of deaths in the country, which can be extracted from the United Nations population estimates.[23] The expected number of deaths can also be estimated from country data by using the projected population multiplied by a reliable estimate of the crude death rate.

[22] Midterm analytical review of performance of the Health Sector Strategic Plan III, 2009–2015. Ministry of Health and Social Welfare United Republic of Tanzania in collaboration with Ifakara Health Institute National Institute for Medical Research World Health Organization. September 2013

[23] World population prospects. Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat. https://population.un.org/wpp/

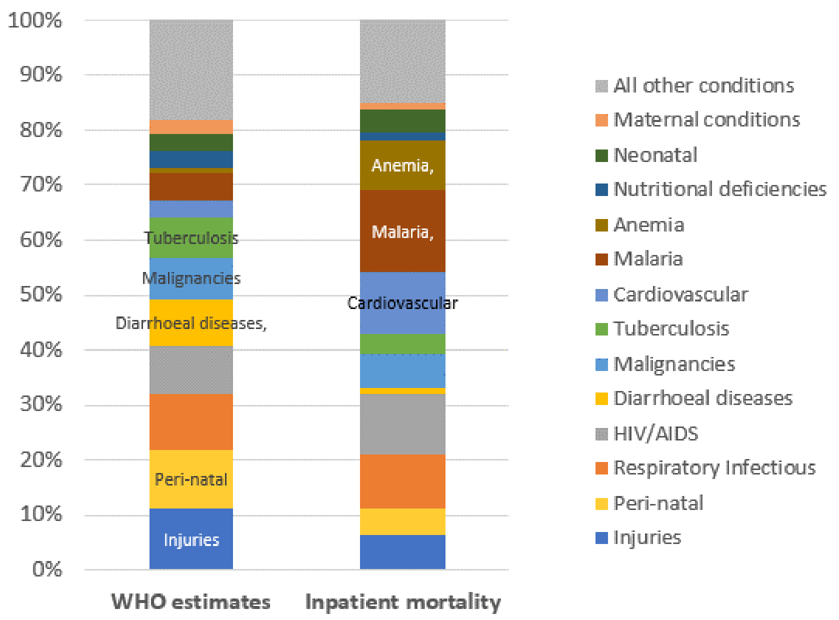
The **distribution of causes of death** for hospital data can also be compared to the estimates for the whole population obtained through statistical modeling, such as WHO's Global Health Estimates[24] and the Global Burden of Disease[25] estimates of the Institute for Institute for Health Metrics and Evaluation (IHME). An example of such a comparison is provided in Box 3.

Box 3: Comparing causes of death distributions between health facilities and estimates for the population

WHO uses a combination of data and modeling to compile national estimates of death by cause. These estimates are useful for driving overall health policy. In contrast, regular facility-based cause-of-death reporting can provide more immediate insights on the most serious illnesses presenting to health facilities; these data can also potentially be analyzed by small geographic areas. The following stacked bar charts compare 2016 WHO mortality estimates for Tanzania with mortality reported from 2006 to 2015 by a sample of 39 hospitals in Tanzania, including district, regional and national referral facilities.*

The comparison reveals that hospital mortality data for this period probably under-represent the percentage of deaths due to injuries, perinatal complications, diarrheal diseases, malignances, tuberculosis, malnutrition and maternal causes. (Note that deaths from injuries often occur before people reach a hospital.) On the other hand, compared to the WHO estimates, hospitals reported higher percentages of deaths due to malaria, anaemia and cardiovascular diseases. If WHO's estimates are reliable, these higher percentages may suggest that patients with certain diseases are more likely to seek care before death than those with other diseases; it could also, however, reflect excessive attribution of deaths to certain causes.

Figure 5: Distribution of causes of death, WHO estimates of deaths in the population versus reported inpatient deaths, Tanzania, 2016



*Mboera LEG, Rumisha SF, Lyimo EP, et al. (2018) Cause-specific mortality patterns among hospital deaths in Tanzania, 2006-2015. PLoS ONE 13(10): e0205833. https://doi.org/10.1371/journal.pone.0205833

[24] https://www.who.int/healthinfo/global_burden_disease/estimates/en/
[25] https://vizhub.healthdata.org/gbd-compare/

3.1.4 Analysis of core indicators

Three ways to analyze institutional mortality are considered here:

- mortality levels: the overall numbers and rates of inpatients deaths;
- leading causes of mortality: the inpatient mortality profile;
- cause-specific mortality: inpatient deaths due to various specific causes.

Mortality levels

In this document, "mortality levels" refers to the total deaths from all causes that occur in health facilities (with disaggregation by age and sex). Four mortality level indicators are presented: institutional mortality rate, stillbirths, neonatal deaths and maternal deaths. The purpose of this set of indicators is to assess the trends of institutional deaths and to identify unexpected changes in the overall numbers and rates. Institutional mortality levels are the simplest measures of inpatient mortality and can provide insights into the quality of health services and offer some indication of population health issues.

These mortality levels must always be interpreted with consideration of differences in facility type and patient mix. Inpatient mortality is to a large extent a reflection of the severity of illness on admission, which may in turn reflect various delays in accessing care. Referral hospitals are likely to admit more patients with complicated or terminal conditions than other facilities and therefore often have higher mortality levels.

Figure 6 : Month-to-month trend in mortality levels, Lupara District[26], 2019

DM. 1.1 - Inpatient mortality levels (2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Institutional mortality rate (%)	7%	7%	4%	6%	7%	8%	9%	9%	9%	8%	7%	8%
Institutional under five mortality rate (%)	2%	3%	3%	2%	4%	4%	4%	4%	2%	3%	3%	2%
Institutional stillbirth rate (%)	3%	4%	2%	1%	3%	2%	4%	1%	2%	1%	2%	3%
Maternal deaths	1	0	0	1	0	0	1	0	0	0	3	0
Neonatal deaths	0	4	2	7	1	6	0	9	7	3	5	1
Stillbirths	11	11	8	4	10	8	11	5	8	4	6	7

1. Institutional mortality rate

This indicator is also called the institutional case fatality rate. Unusual variations can point to quality of care problems, disease outbreaks or other public health concerns, particularly when the data are disaggregated by subnational area or facility. The numerator is the total number of deaths from all causes that occurred in health facilities during a defined period. The denominator is the number of discharges during the same period. Discharges include authorized discharges, transfers out, unauthorized discharges ("absconders") and inpatient deaths. Data should be disaggregated by sex and, at a minimum, by age groups 0-4 and 5+ years. Additional age-sex disaggregated analysis can be done if detailed age categories are available and can provide insights into age-sex related mortality patterns.

2. Stillbirths in health facilities / Institutional stillbirth rate

Stillbirths can occur before or during delivery. Stillbirths occurring before the onset of labour ("antepartum" or "macerated" [27]) may reflect the quality of antenatal care, whereas stillbirths occurring after the onset of labour ("intrapartum" or "fresh") may reflect the care provided during delivery. In many settings, the appearance of the stillbirth ("macerated" versus "fresh") at the time of delivery is used to determine the timing of fetal death in relation to the onset of labour. The percentage of intrapartum stillbirths in facilities is not expected to vary significantly from year to year, unless problems arise with the quality of care. Institutional stillbirth rates and the percentage of intrapartum stillbirths

[26] "Lupara District" refers to a fictitious district in a database created to produce analyses for the *Toolkit* module *Integrated Health Services Analysis – district and facility levels*

[27] An antepartum (macerated) stillbirth refers to a fetus that has suffered an intrauterine death after the 28th week of gestation and before the onset of labour.

can therefore be used as indicators of quality of care (with consideration of the cautions related to facility type and case mix).

3. Neonatal deaths in health facilities

Neonatal deaths include any death in a facility that occurs in the first 28 days of life. This indicator monitors the absolute number[28] of neonatal deaths – whether pre-discharge (i.e. after being born in the facility) or after re-admission. Given this mix of neonates, the indicator may reflect the quality of delivery care and newborn care, the quality of care for neonates admitted to the facility after birth, the severity of illness among the neonates admitted after birth, or the completeness of reporting of neonatal deaths. It is therefore difficult to interpret. Nevertheless, it is important to monitor trends in neonatal deaths to identify unexpected changes. Comparisons among facilities should be interpreted with care as the number of neonatal deaths is very sensitive to the case mix of deliveries and neonatal admissions. Higher numbers of neonatal deaths may be expected in referral facilities that offer advanced care for high risk newborns, e.g. pre-term and low birth weight babies.

4. Maternal deaths in health facilities

This indicator may reflect the quality of care in the facility but may also reflect delays in reaching the facility or inadequate antenatal care. As maternal deaths are rare events, it is recommended to monitor the absolute number of maternal deaths.[29] Maternal deaths in health facilities include antepartum deaths, deaths during delivery and postpartum deaths (according to the definition of maternal death). Women that gave birth outside of a health facility or in a different health facility, but died in the reporting facility, are included. Deaths occurring outside of the facility are not included and should be reported separately. Maternal deaths are often underreported. Facility staff may be hesitant to report maternal deaths as they are sometimes considered to be the result of health worker failures. Furthermore, women may die in other hospital departments and these deaths are often not recorded in maternity registers; this is particularly the case for antepartum and postpartum deaths.

Leading causes of death

This analysis provides a profile of the most common causes of death among inpatients and their relative proportions. Heath facility mortality data alone are rarely sufficient for estimates of causes of death in the population. They may, however, provide useful information on epidemiological trends and the relative importance of various causes of death, and may also provide insights into quality of care.

Interpretation of inpatient cause of death data should consider that, in addition to the issues with data quality and representativeness previously discussed, the reliability of the data is significantly influenced by the diagnostic capacity of the health facility. This varies considerably, based on the training of the health providers and the availability of laboratory and other diagnostic services.

5. Leading causes of inpatient deaths (percentage distribution) / proportional mortality

The analysis starts by listing and ranking the numbers of deaths by cause (see Figure 7). Both the absolute number of deaths by cause (Figures 7 and 8) and the percentage of deaths by cause out of the total inpatient deaths (proportional mortality) should be provided (Figures 7 and Figure 3). The 10 to 20 leading causes are then presented.

The core analyses should, at a minimum, include:

- deaths by cause: under five years of age, sum of both sexes;
- deaths by cause: five years of age and older, disaggregated by sex; and
- comparison of deaths by cause among major geographic areas.

[28] It is also possible to calculate the “first day mortality rate”.

[29] Calculation of the institutional maternal mortality ratio may be also useful. It is also possible to use a combination of the institutional mortality ratio and an estimate of the maternal mortality rate at population level to estimate the rate of mortality among women delivery at home..

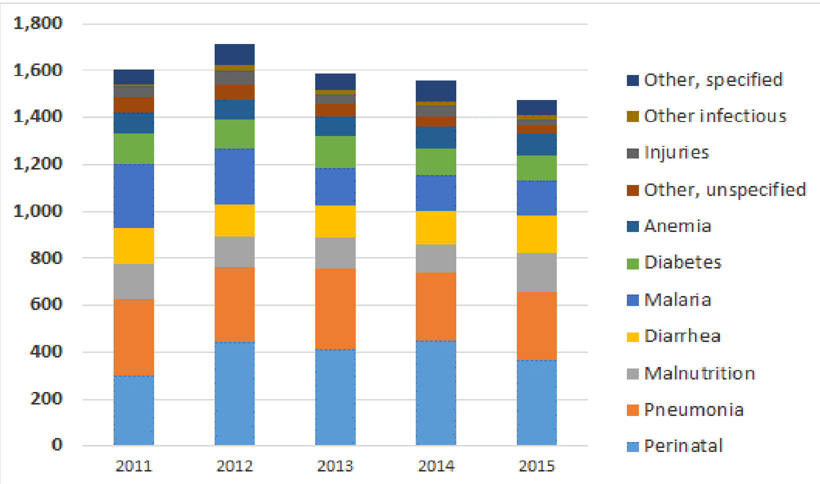
If data are available and numbers are sufficiently large, analyses with more detailed age-sex disaggregation should be conducted.

Distribution of causes of death is presented as a ranked table or chart. Stacked bar charts are the preferred chart type (see Figure 3 and Figure 8). Pie charts are sometimes used to display proportional mortality but are difficult to read when containing more than five segments.

Figure 7 : Distribution of causes of inpatient death, 0 - 4 years, nationwide, 2016 - 2020

	2016		2017		2018		2019		2020	
Cause of death	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Perinatal	300	18.7%	441	25.7%	414	26.0%	450	28.9%	368	24.9%
Pneumonia	329	20.5%	325	19.0%	346	21.8%	288	18.5%	288	19.5%
Malnutrition	147	9.1%	129	7.5%	130	8.2%	118	7.6%	165	11.2%
Diarrhea	152	9.5%	138	8.1%	137	8.6%	142	9.1%	159	10.8%
Malaria	277	17.2%	235	13.7%	160	10.1%	154	9.9%	149	10.1%
Diabetes	125	7.8%	124	7.2%	131	8.2%	115	7.4%	106	7.2%
Anemia	90	5.6%	85	5.0%	84	5.3%	94	6.0%	99	6.7%
Other, unspecified	67	4.2%	62	3.6%	58	3.6%	41	2.6%	37	2.5%
Injuries	50	3.1%	61	3.6%	41	2.6%	48	3.1%	21	1.4%
Other infectious	3	0.2%	21	1.2%	17	1.1%	22	1.4%	16	1.1%
Other GI	19	1.2%	18	1.1%	17	1.1%	12	0.8%	16	1.1%
Cardiovascular	15	0.9%	17	1.0%	18	1.1%	17	1.1%	15	1.0%
Tuberculosis	16	1.0%	18	1.1%	11	0.7%	16	1.0%	12	0.8%
Skin	2	0.1%	11	0.6%	4	0.3%	6	0.4%	11	0.7%
Cancers	5	0.3%	6	0.4%	2	0.1%	7	0.4%	5	0.3%
Mental health	2	0.1%	9	0.5%	4	0.3%	9	0.6%	5	0.3%
Musculosekeletal	3	0.2%	2	0.1%	8	0.5%	2	0.1%	2	0.1%
GU	5	0.3%	7	0.4%	5	0.3%	4	0.3%	1	0.1%
Ear	0	0.0%	2	0.1%	2	0.1%	12	0.8%	0	0.0%
Eye	1	0.1%	3	0.2%	1	0.1%	1	0.1%	0	0.0%
Total inpatient deaths	**1608**	**100.0%**	**1714**	**100.0%**	**1590**	**100.0%**	**1558**	**100.0%**	**1475**	**100.0%**

Figure 8 : Top 10 causes of inpatient death, 0 - 4 years, 2016 - 2020



The ranking is influenced by the extent to which the causes of death are grouped. For example, if all cancers are grouped together, irrespective of type, the group will represent a larger percentage of deaths than deaths from a single cancer such as lung or breast cancer.

The percentage of unknown and ill-defined causes should always be provided, as it is an important indicator of the quality of the data. In Figure 8, this is represented by the category "Other, unspecified". Also, if this percentage changes over time, the percentage of deaths for known causes will also change, which has implications for interpretation of the data.

Multiple years of data should be presented, to show how the ranking of causes changes over time. (This is possible only if the same cause of death categories are used over time.) For example, trend analysis can show whether the percentages of all institutional deaths that are due to malaria or noncommunicable diseases have changed over time.

Proportional mortality data should be assessed for unexpected changes in the ranking over time, for causes of death that rank unexpectedly among the top 10 causes and for percentage distributions that differ significantly from what is expected based on the epidemiological profile of the area. This could indicate a disease outbreak or other public health concern, a quality of care problem, sudden changes in classification or coding practice, or a data quality problem.

The list of the top 10 or 20 causes of death can often highlight only broad groups of causes. To generate further information that can guide country policies and programmes, in-depth analyses should be conducted on specific groups of causes, for example, neonatal causes, maternal causes, cardiovascular diseases or specific types of injuries.

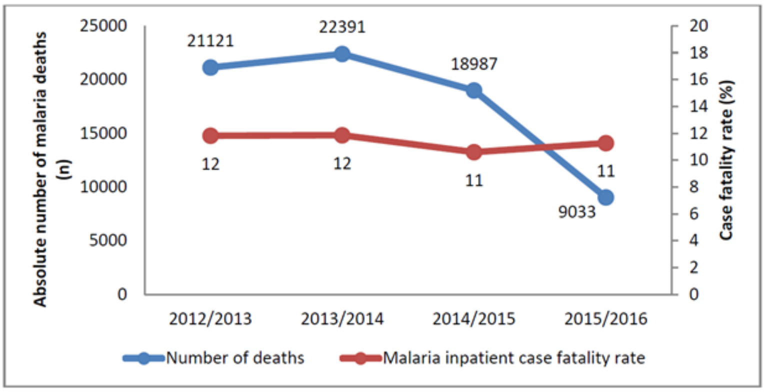
▪ Mortality due to specific causes

A limited number of diseases and conditions may be selected for further analysis, based on the local disease burden and public health priorities. These may include:

- leading causes of death;
- notifiable diseases;
- diseases under surveillance;
- diseases/conditions related to SDGs or national strategic goals;
- diseases/conditions included in the national core indicator set.

Analysis of the mortality trends for specific causes over multiple years can provide insights into epidemiological trends. Such analyses can also assist managers and policy makers in various ways, e.g. assessing the effectiveness of specific interventions, targeting support where it is most needed, advocating for additional resources and refining policies.

Figure 9 : Inpatient malaria deaths and inpatient malaria case fatality, Kenya, 2012/2013 to 2015/2016



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

Data on deaths from specific causes can be analyzed by examining trends and/or comparing geographic areas. The indicators to be assessed include absolute numbers of cases, incidence rates, age distribution, sex distribution and inpatient case fatality. Figure 9 provides an example from an analytic review conducted in Kenya.

Assessment of month-to-month trends in mortality from multiple years of data enables identification of seasonality for some diseases (e.g. malaria, diarrhea, pneumonia). If the data have remained stable over several years, changes in the trend may point to changes in the epidemiological pattern as a result of, for example, an outbreak or the impact of a public health intervention. Analysis of age and sex distributions for specific causes can also provide insights into the epidemiology of some diseases (e.g. HIV, malaria).

6. Case fatality rates (CFR) for major causes

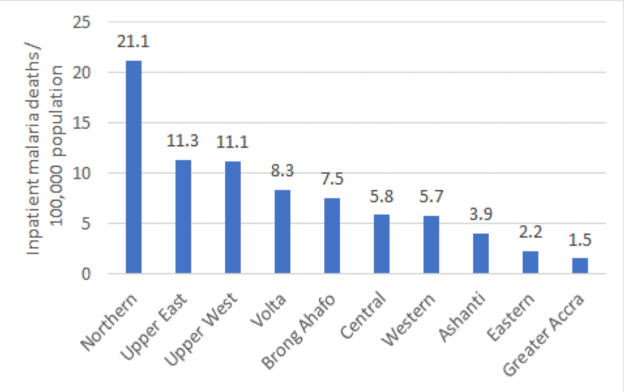
The CFR calculates the percentage of cases of a disease that end in death. The denominator is the number of discharges (including deaths) for a specific diagnosis. The quality of discharge diagnoses may be more variable than the quality of cause of death, which adds uncertainly to the indicator. Health systems should select the conditions that are most relevant for calculating this indicator. Case fatality rates may be influenced by quality of care but can be difficult to interpret as they can vary based on numerous factors, e.g. severity of illness on admission, age, nutritional status, other underlying illnesses, time since onset, etc. Referral facilities often have higher CFRs as they receive more severe cases. However, unusually high CFRs or any substantial changes in CFRs warrant further investigation.

7. Population incidence of inpatient deaths by cause (example: malaria)

This indicator uses the estimated population at risk as the denominator. Some diseases may not be endemic throughout the country (e.g. malaria may be absent in highland areas), in which case only a subset of the national population will be at risk and thus included in the denominator. Defining the population at risk is not always easy and may result in expanding the definition to cover the whole population of an administrative unit.

This indicator represents only a minimum mortality rate because, as noted previously, a significant number of deaths are likely to occur in the community. Differences among geographic areas, particularly those with similar disease profiles, need further investigation to identify the underlying reasons. Interpretation may, however, be challenging because the percentage of deaths from the condition that occur in health facilities may vary substantially among geographic areas. There may also be variation in the completeness of reporting of inpatient deaths.

Figure 10 : Inpatient malaria deaths per 100,000 population, 2015, by region of Ghana



Source: 2015 Annual Report of the National Malaria Control Programme, Ghana Ministry of Health

8. Peri-operative mortality rate

This indicator refers to all deaths prior to discharge among patients that had one or more procedures in an operating theatre during the relevant admission period. The denominator requires a register for procedures conducted in the hospital. For the numerator, the WHO MCCD form includes a question to identify whether the deceased had surgery. Perioperative mortality is an important indicator of quality and safety of care. Globally, the process of undergoing a major surgical procedure (particularly as an emergency) is associated with increased mortality.[30]

Similar to other institutional mortality indicators, a high peri-operative mortality rate does not necessarily reflect poor quality of care, as it is influenced by many factors including the types of procedures performed, delays in accessing care, age and underlying health conditions. However, trends over time should be assessed and unexpected changes should trigger
further investigation. Substantial differences in peri-operative mortality rates among facilities of similar capacity also warrant investigation.

[30] Weiser T, Gawande A. 2015. Chapter 16. Excess Surgical Mortality: Strategies for Improving Quality of Care. In: Debas H, Donkor P, Gawande A, Jamison D, Kruk M and Mock C, editors. 2015. Essential Surgery. Disease Control Priorities, third edition, vol 1. Washington, DC: World Bank. doi:10.1596/978-1-4648 -0346-8. License: Creative Commons Attribution CC BY 3.0 IGO

3.2 MORBIDITY (outpatient and inpatient)

3.2.1 Core morbidity indicators

Indicator	Definition	Calculation	Disaggregation
Leading causes of morbidity			
1. Leading inpatient discharge diagnoses (percentage distribution)	Percentage distribution of the leading inpatient discharge diagnoses (Inpatient proportional morbidity)	N: Number of discharges by diagnosis x 100 D: Total number of discharges Discharges include deaths	Age (minimum: 0-4, 5+ years) Sex Facility type
2. Leading outpatient diagnoses (percentage distribution)	Percentage distribution of the leading new outpatient visits (Outpatient proportional morbidity) Includes only new visits for a specific diagnosis	N: Number of new visits by diagnosis X 100 D: Total number of new outpatient visits	Age (0-4, 5+) Sex Facility type
Morbidity due to specific conditions[31]			
3. Inpatient incidence rate	The number of discharges per inpatient diagnosis per 1,000 population	N: Number of discharges by diagnosis X 1000 D: Total population	Age (0-4, 5+) Sex Facility type
4.Outpatient incidence rate	The number of new visits per outpatient diagnosis per 1000 population Includes only new visits for a specific diagnosis	N: Number of new outpatient visits by diagnosis X 1000 D: Total population	Age (0-4, 5+) Sex Facility type Disease-specific disaggregations

3.2.2 About the data

This chapter discusses the analysis of institutional morbidity data: RHIS data on the diseases and other health conditions for which people visit outpatient services or for which they are admitted as inpatients in health facilities.

This information is important for understanding the types of diseases and conditions for which people seek care at facilities and the resulting burden on the health system. Institutional morbidity data can also, indirectly, provide an indication of epidemiological patterns in the population – including disease outbreaks.

Regular monitoring of morbidity data is essential for timely reaction to changes and for informing service adjustments. It also provides insights into how health staff spend their time, their diagnostic and reporting practices, and the medicines and other commodities that are likely to be needed in the facilities. This information contributes to policy-making, resource allocation and the planning and management of health services.

Many countries rely on population-based surveys to understand the disease burden in the population. However, as such surveys are usually conducted at intervals of several years, the findings are soon out of date and cannot be used for monitoring shorter-term trends or detecting sudden changes. Furthermore, for many diseases, it is difficult to obtain population-based data, particularly for acute illnesses such as pneumonia and diarrhea.

The RHIS is an important source of morbidity data, providing regularly updated information on a wide range of diseases and conditions at all levels and geographic locations of the health system. It is able to

[31] Refer also to programme-specific modules of the *Toolkit for analysis and use of routine health facility data*.

capture data on acute conditions that can alert managers to outbreaks and other changes in the patterns of diseases for which people seek care. Outpatient data provide information from a much larger number of health facilities than inpatient data, while inpatient data usually reflect more severe conditions and may also provide more accurate diagnoses than outpatient facilities.

Institutional morbidity data are not representative of disease occurrence in the general population, as the cases reported by health facilities usually represent only a subset of the cases in the population, depending on care-seeking behaviors and access to services. Also, in some contexts, many episodes of disease may be managed at pharmacies or by informal drug sellers and are never be recorded or reported. Therefore, in most settings, incidence rates calculated from facility data cannot be considered population incidence rates. Nevertheless, trends in reported incidence and proportional morbidity can indirectly reflect trends in disease epidemiology.

- **Capturing morbidity data**

In many countries, aggregate data are reported on a monthly form containing a list of common diagnoses. Ideally, countries should use diagnostic categories which correspond to global standards for classification of diseases (i.e. the ICD). Some countries, however, use their own nationally-defined lists, particularly for reporting of outpatient morbidity.

For outpatient morbidity reporting, new visits should be recorded separately from revisits for the same diagnosis. Revisits are analyzed separately and are typically disaggregated by age group and sex but not by specific diagnosis.

For inpatient morbidity reporting, the standard is to collect the discharge diagnosis. The discharge diagnosis reflects the final diagnosis, while the admission diagnosis often requires confirmation through further investigation. Discharges include authorized and unauthorized discharges, deaths and transfers out. Hospitals should preferably use ICD coding for discharge diagnoses. Data on deliveries are not usually included in inpatient morbidity data.

In inpatient facilities, data are ideally captured in an individual patient record which may be a comprehensive electronic medical record or a register or database containing selected data. The minimum data elements 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 patients do not exist. In this case, the morbidity analyses are based on aggregate reports from health facilities.

Referral hospitals and sentinel site facilities may report morbidity data based on more reliable diagnoses and may also have more complete data for more years than other health facilities. Hence, data from such facilities should be analysed and presented separately from the data reported by other facilities. Caution should be exercised about generalizing the findings from sentinel sites, as the mix of patients seeking care at such facilities may not be representative of all health facilities.

Surveillance data are often captured through parallel data systems that report weekly (or daily when needed), e.g. the Integrated Disease Surveillance and Response (IDSR) system used in parts of Africa. Ideally, such systems should be integrated into or interoperable with the RHIS. Where this is not the case, the numbers of cases reported in the RHIS should be checked for consistency against those reported through the surveillance reporting system.

3.2.3 Assessing data quality

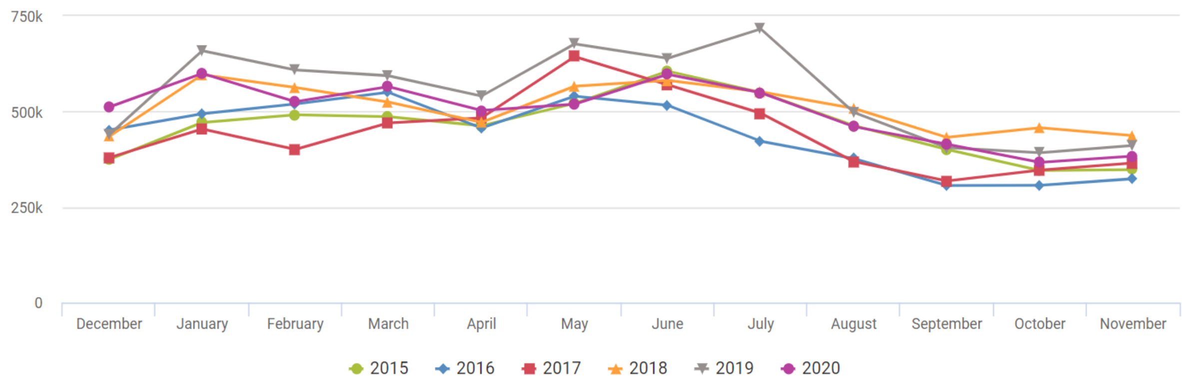
Information on data quality should be presented in the same dashboard or report as the morbidity statistics, to enable understanding of any limitations of the data and to inform interpretation. Morbidity data are assessed according to the main data quality dimensions, in ways similar to those for assessing mortality data quality.

The quality of morbidity data depends to a large extent on the consistent use of case definitions, the capacity of health workers to accurately diagnose, the availability of laboratory and other diagnostic services, and the accuracy of the coders. In some cases, information on whether the diagnosis has been confirmed by laboratory investigation is specified along with the diagnosis. For example, malaria diagnoses are often specified as either laboratory-confirmed or clinical ("presumed") diagnosis. The greater the proportion of laboratory-confirmed diagnoses, the better the quality of the data.

If aggregate monthly data are used to monitor the uptake of initiatives for management of chronic diseases (e.g. hypertension, diabetes, sickle cell anemia, etc.), it is essential that only the initial diagnosis is reported as a new visit. If not, it is possible that large numbers of "new visits" are repeatedly reported for the same small number of patients with, for example, hypertension. This would incorrectly increase the number of new diagnoses due to the chronic disease.

- **Completeness**
  - **Percentage of facilities reporting.** Completeness of facility reporting affects the ability to interpret trends in the numbers of people presenting with various illnesses or conditions. Where less than 90% of required facilities have reported, it is best to disaggregate completeness: by type of facility, by managing authority and by geographic area. This helps the analyst to better understand and acknowledge any potential reporting bias when interpreting the data. This can be especially important when, for example, completeness of reporting is lower for referral facilities which account for a high percentage of specialized diagnoses of chronic diseases such as cancers.
- **Internal consistency**
  - **Trends over time**. Consistency of diagnostic patterns over time is a key indicator of data quality. Trends in the incidence of specific diseases presenting to health facilities are expected to remain reasonably constant over time, taking into account seasonal patterns. Unexpected variations may reflect data quality problems (including changes in diagnostic and reporting practices), but may also, for example, indicate an outbreak of disease. Figure 11 shows how five years of month-to-month trends in confirmed outpatient malaria cases can be presented on a single chart. In this example, each year, a "low season" with relatively few malaria diagnoses (August to December) is followed by a "high season" with more cases (January to July). A sudden increase in reported cases in the low season is suspicious and should be investigated.

Figure 11 : Trend in confirmed outpatient malaria cases, nationwide, last 72 months



  - **Outliers.** The presence of extreme outliers often signals data errors.
  - **Consistency between related data elements**. For outpatient data, the number of positive tests reported in the laboratory data set can be checked against the number of confirmed diagnoses

reported in the outpatient morbidity data set. For example, the number of confirmed malaria cases should equal the number of positive rapid diagnostic tests (RDTs) plus the number of positive microscopy examinations.

- **Incorrect sex-specific diagnoses or implausible diagnoses for age.** Issues to check include female diagnoses for male patients and vice versa, as well as diagnoses unlikely for age, e.g.
  - male diagnoses of cervical cancer, breast cancer;
  - female diagnoses of prostate cancer or benign prostatic hypertrophy.
  - females under 10 years of age with maternity-related diagnoses.
- **Percentage of ill-defined or unknown diagnoses.** As for classifications of causes of death, some inpatient diagnoses and some outpatient diagnoses are poorly defined. Examples include "other", "other intestinal" and "other metabolic disease". When such ill-defined diagnoses are almost as frequent as more specific diagnoses (e.g. if the number of diagnoses of "other intestinal" is similar to the number of diagnoses of "diarrhea"), this suggests that clinicians are not properly classifying the illnesses they manage. This limits the usefulness of the morbidity data for decision-making.
- **Use of standardized inpatient and outpatient diagnoses.** It is essential that diseases/conditions are classified in a standard way – ideally, in accordance with the ICD.[32] In some countries, the list of diagnoses varies within the country or between types of facilities (e.g. referral hospitals versus district hospitals) or from year-to-year. This makes it very difficult to compare morbidity data from year-to-year or between subnational areas. Such lack of standardization of the diagnoses also makes it difficult to train clinicians in reliable diagnosis.

■ **External consistency with other data sources**

- **Comparisons with disease-specific programme data.** Disease-specific data reported through routine facility morbidity reports should be compared with those from disease-specific programme reporting systems and surveillance systems.

3.2.4 Analysis of core indicators

Analysis of morbidity data should provide the 10 to 20 leading diagnoses for both outpatient and inpatient services. Three to five years of data should be presented to review annual trends. This is essential for assessing data quality and may also provide insights into epidemiological changes in the population. Monthly data for several years are needed for understanding seasonal variations. At a minimum, the analyses should be done for all ages (total) and for children under five years of age. Further age-sex disaggregation can be included if data are available.

Two ways of analyzing data on institutional morbidity are considered here:

- leading causes of morbidity: the percentage distribution of discharge diagnoses;
- morbidity due to specific conditions: the numbers of cases or the population incidence of selected diseases or conditions.

■ Leading causes of morbidity

1. **Leading inpatient discharge diagnoses (percentage distribution)** and
2. **Leading outpatient diagnoses (percentage distribution)**

The analysis starts by listing and ranking the numbers of diagnoses. Both the absolute number of each diagnosis (Figure 12 and Figure 13) and the percentage of each diagnosis out of the total of all diagnoses (proportional morbidity; Figure 4 and Figure 12) should be assessed.

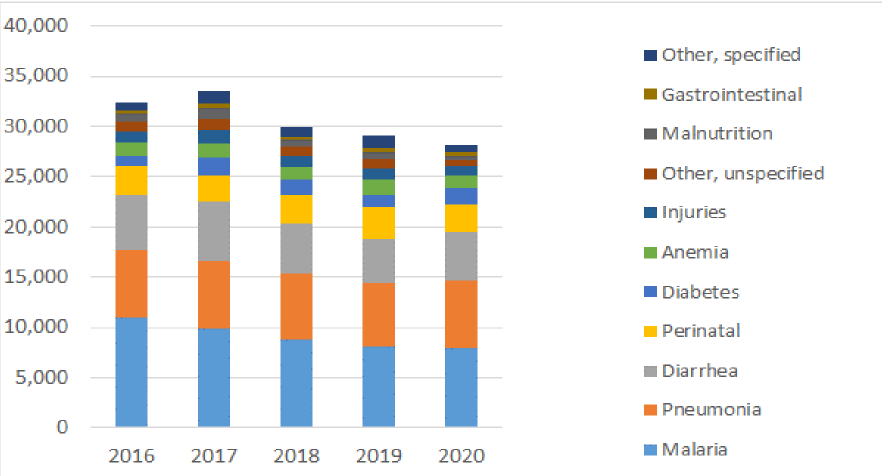
[32] https://www.who.int/classifications/icd/en/

Figure 12 :Top inpatient diagnoses, 0 - 4 years, nationwide, 2016 - 2020

	2016		2017		2018		2019		2020	
Discharge diagnosis	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Malaria	10922	33.7%	9903	29.4%	8814	29.5%	8127	27.9%	7892	28.0%
Pneumonia	6731	20.7%	6726	19.9%	6527	21.8%	6336	21.8%	6821	24.2%
Diarrhea	5503	17.0%	5857	17.4%	5027	16.8%	4369	15.0%	4804	17.0%
Perinatal	2899	8.9%	2667	7.9%	2820	9.4%	3154	10.8%	2683	9.5%
Diabetes	1009	3.1%	1744	5.2%	1481	4.9%	1192	4.1%	1621	5.8%
Anemia	1322	4.1%	1418	4.2%	1254	4.2%	1496	5.1%	1259	4.5%
Injuries	1078	3.3%	1343	4.0%	1169	3.9%	1158	4.0%	1064	3.8%
Other, unspecified	968	3.0%	1019	3.0%	844	2.8%	930	3.2%	543	1.9%
Malnutrition	875	2.7%	1145	3.4%	708	2.4%	754	2.6%	407	1.4%
Gastrointestinal	243	0.7%	468	1.4%	299	1.0%	388	1.3%	354	1.3%
Skin	161	0.5%	346	1.0%	266	0.9%	260	0.9%	135	0.5%
Other infectious disease	167	0.5%	177	0.5%	126	0.4%	122	0.4%	127	0.5%
Tuberculosis	123	0.4%	139	0.4%	108	0.4%	122	0.4%	122	0.4%
GU	123	0.4%	253	0.8%	128	0.4%	142	0.5%	85	0.3%
Cardiovascular	70	0.2%	116	0.3%	60	0.2%	110	0.4%	81	0.3%
Musculoskeletal	66	0.2%	145	0.4%	83	0.3%	105	0.4%	63	0.2%
Mental health	46	0.1%	105	0.3%	60	0.2%	74	0.3%	43	0.2%
Eye	68	0.2%	62	0.2%	67	0.2%	108	0.4%	38	0.1%
Ear	52	0.2%	69	0.2%	76	0.3%	157	0.5%	27	0.1%
Cancers	14	0.0%	16	0.0%	5	0.0%	15	0.1%	10	0.0%
Total inpatient diagnoses	32440	100.0%	33718	100.0%	29922	100.0%	29119	100.0%	28179	100.0%

Distribution of diagnoses can be presented as either a table or a chart. Bar charts are preferred (see Figure 4 and Figure 13). Pie charts are difficult to interpret when containing more than five segments.

Figure 13 : Top inpatient diagnoses, 0 - 4 years, nationwide, 2016 - 2020



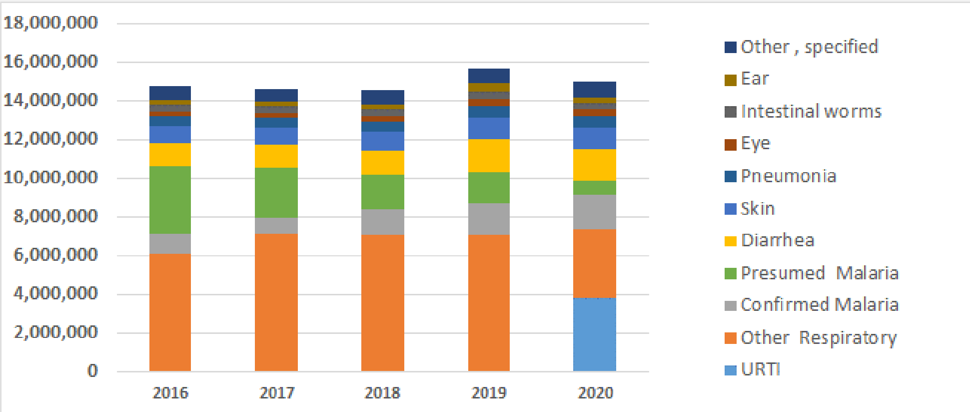
For both inpatient and outpatient proportional morbidity, ranking is affected by the way diagnoses are grouped. For example, if all respiratory infections are grouped together, this group will likely rank considerably higher than the diagnosis of "pneumonia". Such grouping of diagnoses can help to simplify the chart and make interpretation easier. It is useful to define a group consisting of the main non-communicable diseases (hypertension, other cardiovascular disease, malignancies, chronic lung disease, diabetes) and a group consisting of all injuries (road traffic accidents, violence, suicide, falls, burns, animal bites, etc.). Grouping diagnoses in this way makes it easier to monitor and document the growing importance of noncommunicable diseases and injuries.

Proportional morbidity is likely to vary by type of facility. This results from differences in both the reliability of diagnoses and the mix of patients. Referral hospitals are likely to report a larger number of more-specialized outpatient and inpatient diagnoses than other facilities. For certain diseases that are rare and difficult to diagnose, referral facilities may be the only source of reliable diagnosis and reliable data for an entire country. This is often the case for cancers. Cancer registries therefore obtain data from only a limited number of hospitals. The same is true for some neglected tropical diseases, for which only a small number of facilities may have the laboratory capacity and trained staff for reliable diagnosis.

Changes in diagnostic practices can influence proportional morbidity. For example, in the past, malaria was often diagnosed without laboratory confirmation. Such "presumed malaria" cases accounted for 20% or more of all outpatient diagnoses in many malaria endemic countries. With the introduction of malaria RDTs, the diagnosis of presumed malaria is declining. In some cases, health providers are now less likely to diagnose malaria and more likely to diagnose other causes of fever. Such a shift affects the reported distribution of diseases.

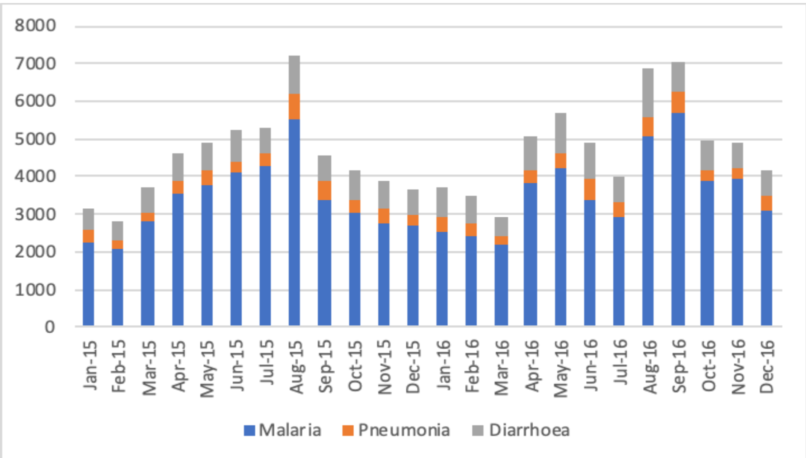
This is illustrated by the data presented in Figure 14 for a country where malaria RDT's were phased in over multiple years. Note that the total of confirmed malaria plus presumed malaria declined during this period, as some of the cases that were tested for malaria were found to be laboratory negative and given diagnoses other than malaria. Figure 14 also provides an example of a change in diagnoses resulting from the introduction in 2018 of a new diagnostic category: upper respiratory tract infection (URTI). In 2019 and 2020 a, growing percentage of patients previously diagnosed with "Other respiratory" were given the new, more specific diagnosis of URTI.

Figure 14 : Trend in outpatient diagnoses, 0 - 4 years, nationwide, 2016 - 2020



Charts presenting the month-to-month trends in diagnoses may show the seasonality of some diagnoses. Figure 11 above provides an example. Figure 15 shows the monthly number of discharge diagnoses for three priority child diseases in one district of a country. The seasonal pattern for malaria is clear. The months of August and September also show increases in discharges for pneumonia and diarrhea.

Figure 15. Discharge diagnosis in children under 5 years of age. Priority diseases. Jan 2015-Dec 2016.



Morbidity due to specific conditions

3. Inpatient incidence rate and **4. Outpatient incidence rate**
Inpatient- and outpatient-based incidence rates are minimum incidence rates – they are based on people with the disease who seek care at the health facility. However, there are likely to be other people in the population that have not been diagnosed. These rates are also affected by the accuracy of the population estimates used as denominators. Nevertheless, when these indicators are monitored over time, they can provide insights into epidemiological patterns.

In addition to assessing incidence rates for the leading causes of morbidity, countries may define a limited number of specific conditions (defined by country priorities) that should be presented individually, e.g. vaccine-preventable diseases, notifiable diseases, neglected tropical diseases, noncommunicable diseases (hypertension, diabetes, stroke, myocardial infarction, cancers, chronic respiratory diseases).

Figure 16 : Trends in the incidence and case fatality of cholera, Tanzania, 2004 – 2012

Year	Cases	Incidence per 100,000	Deaths	Case Fatality Rate (%)
2004	5566	15.7	95	1.7
2005	3284	9.0	108	9.3
2006	14297	37.2	254	1.8
2007	2890	7.6	70	2.4
2008	2391	6.1	73	3.1
2009	6244	15.5	81	1.3
2010	5566	13.5	95	1.7
2011	1149	2.7	32	2.7
2012	343	0.8	14	4.1

Source: Midterm Analytical Review of Performance of the HSSP III, 2009–2015. Ministry of Health and Social Welfare

4 Group II indicators – Health system performance

4.1 UTILIZATION AND ACCESS

4.1.1 Core indicators of utilization an access

Indicator	Definition	Calculation	Disaggregation
1. Outpatient attendance per capita (Outpatient service utilization)	Number of outpatient department (OPD) visits per person per year (Includes only visits for curative care; preventive care visits,e.g. antenatal care, immunizations, are excluded)	N: Number of new visits + re-visits for to OPD in a year D: Total population	Age (<5, >5) Sex New visits vs re-visits
2. Hospital[33] discharge rate (Inpatient service utilization)	Number of inpatient discharges* per 100 population per year (Includes authorized discharges, absconsions, transfers out and deaths; excludes discharges for delivery)	N: Number of inpatient discharges in a year X 100 D: Total population	Age (<5, >5) Sex Facility type
3. Caesarean section rate at population level	Percentage of deliveries by caesarean section among estimated live births in the population	N: Number of caesarean sections in a facility X 100 D: Estimated number of live births in the population	Age (10-14;15-19; 20+) Facility type
4. Surgical volume	Number of surgical procedures undertaken in an operating theatre per 100 000 population per year (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.)	N: Number of surgical procedures in a year X 100 000 D: Total population	Procedure type Emergency vs Elective Facility type
5. Service-specific availability	a) Number of health facilities offering specific services per 10 000 population b) Percentage of facilities offering the specific service (Specific services may include: general outpatient curative services; specific services, e.g. care for HIV, TB, NCDs, mental health; general maternal child health services; immunizations; basic emergency obstetric and neonatal care (BEmONC); comprehensive emergency obstetric and neonatal care (CEmONC); basic and comprehensive surgical care; laboratory; radiology, etc.)	N: Number of facilities offering the service X 10 000 D: Total population N: Number of facilities offering the service X 100 D: Total number of facilities	Facility type Facility ownership

[33] The term “hospital discharge rate” is conventionally used to express the inpatient discharge rate and is preferred to the admission rate. The term “hospital discharge” includes discharges from health centers, polyclinics and other health facilities which retain patients overnight for health services other than labour and delivery.

4.1.2 About the data

This chapter discusses data on how often people use health services and, indirectly, their access to the services.

Access to and utilization of health services are fundamental to UHC and the health of the population, and therefore also to the SDGs. Equity of access is essential for achieving UHC.

Access refers to whether people are able to reach health services and use them. It is determined by a range of factors such as availability and functionality of services and equipment, distance and travel time to facilities, availability of transport, financial barriers and cultural factors. Measurement of many of these factors requires data from sources other than the RHIS, such as population-based surveys, health facility assessments and geospatial modelling. However, some RHIS data can be used to produce indirect (proxy) measures of access.

Utilization refers to how often people seek services at health facilities. In addition to access issues, utilization is influenced by factors such as demographics, disease profiles, perceptions of quality of care and personal preferences.

Service utilization is often used as an indirect measure of access to outpatient and inpatient care. Utilization indicators include outpatient department (OPD) attendance rates, hospital discharge rates and rates for major surgical procedures. Higher utilization rates do not necessarily reflect better access to services, as the services could be used repeatedly by a limited segment of the population. Low rates, however, usually point to poor access, availability and/or quality of services. For example, several countries have shown that outpatient utilization increases when barriers to using health services are removed, such as bringing services closer to the people or reducing user fees.

Availability of services is a prerequisite for access. The main data sources for availability of specific services are periodic health facility assessments/surveys, e.g. WHO's Harmonized Health Facility Assessment (HHFA)[34] or Service Availability and Readiness Assessment (SARA).[35] Facility assessments have the advantage that data are collected with some degree of independence and standardization. However, such assessments are usually conducted at intervals of several years and the most recent findings may be outdated. While facility censuses (e.g. all hospitals) provide findings on all facilities, many assessments yield data on only a sample of facilities in a sample of districts. If the sampling is well-designed and of adequate size, such samples can be used to estimate service availability at national and regional/provincial level. However, the estimates are usually not available for lower subnational and facility levels, except for those types of facilities (e.g. hospitals) for which a facility census was conducted.

Periodic (e.g. semi-annual or annual) self-reporting by facilities can also provide information on service availability and readiness. In the absence of facility assessments or self-reported data, RHIS data can serve as a proxy measure for service availability. For example, reported data on the number of patients receiving ART indicates the availability of ART services at a facility. However, the absence of this data does not necessarily mean that the service is not available, as the possibility of incomplete reporting should be considered.

Service availability and readiness depend on the availability of health service resources or inputs, as discussed in Chapter 5. Some of the indicators discussed here are also indicators of availability, e.g. "density" of health facilities, beds and health workers, and stockouts of medicines and medical products.

[34] https://www.who.int/data/data-collection-tools/harmonized-health-facility-assessment/introduction

[35] https://www.who.int/healthinfo/systems/sara_methods/en/

4.1.3 Assessing data quality

Data on utilization of health services should be reviewed for the four dimensions of data quality as presented in the Chapter 1. Findings from the data quality assessment should be presented in the same dashboard or report as the utilization indicators, to enable understanding of the limitations of the data and to inform interpretation.

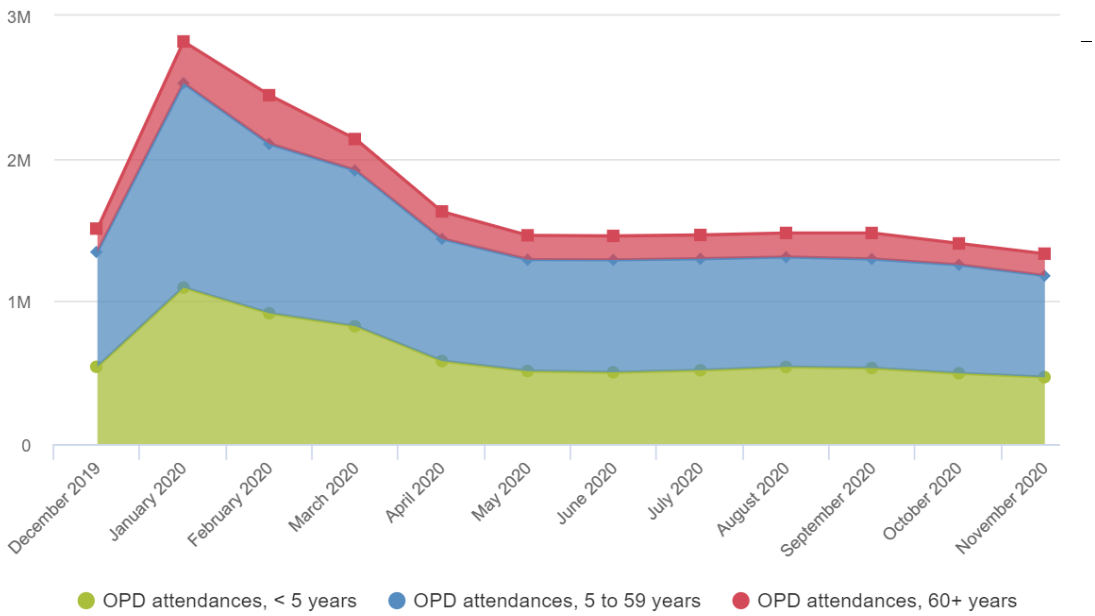
- **Completeness**

– **Percentage of facilities reporting:** Completeness of facility reporting affects the ability to interpret trends in the utilization rates of outpatient and inpatient services. Where less than 90% of required facilities have reported, it is best to disaggregate completeness by type of facility, by managing authority and by geographic area.

- **Internal consistency**

– **Trends, outliers and seasonality:** In areas that are endemic for certain diseases, there may be significant increases in total OPD visits during certain seasons, e.g. malaria season. Utilization may also vary based on local social and economic cycles, e.g. utilization may decrease during holiday periods or harvest months. Extreme variations ("outliers") may be due to data quality problems or they may reflect an actual sudden increase in service utilization. This complicates the process of data quality review. A way to identify possible data errors in such cases is to look for suspicious age or sex distributions of outpatient visits. This is illustrated by Figure 17 which shows the trend in total outpatient attendance for the same country as is presented in Figure 11. The increase in total OPD attendance during January to March might suggest a data quality issue or it might simply be due to the seasonal increase in malaria shown in Figure 11. The fact that the rise in OPD attendance is seen in all three age groups suggests that this increase is more likely to represent a true increase in outpatient utilization.

Figure 17 : Trend in outpatient visits, by age group, nationwide, last 12 months



– **Changes in reporting practices:** Information on what is and is not included in the OPD data should be clearly stated in reports and dashboards, to enable informed interpretation. Large year-to-year changes in outpatient or inpatient utilization may reflect changes in reporting practices such as:

  - large referral hospitals or private facilities abruptly starting or stopping submission of reports;
  - whether or not repeat visits are counted as outpatient visits;
  - whether or not preventive visits are counted as part of outpatient visits; or
  - whether or not a utilization indicator is based on a count of total diagnoses (for which a single patient may have more than one), rather than a count of total OPD visits or total discharges.

- **External consistency**

- It is essential to estimate the percentage of all facilities (including government, military, private-non-profit and private-for-profit providers) that are included in the reporting system, to understand how representative the available RHIS data are of all health services in the country. A high percentage of the population may use private health care services that may not be included in the RHIS. Comparison of utilization rates obtained from RHIS data should therefore periodically be compared with utilization data from other sources, e.g. population-based surveys such as the Demographic and Health Surveys (DHS).
- It may be difficult to assure the reliability of data that facilities periodically self-report on availability of services and resources (health workforce, medicines, beds, equipment) and their readiness to provide key services (e.g. BEmONC or CEmONC services). Moreover, reporting rates may be low for these data. Given these limitations, such self-reported data should be carefully reviewed for their consistency with data collected during health facility assessments or from other sources.

4.1.4 Analysis of core indicators

Three ways to analyze data on service utilization and availability are considered here:

- overall service utilization:
  - Outpatient utilization: outpatient attendance per capita[36];
  - Inpatient utilization: hospital discharges per 100 population;
- surgical service utilization: caesarean section rate in the population; surgical volume;
- service-specific availability.

Analysis of utilization data should be disaggregated by sex and, at a minimum, by the age groups 0-4 years and 5+ years.

1. Outpatient attendance per capita / Outpatient service utilization

Outpatient attendance data should include all types of visits for curative care (general OPD as well as programme-specific and specialist consultations) but exclude visits for preventive care, e.g. ANC, immunization. However, in practice, there may be variations among countries and facilities in what is included. For example, visits of specific programmes (e.g. TB, HIV) may be excluded or there may be variation concerning inclusion of specialist consultations. To assist interpretation and make comparison possible, details of what is included and excluded should be provided when presenting the indicator.

New OPD visits should be reported separately from revisits. OPD utilization is calculated using the sum of new visits and re-visits (unlike the analysis of outpatient morbidity which includes only the diagnoses for new visits). It is useful to also disaggregate the analysis by new visits versus re-visits (see Figure 18a). A high revisit proportion (e.g. 20% or more), along with a low overall OPD utilization rate, may suggest that a large proportion of the population has very poor access to services, but that some people have good access, i.e. some individuals visit multiple times while others do not use the facilities at all.

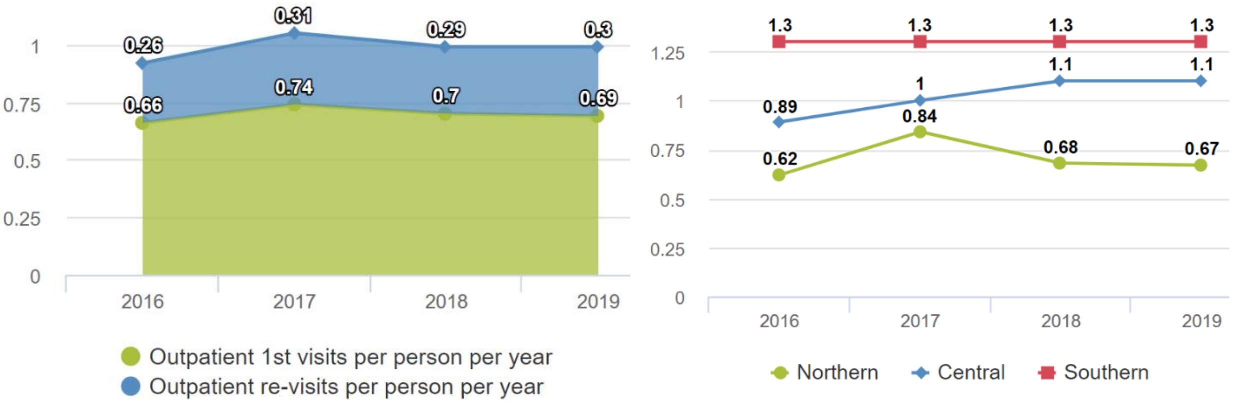
Benchmarking OPD utilization is difficult because utilization is influenced by many factors, including access to services, supply of medicines and medical products, availability of laboratory and other diagnostic services, and perceptions of quality of care. In most European Union Member States, the number of physician consultations per person per year ranges from 4.3 to 10.[37] The WHO SARA suggest five outpatient visits per person per year[38]; however, in many settings, this may be unrealistically high.

[36] This indicator may be expressed in various ways, e.g. outpatient or OPD consultations per person per year, outpatient or OPD visits per person in the population.

[37] https://ec.europa.eu/eurostat/statistics-explained/index.php/Healthcare_activities_statistics_-_consultations#Consultations_of_doctors

[38] http://www.who.int/healthinfo/systems/sara_reference_manual/en/

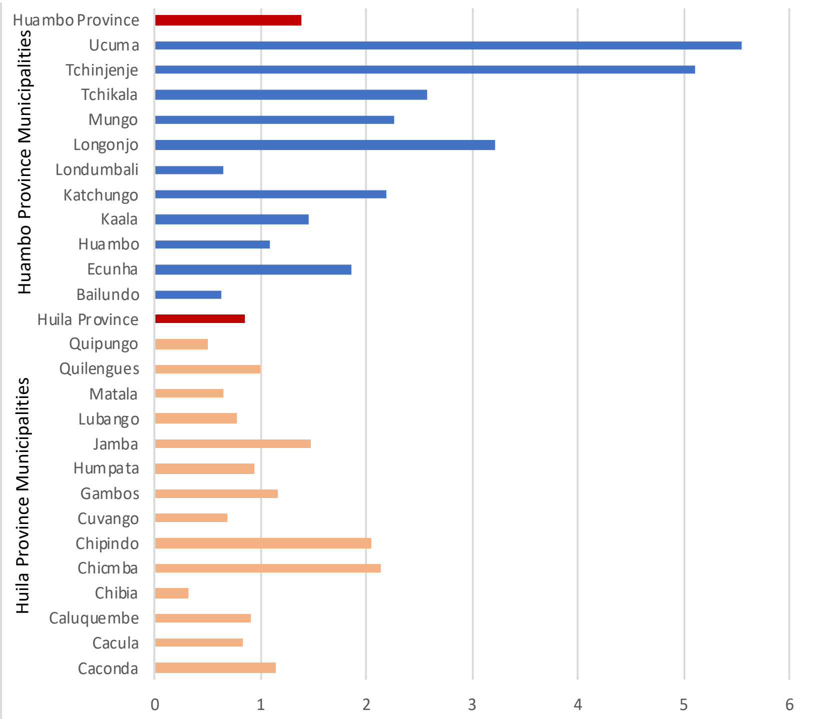
Figure 18 : Outpatient visits per person per year, national (left) and by region (right), 2016 - 2019



Box 3: Differences in OPD utilization may result from changes in availability of medicines

As part of the decentralization policy of Angola, municipalities were given the responsibility to procure essential medicines, but were given only a small and insufficient budget for this purpose. Most provinces (including Huambo Province) allowed municipal health managers to set up a revolving drug fund, where people were charged for medicines and these funds were then used to replenish medicine stocks. In other provinces, such as Huila Province, medicines were dispensed free-of-charge, even though the available budget did not enable adequate replenishment of the stocks. The effect on OPD consultations per capita is shown in the figure below, with utilization in Huila Province significantly lower than in Huambo Province.

Figure 19 : Outpatient visits per capita, by municipality of Huila and Huambo provinces of Angola, 2005



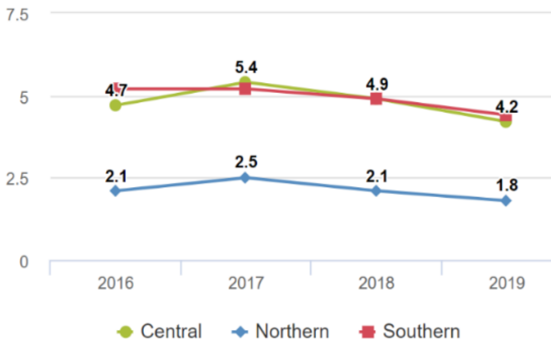
Sources: Ministério da Saúde de Angola 2007. Mapa Sanitário da Província da Huíla; Ministério da Saúde de Angola 2007. Mapa Sanitário da Província do Huambo

2. Hospital discharge rate / Inpatient service utilization

The hospital discharge rate is the sum of inpatient discharges (including deaths) per 100 population per year.[39] An inpatient discharge is defined as at least one overnight stay in the hospital. The rate includes all discharges except those for delivery. It is difficult to benchmark discharge rates. OECD countries with ageing populations may have about 17 discharges per 100 population per year.[40] The WHO SARA suggests 10 discharges per 100 population per year.

In low- and middle-income countries with high disease burdens, low hospital discharge rates suggest limited access to inpatient services. In hospital-oriented health systems (e.g. in some eastern European countries), discharge rates are often high. High rates may also indicate poor quality of care in PHC, especially for conditions that can be treated through outpatient care or where early intervention can prevent complications, e.g. diabetes, hypertension, asthma, congestive heart failure. The percentage of discharges from re-admissions, if available by diagnosis, may also provide information on quality of care.

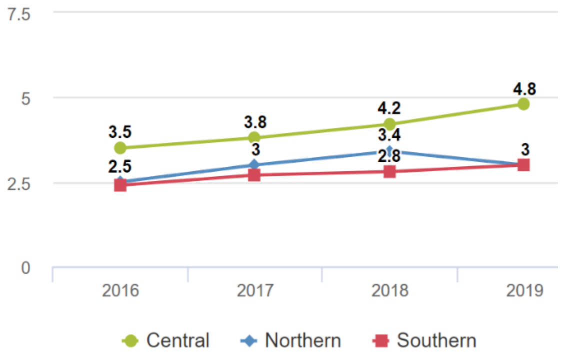
Figure 20 : Inpatient discharges per 100 persons per year, by region, 2016 - 2019



3. Caesarean section rate in the population

This indicator is calculated by dividing the total number of caesarean sections (c-sections) per year by the estimated number of live births[41] in the population. A low rate (significantly below 10%) may indicate limited access to emergency obstetric care. This is often associated with long travel distances to facilities. C-sections are effective in saving lives or mothers and babies, but only when they are performed for medically-indicated reasons.

Figure 21 : Caesarian section rate in the population, by region, 2016 - 2019



At population level, c-section rates above 10% are not associated with reductions in maternal or neonatal mortality rates.[42] Excessive use of the procedure unnecessarily exposes women and babies to the risks of anesthesia and surgery and adds a substantial expense to the health system. (A second c-section indicator is discussed in Section 4.3: c-section rate at facility level.)

4. Surgical volume

The numerator requires standardized reporting to avoid inclusion of minor surgical procedures. A surgical procedure is defined here as the incision, excision or manipulation of tissue that needs regional or general anesthesia, or profound sedation to control pain. It usually involves an overnight stay in hospital. This is sometimes referred to as a "major surgery". The most common surgical interventions in secondary (e.g. district) hospitals are generally c-section, hernia repair and surgery related to fractures.

[39] Hospital discharge rate may also be expressed as discharges per 10,000 or per 100,000 population per year

[40] https://gateway.euro.who.int/en/indicators/hfa_534-6010-inpatient-care-discharges-per-100/visualizations/#id=19629

[41] Sometimes deliveries or total births are used as the denominator. However, the difference in results when using the various denominators is likely to be less than 1%. (One c-section for twins can produce two live births, while some deliveries result in stillbirths, resulting in a "balancing" of the numbers)

[42] WHO statement on caesarian section rates. World Health Organization. 2015. https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/cs-statement/en/ (Accessed 13 May 2020)

If the number of surgical procedures for a defined population is relatively low, surgical services may not be accessible to all groups within this population. When availability of surgical care is low, conditions that could easily be treated may progress to conditions with lasting disability or high fatality. Surgical interventions also require the availability of appropriate anesthetic capacity. The Lancet Global Commission on Surgery[43] has set a target for 5 000 procedures per 100 000 population by 2030 (or 5%) for surgical and anesthesia care.

5. Service-specific availability

Service-specific availability indicates the presence of defined services and measures whether the service delivery system meets the range of needs of the target population. Measures of service availability can be expressed as:

- the percentage of health facilities that offer a specific service (e.g. 70% of all facilities offer ART); or
- the number of health facilities that offer a specific service per 10 000 population.

As noted previously, the main sources of data on the availability of specific services are periodic health facility assessments. RHIS data can however be used to obtain indirect information on the availability of selected services, based on the assumption that reporting of an activity implies that the required service is provided. For example, facilities reporting "full blood counts"[44] can be assumed to have a laboratory. Figure 22 provides an example of service-specific availability data from Afghanistan.

Figure 22 : 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: Afghanistan Ministry of Public Health. Afghanistan Joint Health Sector Review 2015

Distribution of maternal and child health services, general OPD curative services and services for NCDs such as hypertension and mental health conditions, should be reasonably uniform across the country as all areas require these services. In some contexts, service-specific availability is adapted to the disease profile of the area. For example, availability of malaria services for an area with endemic malaria will differ from the availability for an area without malaria.

Targets for the number of facilities offering a specific service per population exist only for selected services. For example, there are targets for Emergency Obstetric Care of four Basic (BEmONC) facilities and one Comprehensive (CEmONC) facility per 500,000 people.

[43] Lancet Commission on Global Surgery 2030. Policy Brief: Monitoring surgery and anaesthesia for improved health, welfare and development.
https://b6cf2cfd-eb09-4859-92a9-a8f002c3bcef.filesusr.com/ugd/346076_d687ef09a01747eeae9921985c202814.pdf

[44] Not all laboratory tests are suitable for this purpose. For example, RDT for malaria and blood sugar measurements using a glucometer do not require a laboratory.

When assessing service-specific availability, the distances and travel time required to reach a facility offering a specific service should also be considered. A map showing the locations of various services in relation to population and road networks is useful.

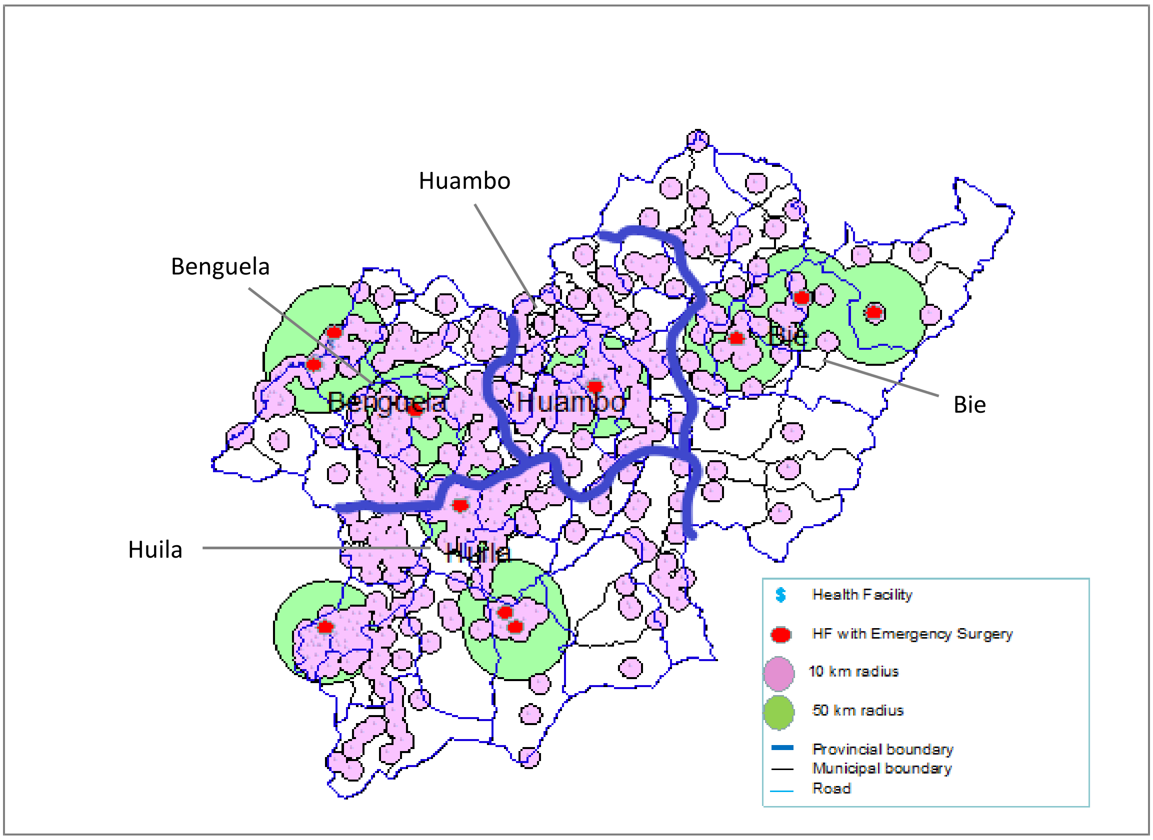
Figures 23 and 24 illustrate the substantial variation in availability of PHC and emergency surgery services among four provinces of Angola. Based on the population per service (see Figure 23), residents of Bie and Huila regions appear to have good access to emergency surgery services. Review of the map (Figure 24), however, shows that access to such services is limited in the eastern third of Huila province and the southern third of Bie region.

Figure 23 : Population served by PHC and emergency surgery services in four provinces of Angola, 2007

Province	Population	Health Facilities		Population per service	
		Total	With emergency surgery services	PHC	Emergency surgery
Benguela	2,723,136	152	3	17,915	907,712
Bie	1,165,836	80	3	14,573	388,612
Huambo	1,299,835	135	1	9,628	1,299,835
Huila	1,491,998	183	3	8,153	497,333

Source: Health Maps of Benguela, Bie, Huambo and Huila provinces. Angola 2007

Figure 24 : Distribution of PHC and emergency surgery services in four provinces of Angola, 2007



Source: Health Maps of Benguela, Bie, Huambo and Huila provinces. Angola 2007

4.2 COVERAGE

4.2.1 Core coverage indicators

Indicator	Definition	Calculation	Disaggregation
1. Contraception first time users	Clients who for the first time in their life accept a contraceptive method	N: No. of clients who accept a family planning method for the 1st time	Age (10-14,15-19,20+) Sex; Unit of contraceptive method
2. Antenatal client 1st visit before 12 weeks gestation	Percentage of antenatal care clients with 1st visit before 12 weeks gestation	N: No. of ANC 1st visits before 12 weeks x 100 D: No. of ANC 1st visits	Age (10-14, 15-19, 20+)
3. Antenatal care 1st visit coverage	Percentage of estimated pregnant women in the population who had a 1st ANC visit	N: No. of ANC clients with 1st ANC visit x 100 D: Estimated no. of pregnant women	Age (10-14, 15-19, 20+)
4. Antenatal care 4th visit coverage	Percentage of estimated pregnant women in the population who had a 4th ANC visit	N: No. of ANC clients with 4th ANC visit x 100 D: Estimated no. of pregnant women	Age (10-14, 15-19, 20+)
5. Institutional delivery coverage	Percentage of women (in the population) who gave birth in a health facility	N: No. of deliveries in facilities X 100 D: Estimated no. of live births in the population	Age (10-14, 15-19, 20+)
6. DTP3 coverage Also coverage of other vaccines in the national schedule	Percentage of the target population that received the third dose of diphtheria-tetanus-pertussis containing vaccine (DTP3)	N: No. of children receiving DTP3 × 100 D: Estimated no. of target population	By vaccine/dose of vaccine Age (0-11m, 12-23m for infant immunization; 1-2 years, 2+ years for toddler immunizations) Status for tetanus toxoid (pregnant women, other)
7. ART coverage (current)	Percentage of the estimated number of people living with HIV that are currently receiving antiretroviral therapy (ART)	N: No. persons living with HIV currently receiving ART x 100 D: Estimated no. of persons living with HIV	Age (< 15, 15+) Sex (M, F, TG) Special populations (KPs)
8. TB case notification rate	TB cases notified per 100,000 population	N: No. of TB cases notified x 100,000 D: Estimated population	By case type: pulmonary bacteriologically confirmed vs pulmonary clinically diagnosed; By treatment history: new and relapse (incident cases) vs previously treated, excluding relapse Age (refer to TB module); Sex
9. Hypertension new cases	Number of people newly diagnosed with hypertension	N: No. of hypertension new cases	Age Sex
10. Diabetes new cases	Number of people newly diagnosed with diabetes	N: No. of diabetes new cases	Age Sex

4.2.2 About the data

This section discusses data on the coverage essential health services. Coverage refers to the percentage of a target population that received a specific health intervention or service.

The main source for national level coverage estimates is population-level data. Such data may come from administrative systems that cover the entire population[45] or, in most resource-limited settings, population-based surveys. Such surveys are, however, conducted only at intervals of several years and survey findings may therefore be out-of-date. Furthermore, they rarely produce estimates that are reliable at the level of relatively small subnational areas such as districts.

For some indicators, the RHIS can provide data for subnational coverage estimates (e.g. district level) to determine whether services are on track to meet local targets and to assess equity among geographic/administrative areas. Countries may use coverage estimates based on RHIS data to assess progress during the periods between population-based surveys. When using RHIS data to estimate coverage, the limitations of routine data must always be considered, including: the extent to which reported RHIS data represent all service providers, the completeness and quality of reporting and the reliability of target population estimates.

- **Coverage, quality and UHC**

Quality of health service delivery is discussed in the next section but is mentioned here as there are relationships between coverage and quality. Quality refers to the extent to which the services are delivered according to required standards. Coverage may be considered a dimension of overall health system quality. Perceptions of service quality affect utilization and coverage.

Health service coverage and quality are central to UHC (SDG 3.8). Without quality, coverage will not be effective. The global UHC indicators require nationally representative data and have definitions developed for population-based surveys or data sources other than the RHIS. Only two[46] UHC indicators specifically require RHIS data. Therefore, national level progress in the UHC indicators cannot be measured using only RHIS data. However, regular monitoring of health service performance using RHIS data is needed for management and improvement of the services, which are essential to achieving UHC.

The indicators discussed in this section include facility adaptations of selected UHC indicators. However, strengthening of facility services for UHC requires attention to a wider range of service aspects than those reflected by the UHC indicators and, therefore, measurement of a wider range of indicators. Selection of such indicators should be guided by country priorities. This section provides some examples.

4.2.3 Assessing data quality

As for all RHIS data, the quality of coverage data should be assessed according to the four main data quality dimensions (refer to Chapter 1). Evidence of poor data quality includes erratic year-to-year fluctuations, coverage estimates far in excess of 100%, implausibly low coverage, and disease outbreaks in areas with high estimated coverage.

- **Completeness**
  - **Percentage of facilities reporting:** Incomplete reporting can significantly reduce coverage calculated using facility data as the numerator.
  - **Trends and outliers:** Coverage estimates are expected to remain relatively stable or show gradual improvement over time. Unusual increases or decreases require investigation. A few “extreme outlier” values can significantly distort coverage estimates.
- **Internal consistency**
  - **Consistency between related indicators / data elements:** Related coverage indicators should follow a similar trend, for example, DTP1 and DTP3 doses. This is easily visualized by plotting the data element trends on the same chart.

[45] Such systems are found in some high-income countries and are usually linked to a comprehensive, reliable CRVS system.

[46] UHC indicators specifically requiring RHIS data: percentage of incident TB cases that are detected and successfully treated in a given year, and percentage of people living with HIV currently receiving antiretroviral therapy.

■ External consistency

Coverage estimates based on RHIS data should periodically be compared to coverage estimates derived from a high-quality, nationwide household survey such as a DHS or a Minimum Indicator Cluster Survey (MICS). An example of such a comparison is presented in Box 4. Estimates from household surveys are often seen as the gold standards for coverage estimation. However, while surveys can be very useful, they also have inherent limitations including their infrequency (several years may elapse between surveys), limited geographic disaggregation (estimates at district level and below are often not available) and quality (not all surveys adhere to strict sampling and interview protocols and data based upon the recall of persons interviewed may not be reliable).

Box 4. Comparing administrative and survey coverage indicators in Afghanistan

In this example, comparison of coverage indicators calculated using RHIS ("HMIS") data with those obtained from population surveys, reveals systematic differences: administrative coverage rates are consistently higher than survey-based rates.

Indicator	Afghanistan Health Survey 2018	HMIS 2018
Institutional Deliveries	59%	67%
Antenatal Care 1st visit	65%	98%
Penta-3 vaccine	61%	92%

In the case of Afghanistan, the discrepancies could reflect poor quality HMIS data. (There is an incentive to overreport, as these indicators are used in a pay-for-performance scheme.) However, the discrepancies are most likely to result from unreliable population data. Population estimates were projected from the last census, conducted in 1979, and are likely to differ significantly from reality.

Sources: Royal Tropical Institute - Netherlands 2019, Afghanistan Health Survey 2018 and Afghanistan Ministry of Public Health Annual Report 2018

■ External comparisons of population data

- **Target populations:** A major challenge in coverage calculation involves obtaining the correct denominator – the target population. Various methods have been proposed to improve denominator estimations and coverage calculations. Refer to General Principles (especially Annex 1) for detailed discussion on denominator issues.
- **Estimating the population at risk:** Where certain diseases (e.g. malaria) are endemic only in some parts of the country, care must be taken to use only the population in these areas "at risk" as the denominator when calculating nationwide coverage of, for example, IPTp.

■ Other data quality issues

- **Patients needing long-term follow-up:** Patients with chronic diseases (e.g. hypertension, diabetes, sickle cell anemia, HIV, TB, etc.) and patients started on contraceptives are expected to make multiple follow-up visits. In the absence of a system of longitudinal patient records it is difficult to assess programme coverage using RHIS data. Reliable monitoring of care over time is difficult even with a longitudinal tracking system such as is usually available for ART or TB treatment. Patients who initiate care at one clinic but seek follow up at a different clinic need to be reported as having "Transferred in" rather than as having initiated treatment. Reliable monitoring of treatment outcomes (e.g. TB treatment success, ART retention) requires reliable recording of the number of persons who began treatment ("the treatment cohort"), transfers-in and -out and those who died or were lost to follow-up. Compiling all the required data takes time and often results in delays in reporting of reliable statistics on treatment outcomes.
- The coverage indicators in this document represent multiple programmes and several indicators have specific data quality issues that are addressed in the programme-specific guidance documents.

4.2.4 Analysis of core indicators

This section describes basic coverage calculations using RHIS data and available target population estimates. High levels of coverage reflect good access to and utilization of services. Low coverage levels may reflect access problems and/or perceptions of poor service quality.

When target population estimates are unavailable or unreliable, trends in the absolute numbers of outputs (i.e. numerators) can be monitored over time, including comparisons with the same month or quarter in previous years. Refer to Box 5 (under ANC 1 and ANC 4 visit coverage) for an example.

Sometimes the term "coverage" is used to refer to the percentage of individuals receiving a specific intervention among those that accessed the service, e.g. "Antenatal syphilis testing coverage". The denominator in such indicators is based on facility data rather than on population estimates. However, in this guidance, "coverage" is used exclusively to refer to population coverage.[47] Hence, in this guidance, this indicator is named "Antenatal client syphilis screening" and is included among the indicators of quality rather than among the indicators of coverage.

1. Contraception first time users

Growing trends in adolescent pregnancy and varying fertility levels highlight the need to track the number of new contraceptive users by age and sex and to monitor changes over time. This indicator refers only to clients starting contraception for the first time in their life. It excludes clients that switch contraceptive methods. It is presented as a count. Measurement of contraceptive "coverage" (met need for family planning) requires a population-based survey. Couple years of protection (CYP)[48] is an additional family planning indicator that uses health service data and is based on quantities dispensed of various contraception methods.

2. Antenatal client 1st visit before 12 weeks gestation

This is not a population coverage indicator but is presented here as it is important to review alongside ANC1 coverage. WHO recommends that ANC starts in the first trimester (before reaching 12 weeks of pregnancy), to allow early detection of problems and to promote the best possible outcomes for both mother and baby. Health education and support starting early in pregnancy also help to promote a positive pregnancy experience for the woman. A low percentage of 1st visits before 12 weeks may reflect lack of community awareness of the importance of early antenatal care.

3. Antenatal care 1st visit coverage, 4. Antenatal care 4th visit coverage and **5. Institutional delivery coverage**

WHO recommends a minimum of eight ANC visits at specified intervals during pregnancy, to reduce perinatal mortality and improve women's experience of care. The 4th ANC visit coverage indicator is presented here for consistency with the related UHC indicator and to detect early drop-off in follow-up[49]. A large difference between 1st and 4th visit coverage may reflect perception of poor quality of care. It may also indicate use of private providers after the 1st visit to a public facility ("registration" for ANC may facilitate access to a public facility for delivery), or late presentation for the 1st ANC visit (also shown by a low percentage of ANC 1st visits before 12 weeks gestation).

WHO recommends that all births take place in health facilities so that obstetric complications can be identified and managed as soon as they occur. Increasing the percentage of institutional deliveries is a key strategy for reducing maternal and newborn mortality and stillbirths. The denominator is the

[47] Some exceptions are made to this principle: for reasons that are noted, the coverage indicator group includes one indicator with a service-based denominator (ANC 1st visits before 12 weeks) and three indicators for which numerator data are assessed without reference to a denominator (contraceptive first-time users, hypertension new case and diabetes new cases).

[48] Refer to the RMNCAH module for further details.

[49] An alternate indicator to assess drop-off in ANC visits is the percentage of women with a 1st ANC visit that had a 4th ANC visit, i.e. using ANC 1st visits as the denominator.

estimated number of live births[50] in the population. Skilled birth attendance is also a commonly-used indicator but is less objectively measurable than institutional deliveries. Furthermore, although delivery in a health facility does not guarantee skilled attendance, and some community deliveries have skilled attendance, the institutional delivery and skilled attendance indicators are highly correlated[51].

Box 5 explains how to use some recommended charts for visualizing long-term and short-term trends in coverage data – even in the absence of reliable target population estimates. The advantage of using indicators calculated with a reliable denominator/target is that they enable comparisons between geographic areas with different target populations. This is illustrated with Figure 25 and Figure 26.

Figure 25 : Coverage with antenatal and delivery services, by region, 2019

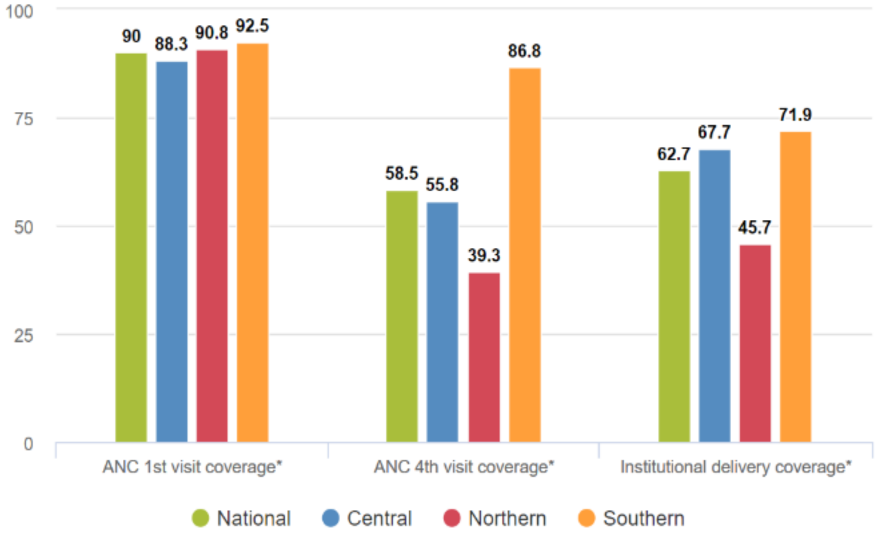
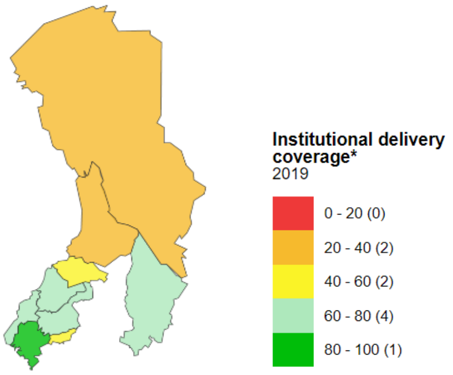


Figure 26 : Institutional delivery coverage, by district, 2019



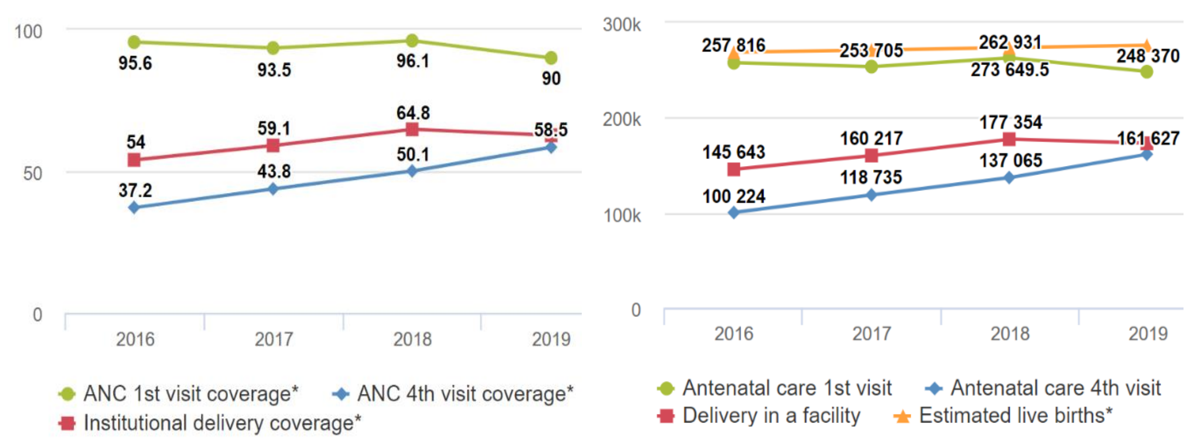
[50] Sometimes deliveries or total births is used as the denominator. However, the difference in the values of the indicator when using the various denominators is likely to be less than 1%. As a result of stillbirths, the number of deliveries may be one or two 2% more than the number of live births. However, this effect is balanced by the fact that, because of twin and triplet deliveries, the number of deliveries may be one or two percent less than the number of live births.

[51] Inequalities in the coverage of place of delivery and skilled birth attendance: analyses of cross-sectional surveys in 80 low and middle-income countries. Joseph G, et al. Reprod Health. 2016; 13: 77. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4912761/

Box 5: Numerator data correspond closely to coverage estimates

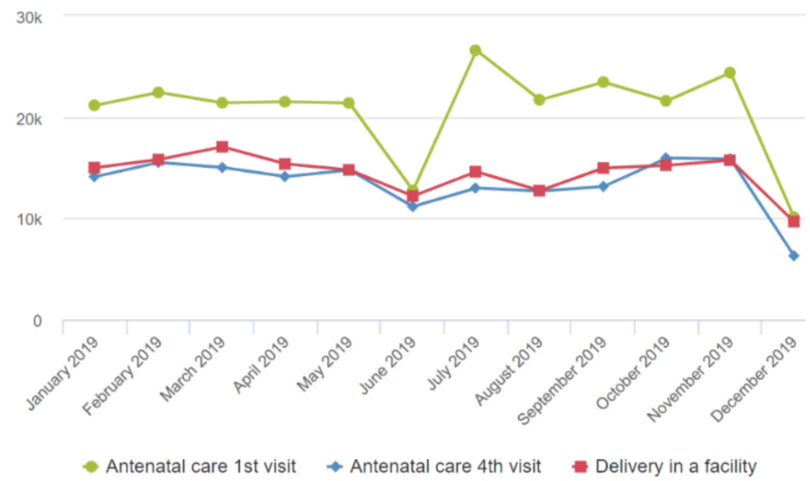
Charts showing trends in numerator data (for example, numbers of 1st ANC visits) can often be interpreted without reference to an estimated target/denominator. This is especially true where a survey has shown that coverage of a service is quite high (>90%) in almost all geographic areas. Comparison of the two charts of Figure 27 shows that the lines in both charts display the same trends and the same relative levels. For example, in both cases the line for ANC 1st visits is highest (almost equal to the target of 100%), but it dropped somewhat for 2019. Even if the chart on the right did not include a line showing the estimated target, the line for ANC 1st visits could be used as a reference for showing the lower coverage achieved with ANC 4th visits and delivery in a health facility. The close correspondence between the two charts shows that when good estimates of the denominator are lacking (e.g. at facility level), it is useful to track the trends in the numerators.

Figure 28 : Trends in maternal health coverage (left) and services (right), nationwide, 2016 - 2019



This close correspondence means that numerator data can also be used to monitor short-term trends in coverage. This is illustrated in Figure 28 which shows a modest drop in service outputs (and thus coverage) in June and a major drop in December. A chart such as this showing the month-to-month trend in services can sometimes help to identify very large outliers suggesting errors in data entry.

Figure 27 : Trend in antenatal and delivery services, nationwide, last 12



6. DTP3 coverage

DTP3[52] coverage by the age of one year is used to measure overall performance of the immunization programme. Comparing the coverage of several tracer vaccine doses provides insights into factors affecting coverage at different points in the immunization schedule. Early doses, such as BCG or DTP1,

[52] DTP vaccine is included in the pentavalent vaccine, also referred to as "Penta" or "DTP-Hep-Hib".

are indicative of access to immunization services. High DTP1 coverage indicates that health services are easily available to a high proportion of the population and that people value vaccination. High coverage of later doses, e.g. DTP3, indicates that people also understand the importance of completing the schedule. Low DTP3 coverage may reflect perceptions of poor quality of care at the time of an early dose.

The denominator for calculating immunization coverage should include doses administered during both fixed and outreach sessions but doses delivered during vaccination campaigns should be excluded.[53] The denominator is the estimated number of surviving infants. (Refer to *General Principles* for details on calculation of the denominator.) Coverage of significantly over 100% (or significantly higher than found in a coverage survey) can indicate either under-estimation of the denominator or over-reporting of vaccine doses administered.

Figures 29 and 30 illustrate some recommended ways of visualizing immunization data. The same principles apply to immunization data as were discussed in Box 5 for maternal health coverage data. Both the charts in Figure 29 show similar findings:

- high levels of coverage with BCG and Penta 1 and Penta 3;
- some dropout from Penta 1 to Penta 3 and MR 1 (MCV1);
- a gradual rise in coverage with the new rotavirus vaccine and MR 2 (MCV2) vaccines; and
- limited progress with introduction of MR2 and yellow fever vaccines.

Figure 29 : Trends in tracer vaccine coverage (left) and doses (right), nationwide, 2016 - 2019

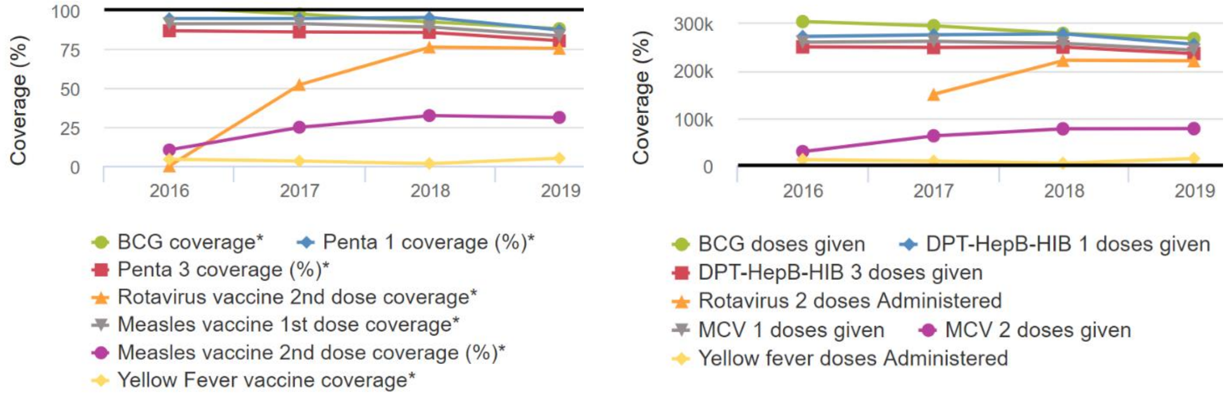
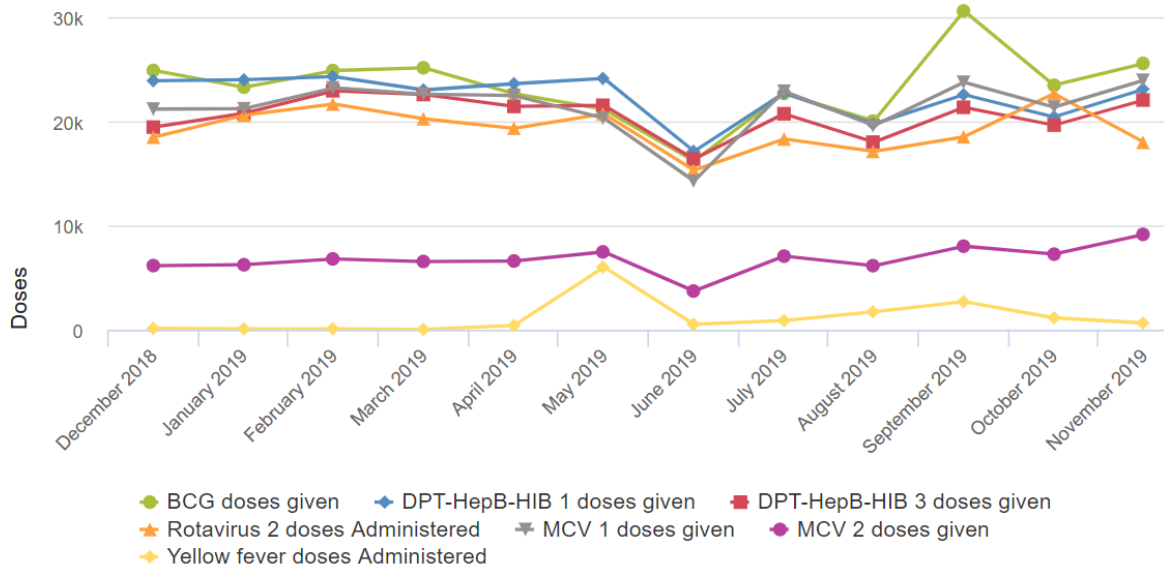


Figure 30 : Trend in tracer vaccine doses, nationwide, last 12 months



[53] While it is essential that campaign data are reported separately and not merged with RHIS data, such merging is unfortunately quite common. During campaigns it is common for children already immunized during a routine visit to be re-immunized. Merging these two types of data makes it very difficult to interpret routine immunization data.

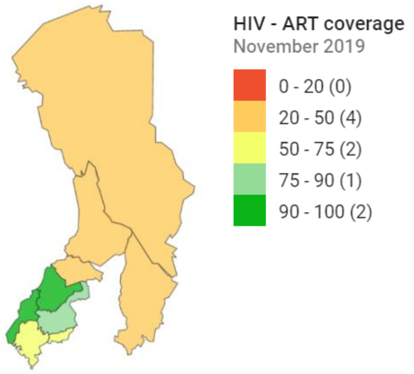
Note in Figure 30, the same modest drop in services (and thus coverage) in June and a major drop in December as seen in Figure 28 in Box 5 above. A drop in the values for multiple services suggests either a general disruption of health services and/or of reporting. Note also the rises in yellow fever doses in May of 2019 and of BCG doses in September of 2019. As the values for the other vaccines do not change much during these months, these isolated outliers are quite suspicious and should be investigated.[54]

7. ART coverage

This indicator assesses how well health services are performing in linking persons living with HIV (PLHIV) to ART services. The numerator, the number of PLHIV currently on ART, refers to the cumulative number of patients on ART at a specific point in time (e.g. at the end of the month for which the number is generated). The numbers should not be summed over different periods of time, such as a quarter, a year or multiple years as this will result in double-counting. The indicator must take into account PLHIV that were on ART at the end of the previous reporting period, those newly started ART in the current reporting period, as well as those that transferred in or out, were lost to follow-up or died.

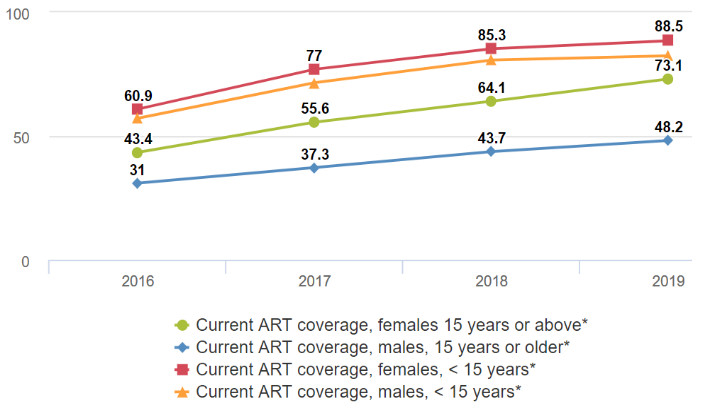
The denominator is based on estimates of the total number of PLHIV. The extent to which ART coverage estimates can be produced for lower subnational levels (e.g. district) depends on the levels for which estimates of the number of PLHIV are available. Estimates of PLHIV for national and, increasingly, also for subnational levels, are provided annually by UNAIDS, using a software product called Spectrum. Such estimates may however not always be updated every year.

Figure 31 : ART coverage (%), by district, 2019



It is important to disaggregate this indicator by sex and age groups as there can be striking differences both in the prevalence of HIV and in access to ART services. For example, in the case shown in Figure 32, the ART coverage was higher among female PLHIV due to ART being initiated during antenatal care and delivery.

Figure 32 : Trends in ART coverage, by age group and sex, nationwide, 2016 - 2019



8. TB case notification rate

TB data are usually reported quarterly from health facilities. 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 help to identify populations at high risk of TB and assess the effectiveness of case finding. Low notification rates may result from poor access to care or reporting problems, rather than actual low numbers of cases.

[54] A possible explanation for the abrupt increase in the value for yellow fever is that this vaccine was first introduced in May 2019, when there was a backlog of many children nine months or older who had not previously been vaccinated. The abrupt increase in the value of BCG in September 2019 is probably due to a data entry error.

In Figures 33 and 34, the blue circles indicate a province with a high number of TB cases (numerator), but a lower TB case notification rate, due to a high population (denominator). The red circles show a province with a lower number of TB notifications but a higher TB notification rate due to a low population. Planners must decide whether to target additional interventions to areas with higher risk (e.g. the province circled in red) or to areas with the highest number of notifications (e.g. the province circled in blue). As a third option, planners may suspect that TB is being under-diagnosed in one of the other provinces with a low notification rate (e.g. one of the provinces with shaded pale yellow in Figure 31) and work to improve detection of TB in that province.

Figure 33 : New and relapse TB cases (left) and notification rate per 100,000 population (center), by province of Benin, 2018

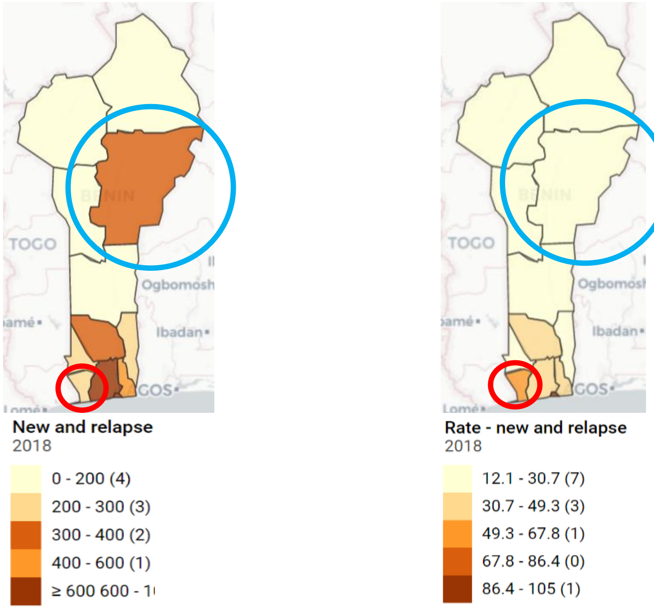
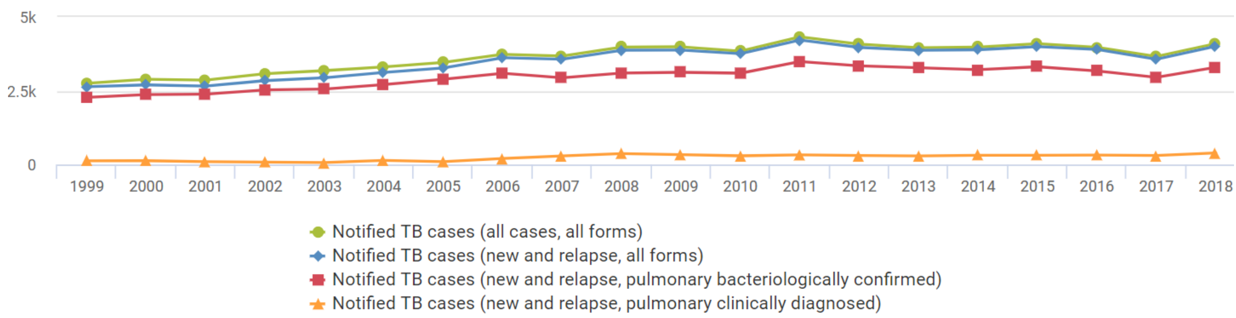


Figure 34 : Population, by province of Benin, 2018

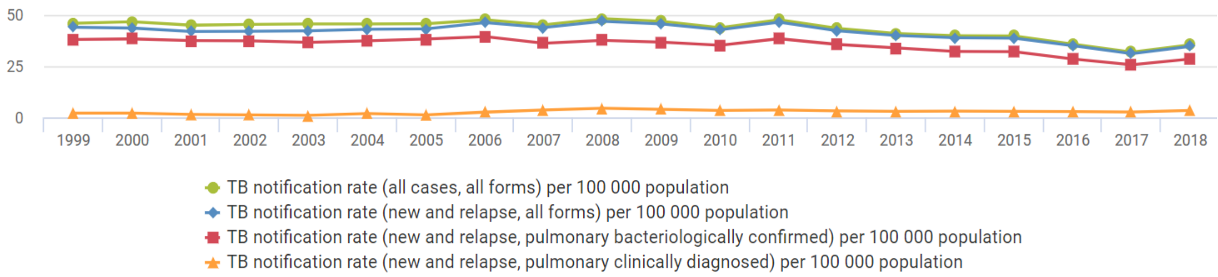
Changes in trends in the epidemiology of TB are expected to move relatively slowly. Large changes (> 10% increase or decrease) in reported numbers of cases are likely to be the result of data quality issues or factors outside the control of the TB programme, such as: changes in the number of treatment sites, changes in case definition, security issues or disasters. Rapid changes, however, could also be directly related to changes in TB programme activities, such as new screening or diagnostic practices or active case finding or, sometimes, to ongoing transmission in the community. Figures 35 and 36 show that while the numbers of notifications have increased, the notification rate has decreased over the last two decades[55].

Figure 35 : Trends in TB notifications, Benin, 1999 - 2018



[55] According to WHO estimates (https://www.who.int/teams/global-tuberculosis-programme/data), during this period, the estimated incidence of TB declined by approximately one third while the TB notification rate declined by only 15%. The reason that the TB notification rate did not decline by a larger percentage, is that the national TB programme detected a higher percentage of cases -- increasing the percentage of cases detected from 45% in 1999 to 62% in 2018.

Figure 36 : Trends in TB notifications per 100,000 population, Benin, 1999 - 2018



9. Hypertension new cases, and **10. Diabetes new cases**

The ongoing global increases in NCDs such as hypertension and diabetes mean that increasing numbers of people will require treatment. Most patients with hypertension can be treated in PHC facilities. Early detection is essential for prevention of long-term consequences such as heart attack, stroke and kidney failure. Therefore, it is important that the RHIS addresses the need for NCD data. The purpose of the proposed indicators is to track the extent to which health services are detecting people with hypertension and diabetes. The counts of absolute numbers represent a starting point for contexts where little or no NCD data are reported from PHC and other outpatient services.

Many countries capture the total numbers of OPD visits for hypertension and/or diabetes. However, beyond showing the workload associated with NCD cases, the total number of visits is of limited use. The number of visits does not represent the number of patients receiving treatment, as visit frequency may vary among patients and often depends on the frequency of medication refills. 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 obtain the numbers of new cases detected each month.

A limitation of these indicators 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, whether the diseases are controlled and whether there are complications. This requires a well-developed facility information system with longitudinal patient records based on a system of unique patient identifiers, e.g. electronic registers.

In some countries, many people with hypertension and other cardiovascular diseases may seek care in the private sector, whereas those with diabetes (particularly insulin-dependent diabetes) tend to seek care in public facilities where they receive medication free of charge.

Additional facility-based indicators for NCD management are available in WHO's HEARTS package for management of cardiovascular disease in PHC: Systems for monitoring.[56]

[56] https://www.who.int/cardiovascular_diseases/hearts/en/

4.3 QUALITY

4.3.1 Core quality indicators

indicator	Definition	Calculation	Disaggregation
1. Antenatal client syphilis screening	Percentage of antenatal care clients screened for syphilis	N: No. of ANC clients screened for syphilis X 100 D: No. of ANC client 1st visits	
2. Prevention of mother-to-child transmission (PMTCT) testing	Percentage of antenatal clients and/or women delivering in a facility who were tested for HIV (or who already know they are HIV positive), for prevention of mother-to-child transmission (PMTCT)	N: No. of pregnant women attending ANC and/or who had a facility-based delivery, who were tested for HIV during pregnancy or already knew they were HIV-positive D: No. of ANC 1st visits or No. of deliveries in facility	HIV status/test results: 1) Known HIV infection at ANC entry; 2) Tested HIV positive at ANC during current pregnancy; 3)Tested HIV negative at ANC during current pregnancy Total identified HIV positive women = 1 + 2
3. Intermittent preventive treatment for malaria during pregnancy (IPTp)	a. Percentage of antenatal clients that received sulfadoxine/ pyrimethamine (SP) course for IPTp3 (3rd dose)	N: No. of pregnant women given 3 doses of SP for IPT D: No. of ANC 1st visits	
4 .Caesarean section rate at facility level	Percentage of deliveries in health facilities by caesarean section	N: No. of caesarean sections X 100 D: No. of deliveries in facilities	Age (10-14;15-19; 20+) Facility type
5. Immunization dropout rates: DTP1 to DTP3	Percentage of infants who received a 1st dose of of DPT but did not receive a 3rd dose	N: (DPT1 doses – DPT3 doses) x 100 D: DPT1 doses	
BCG to MCV1	Percentage of infants who received BCG but did not receive a 1st dose MCV	N: (BCG doses – MCV1 doses) x 100 D: BCG doses	
MCV1 to MCV2	Percentage of children who received a 1st dose of MCV but did not receive a 2nd dose	N: (MCV1 doses - MCV2 doses) x 100 D: MCV1 doses	
6. HIV care cascade	No. of persons newly diagnosed with HIV No. of persons newly diagnosed with HIV that initiated ART No. 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, 12m, 24m, 36m, 48m, 60m)
7. HIV tested new and relapse TB cases with a documented HIV status	Percentage of new and relapse TB cases who had a HIV test result recorded in the TB register among all TB cases notified during a specified time period, usually 1 year	N: No. of new and relapse TB cases notified in a specified time period who had a HIV test result recorded in the TB register D: No. of new and relapse TB cases notified in the same time period	
8. Drug susceptibility test (DST) for TB cases	Percentage of TB cases with DST results for at least rifampicin resistance, during a specified time period, usually 1 year	N: No. of TB cases notified with DST results for at least rifampicin resistance in a specified time period x 100 D: No. of TB cases notified in the same time period	By treatment history: new, previously treated, unknown history

indicator	Definition	Calculation	Disaggregation
9. TB treatment success rate	Percentage of TB cases successfully treated (cured or treatment completed) among TB cases notified to national health authorities during a specified time period, usually one year.	N: No. of TB cases notified in a specified period time period that were successfully treated X 100 D: No. of TB cases notified in same period	Treatment outcome; Case type; Treatment history HIV status; Drug sensitivity (Refer to TB module for details)
10. Malaria diagnostic testing ratio	Percentage of suspected malaria cases that had a diagnostic test for malaria	N: No. of malaria tests performed x 100 D: No. of suspected malaria cases	Microscopy , RDT Age (<5, 5-14, 15+)
	Malaria tests = No. of RDT + No. of microscopies Suspected cases = No. of malaria tests performed + No. of presumed cases of malaria reported Presumed cases = No. of cases diagnosed with malaria without any laboratory confirmation		
11. Confirmed malaria cases treated with ACT	Percentage of confirmed cases of malaria that receive first-line antimalarial treatment: artemisinin-based combination therapy (ACT)	N: No. of confirmed cases of malaria treated with ACT x 100 D: No. of confirmed cases of malaria Confirmed cases = RDT positive + microscopy positive	Age (<5, 5-14, 15+);

Note: Quality-related indicators are also found in other indicator groups:
Mortality: Selected mortality indicators, e.g. CFRs, may reflect quality of care in facilities.
Morbidity: Admissions for certain diagnoses (e.g. hypertension, diabetes, chronic lumg disease) may refect inadequate care in PHC facilities. Re-admissions for certain diagnoses (e.g. post-operative infections) may reflect inadequate inpatient care.
Health service resources: Availability of appropriate inputs are a prerequisite for quality services.

4.3.2 About the data

The indicators presented in this section are proxy or indirect measures for quality of care. They are intended to highlight issues that may require further investigation. Some of the indicators use data from more than one programme and can help to assess collaboration and integration.

The quality of a health service or a specific intervention determines its effectiveness. Service quality has multiple dimensions. It is dependent on the availability and functionality ("readiness") of key health service resources (e.g. finance, workforce, medicines, infrastructure) and their appropriate management. Quality is also influenced by health worker training, working conditions, competence and behavior, as well as by appropriate health worker support, supervision and accountability mechanisms.

Quality of care can be measured both directly and indirectly. Adequate quality assessment requires data sources other than RHIS, e.g. facility assessments, clinical record audits and patient interviews. Some aspects of quality can, however, be assessed through proxy indicators using RHIS data and can highlight a need for further, in-depth quality assessments.

This document features a limited set of tracer indicators for quality that can be obtained from RHIS data. The analysis sections of this chapter provide brief notes on each indicator. Further details are available in the programme-specific guidance documents.

4.3.3 Assessing data quality

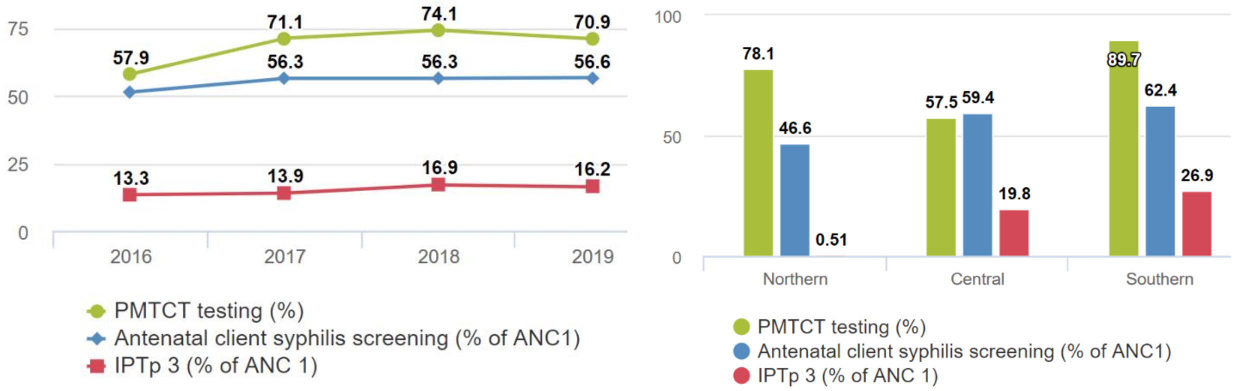
The quality of care indicators in this document should be assessed for the data quality dimensions of completeness, internal consistency and external consistency. Some examples of data quality issues specific to certain indicators are discussed in Section 4.3.4.

4.3.4 Analysis of core indicators

1. Antenatal client syphilis screening, 2. PMTCT testing rate, and **3. Intermittent preventive treatment for malaria during pregnancy (IPTp3)**

These three indicators reflect standard ANC interventions in many settings. Poor performance may highlight failure to implement protocols and/or lack of commodities. Screening for syphilis and HIV during early pregnancy enables treatment of the mother, protection of the baby and minimizes the risks of complications. In malaria-endemic areas, intermittent preventive treatment for malaria with sulfadoxine-pyrimethamine is recommended for all pregnant women. Doses should start in the second trimester and are given at least one month apart, ensuring least three doses.[57] If mothers present for their first ANC visit during late pregnancy or if they do not attend follow-up appointments, it may not be possible to receive three doses before delivery.

Figure 37 : Antenatal care quality indicators (% of ANC 1), nationwide (left) and by region (right), 2016 - 2019



4. Caesarean section rates at facility level.

This indicator is calculated by dividing the total number of C-sections by the total number of deliveries in a health facility. WHO does not provide benchmarks for facility C-section rates but emphasizes that the intervention should be provided to women in need. However, in recent years, governments and clinicians have expressed concern about the rise in C-sections and the potential negative consequences for maternal and infant health.[58]

Figure 38 : Caesarian section rates at facility level, by facility of District 1, 2016 – 2019

Caesarean section rate at facility level				
Organisation unit / Period	2016	2017	2018	2019
Lugulu Friends Mission Hospital	25.1	22.4	33.4	45.9
Dreamland MC Health Centre	0	17.9	28.9	43.8
Khalaba Medical Services		0	17.6	36
Lumboka Medical Services	30.8	30.7	35.2	34.4
Elgon View Medical Cottage	17.2	22.2	25.9	32.9
Bungoma West Medical Services			9.8	31.6
St Damiano Nursing Home	21.5	20.7	22.5	25.3
Bungoma Referral Hospital	17.1	18.6	18.9	19.7
Webuye Hospital	13.7	11.3	11.5	13.5
Kimilili Subcounty Hospital	14.3	9.3	8.2	6.6
Mt Elgon District Hospital	9.6	4.8	4.3	1.4

Source: Kenya DHIS2 training instance

C-section rates may vary widely among facilities, depending on differences in infrastructure and staff capacities, in clinical management protocols and, particularly, in the types of cases received (high-level referral facilities are more likely to receive complicated cases requiring C-sections). Therefore, caution is needed in comparing C-section rates among facilities. However, review of facility C-section rates may highlight significant changes over time or unusually high rates that may require further investigation. It is also useful to assess the facility C-

[57] WHO recommendations on antenatal care for a positive pregnancy experience. World Health Organization, Geneva. 2016. (https://www.who.int/health-topics/maternal-health#tab=tab_1.

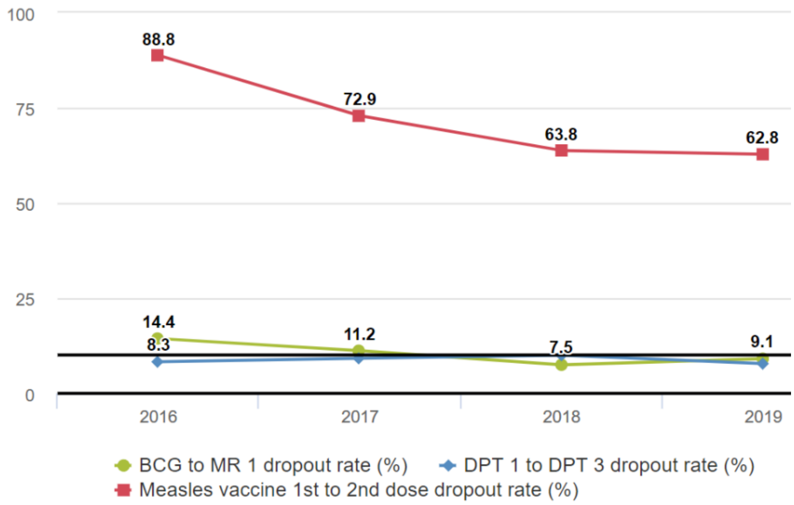
[58] WHO statement on caesarean section rates. World Health Organization. 2015. https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/cs-statement/en/ (Accessed 13 May 2020)

section rate alongside the C-section rate in the population. (Refer to section 4.1). For example, a low population level C-section rate and high facility C-section rate may be an indication that there are too few facilities providing C-section services, but that those that can provide C-sections have high capacity.

5. Immunization drop-out rates

Dropout rates measure the percentage of children that received the early dose(s) of a series of vaccinations but failed to receive the later dose(s). A dropout rate of greater than 10% (the upper black lines in Figure 39 and Figure 40) is considered too high.

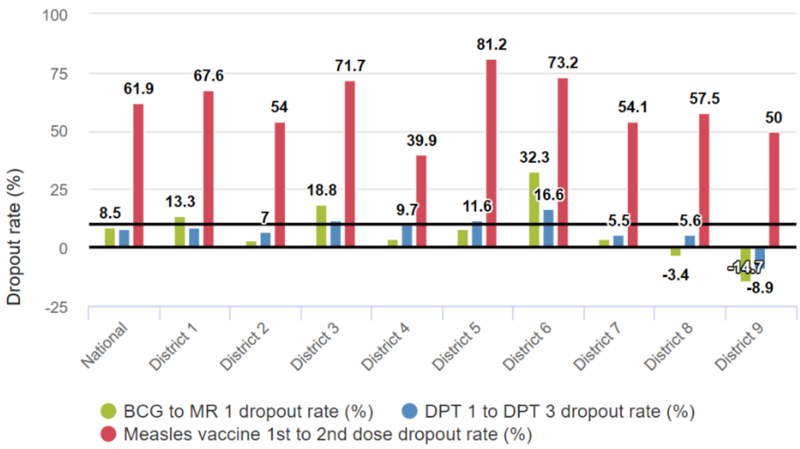
Figure 39 : Immunization dropout rates (%), nationwide, 2016-2019



A high dropout rate may reflect dissatisfaction with immunization services or it may be due to barriers to repeat vaccinations such as distance, fees or irregular sessions such as where immunizations are delivered to a community only through quarterly outreach. The MCV1 to MCV2 dropout rate assesses the ability of the programme to reach children after the first year of life.

If the number of later doses (e.g. DTP3) exceeds the number of early doses (e.g. DTP1), the result is a negative dropout rate, as shown for Districts 8 and 9 in Figure 40. A negative dropout rate over a full year usually points to data quality problems. Negative BCG to MCV dropout is sometimes the result of inappropriate reporting of campaign doses of MCV along with routine doses

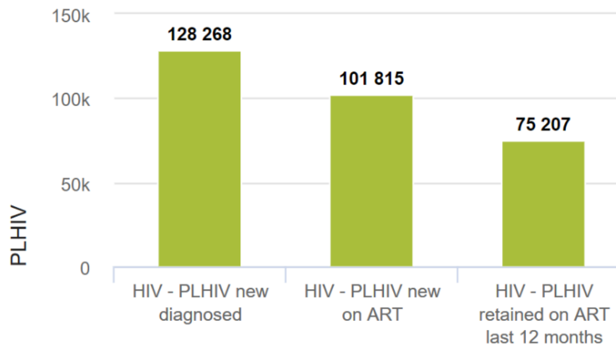
Figure 40 : Immunization dropout rates, by district, last 12 months



6. HIV care cascade

The cascade monitors achievement of the 90-90-90 objectives of HIV care: at least 90% of PLHIV should be diagnosed; at least 90% of newly diagnosed PLHIV should start ART and, of those, at least 90% should still be on treatment at the end of a given period. The ideal 90-90-90 cascade is based on longitudinal review of individual data for PLHIV within a group (cohort) that were newly diagnosed within the same time period. In a mature, well-functioning "treat all" ART programme, the number of "newly on ART" is

Figure 41 : HIV care cascade based on routine data, nationwide, 2019

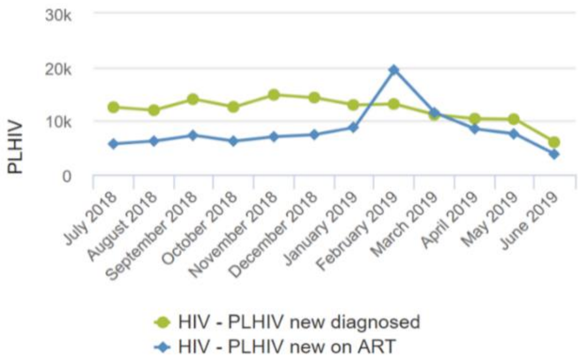


expected to be 90% or more of “PLHIV newly diagnosed”. The number of “PLHIV retained on ART at 12 months” should be 90% or more of the number “newly on ART”.

The bar chart demonstrates the ideal “90-90-90” HIV care cascade by showing cascade indicators as absolute numbers, using data available from the RHIS. However, the data in most RHIS are “unlinked” aggregated data, i.e. they are usually not based on longitudinal follow-up of individual patients. The above chart may therefore not show the typical cascade obtained using individual longitudinal data. This is due to inclusion of different groups (cohorts) of PLHIV in each bar. For example, some individuals “Newly on ART” (2nd bar) in 2019 may have been newly diagnosed more than a year earlier but waiting to enroll in treatment. Individuals included in “Retained on ART at 12 months” (3rd bar) would have been diagnosed and started on ART in the year prior to those people included in the 2nd bar. Despite these limitations, the chart is useful in providing an idea of the functioning of the HIV care programme.

If the number of PLHIV newly on ART is greater than the number of PLHIV newly diagnosed, this may reflect a data quality issue, but could also be explained by other factors. For example, Figure 42 presents data from a country that adopted a universal ART treatment policy at the beginning of 2019. When the new treatment policy was adopted, there was a surge in PLHIV new on ART as a result of a backlog of patients who previously had to wait before they were eligible to start ART.

Figure 42 : PLHIV newly diagnosed and PLHIV new on ART, nationwide, last 12 months



7. HIV tested new and relapse TB cases with a documented HIV status

This indicator assesses the percentage of TB cases for which HIV status was assessed. Assessing the HIV status among TB cases is critical for appropriate clinical management of both TB and HIV disease. The percentage of TB patients who are HIV positive provides useful data to forecast treatment and support needs for management of co-infected patients.

Tracking of these indicators helps TB programme managers to identify weaknesses in collaborative activities between HIV and TB service providers, which may result in TB patients not being tested for HIV and co-infected patients not being treated with ART or co-trimoxazole preventive therapy (CPT).

Figure 43 : % of TB cases assessed for HIV, by province of Benin, 2018

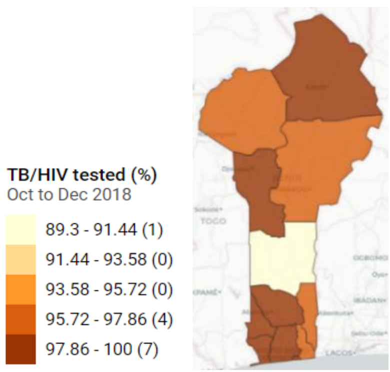
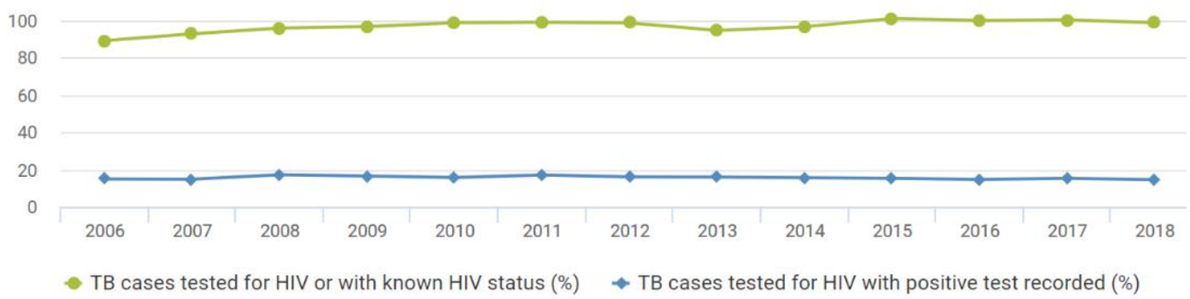


Figure 44 : New and relapse TB cases tested for HIV: % of cases assessed and % of cases positive, nationwide, 2006 - 2018



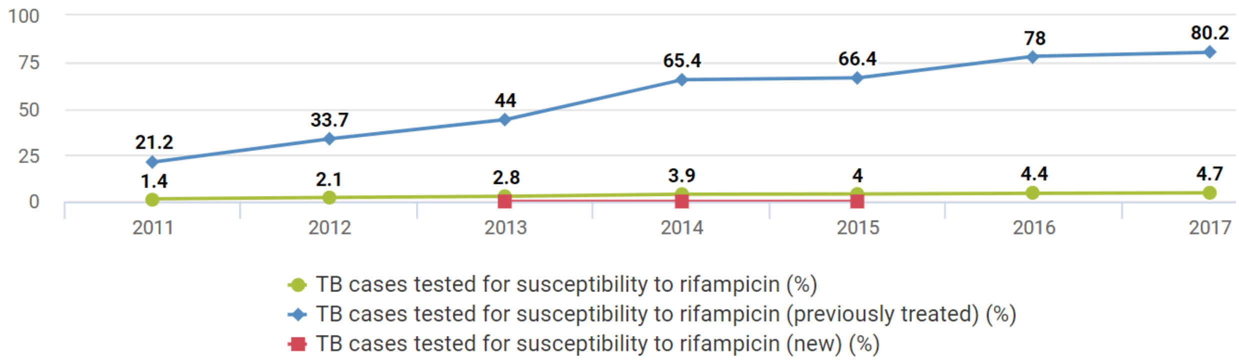
Data on HIV status are collected both during notification and during treatment outcome reporting. This is necessary because some TB patients are not tested for HIV at the start of treatment but are tested later during treatment. Incorrect data collection and reporting processes result in either underreporting or double-counting, with data showing more than 100% of TB cases being tested for HIV.

8. Drug susceptibility test (DST) coverage for TB cases

This indicator reflects the percentage of TB cases with DST results for at least rifampicin resistance. Drug resistant TB (DR-TB) can develop through inadequate treatment or can be acquired through transmission between individuals. Rapid drug susceptibility testing should be provided for all TB cases to ensure that DR-TB cases are rapidly detected and treated with the correct treatment regimen, to improve patient outcomes and prevent onward transmission of DR-TB.

WHO requires that, by 2025, 100% of all TB cases notified in a national system will have documented DST results for at least rifampicin. Figure 45 presents an example of a country that has increased DST testing of previously treated TB but has yet to introduce testing of new cases. As a result, less than 5% of total cases were tested for rifampicin susceptibility as of 2017.

Figure 45 : Rifampicin susceptibility testing (%), nationwide, 2011 - 2017

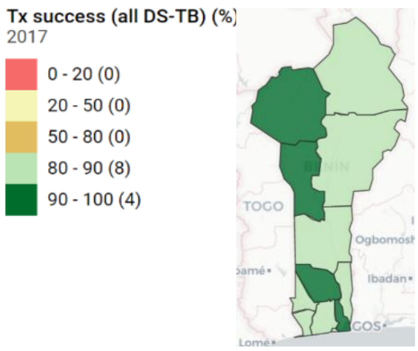


9. TB treatment success rate

TB treatment success rate is the percentage of notified TB cases that were cured (based on laboratory confirmation) or that completed treatment. It is an important marker of disease control and service quality.

Low treatment success rates may indicate problems with treatment regimens, poor treatment management, adverse side-effects of TB medicines, or comorbidities that lead to death or loss to follow up. It is important to investigate why treatment success rate is low, in order to be able to implement solutions for improving patient care.

Figure 46 : : TB treatment success, DS-TB, by province of Benin, 2017



Treatment success should be disaggregated to monitor outcomes for cases that may be more difficult such as those which were previously treated and cases which are HIV positive (see Figure 47). Monitoring 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 each contribute to the inability to achieve treatment success (see Figure 48).

Figure 47 : Treatment success rate, various forms, nationwide, 2011 - 2017

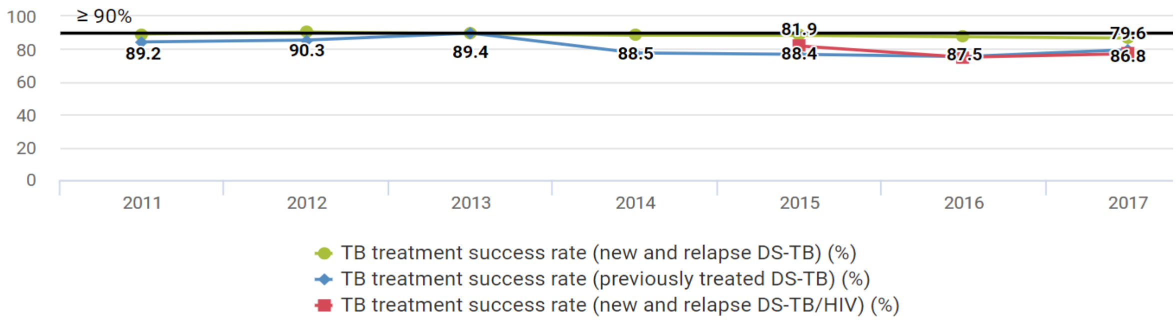
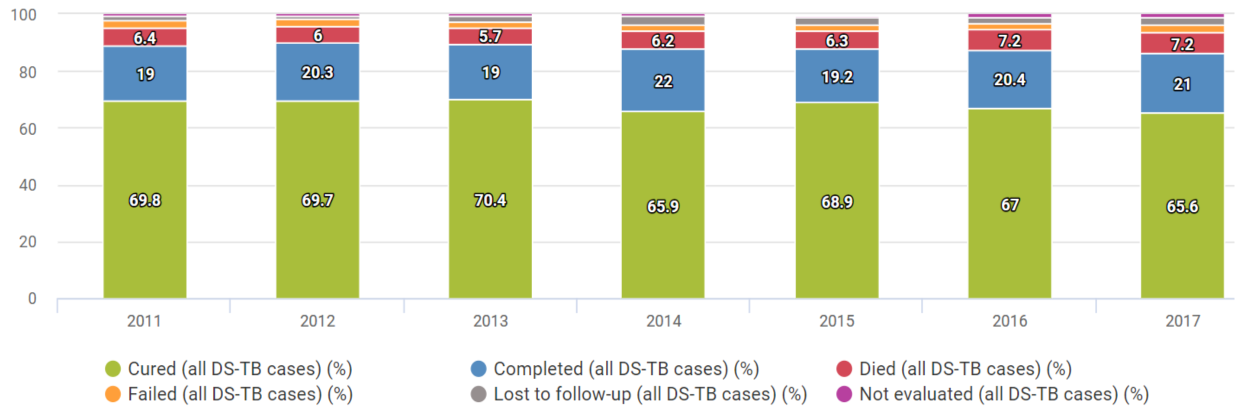


Figure 48 : Treatment outcomes for drug-sensitive TB, nationwide, 2011 - 2017



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

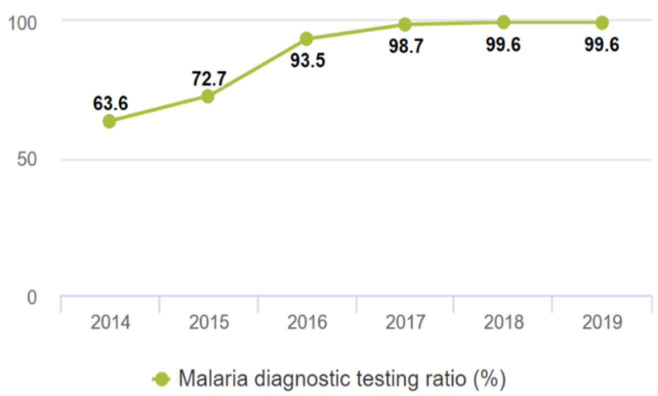
This indicator tracks the percentage of suspected malaria cases that receive a laboratory test (RDT or microscopy). The numerator is the total number of malaria tests performed (RDT + microscopy). The denominator is the total number of "suspected cases", i.e. people presenting with fever or other symptoms and signs of malaria. If the number of suspected cases is not specifically reported, then:

Suspected cases = persons tested + presumed cases of malaria; or
Suspected cases = total malaria diagnoses (confirmed + presumed) + negative malaria tests.
Confirmed malaria cases are those diagnosed through a laboratory test. Presumed malaria cases are those that did not receive a laboratory test but were diagnosed based on clinical assessment only.

The target for the diagnostic testing ratio is 100%. Health systems are working to reduce the number of "presumed malaria" diagnoses in order to improve diagnostic accuracy and effective management of febrile illness (especially in areas where malaria is not a common cause of fever) and to reduce unnecessary prescription of antimalarials.

Figure 49 provides an example of a country that increased the use of RDTs beginning in 2014. As a result, the malaria diagnostic testing ratio increased steadily and has been close to 100% since 2017.

Figure 49 : Malaria diagnostic testing ratio, nationwide, 2014 - 2018



It is important, however, to avoid potential under-reporting of actual presumed diagnoses or over-reporting of confirmed diagnoses, as this will make the diagnostic testing ratio no longer reliable for monitoring diagnostic practice. To assess this, it is useful to compare the diagnostic testing ratio obtained from RHIS data with findings from a population-based survey measuring the percentage of fever cases attending health facilities that received a malaria diagnostic test. It is also important to investigate whether low diagnostic testing ratios may reflect a lack of diagnostic testing supplies.

11. Confirmed malaria cases treated with ACT

ACT is the first line treatment for uncomplicated malaria. Low or decreasing percentages of confirmed cases treated with ACT could point to problems with ACT availability or to poor quality of care. The number of confirmed malaria cases is the sum of RDT positive cases and microscopy positive cases. Some health information systems are unable to generate reliable data on this indicator. It is incorrect to use total ACT treatments given as the numerator, since it is possible that some patients who were given ACT tested negative while others were presumed cases of malaria.

Reporting on this indicator is 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 a general outpatient register and general outpatient report to capture such data. Others have introduced a separate register and a separate form for this purpose.

5 Group III indicators – Health service resources

5.1 AVAILABILITY, DISTRIBUTION AND EFFICIENCY

5.1.1 Core health service resource indicators

	Indicator	Definition	Calculation	Disaggregation
Infrastructure				
Availability	1. Health facility density and distribution	Total number of health facilities per 10 000 population OR: Population per facility	N: no. of health facilities x 10,000 D: total population	Facility type Managing authority Specific services offered
Availability	2. Hospital bed density	Number of hospital beds per 10 000 population	N: no. of hospital beds reported as available x 10,000 D: total population	Type of bed Managing authority
Efficiency	3. Bed occupancy rate (BOR)	Percentage of available beds that were occupied over a specified period	N: no. of occupied bed-days X 100 D: no. of available bed-days	Facility type and level
Efficiency	4. Average length of stay (ALOS)	Average number of days that an inpatient spends in hospital over a specified period	N: no. of occupied bed-days D: no. of discharges	Facility type
Health workforce				
Availability	5. Health worker density and distribution	Number of health workers per 10 000 population	N: no. of skilled* health workers x 1,000 D: total population *only health workers with documentation (degree, diploma, certificate) should be included	Occupation Distribution: place of employment: (urban/rural; PHC / specialist clinic / hospital)
Availability	6. Vacancy rate	Percentage of funded full-time posts not filled for at least 6 months and which employers are actively trying to fill	N: no. of full-time posts not filled for at least six months x 100 D: no. of full-time posts.	Occupation Facility type PHC vs hospital
Efficiency	7. Health worker productivity[59]	Average number of service units provided by a given health worker in a specified period (e.g. working day, year)	N: no. of service units provided in a specified period D: no. of workers providing the service x no. of available working days in same period)	Service type Occupation Facility
Essential medicines and medical products				
Availability	8. Health facilities with no stockout	Percentage of health facilities with no stockout of selected tracer medicines and medical products	N: no. of health facilities reporting no stockout in a specified period D: no. of health facilities reporting through the RHIS in the same period	Facility type Managing authority Type of medicine or product
Availability	9. Medicines expenditure per capita	Availability of medicines and medical products expressed as their monetary value per capita	N: expenditure on medicines and medical products in a specified period D: total population	Medicine group (in Essential Medicine List); Funding source
Financial resources				
Avail.	10. Health services expenditure per capita	Public health system expenditure per capita on health facility services	N: expenditure D: total population	Funding source Budget line
Effic.	11. Budget execution	Percentage of allocated health service budget that was spent over a specified period	N: expenditure x 100 D: allocated budget	Budget line Funding source Service

[59] Adapted from: "Provider productivity", page 29. (in: Handbook on monitoring and evaluation of human resources for health. World Health Organization. 2009 http://whqlibdoc.who.int/publications/2009/9789241547703_eng.pdf

5.1.2 About the data

Health service resources are the inputs (production factors) needed to provide the health services that are the sources of the data analyzed in the previous chapters. The resources discussed in this chapter include: infrastructure (health facilities), health workforce, medicines and medical products, and health service financing.

The availability and use of these resources are important determinants of health system performance. Therefore, managers need to assess resource data in relation to RHIS data.

Health service resource systems and their data are extensive and complex. This chapter provides a limited number of indicators that highlight selected aspects of resource availability and the efficiency of resource use.

Availability indicators compare the amount of a given resource (e.g. facilities, nurses) to the population served. Availability is assessed through **density** (resources per population[60]) and **distribution** (the locations of the resources[61]). These indicators are used as proxy measures for **access** and also as **equity** measures when comparing sub-national administrative units.

Efficiency indicators broadly assess value-for-money by comparing the amount of a given resource (or its cost) used with the amount of services/outputs produced using the resource, e.g. number of consultations per medical doctor per day or percentage of hospital beds that are occupied.

Producing health resource indicators may require specific efforts. Health resource data are often not available through the RHIS and need to be obtained from various information systems maintained by or for various agencies within or external to the ministry of health (e.g. central medical stores, health workforce department, finance department, national immunization programme, the Global Fund, etc.). As discussed in the next section, there may be variations among these systems in definitions, classifications and reporting periods of resource data. Some preliminary steps are therefore usually needed to extract these data before indicators can be produced.

Health infrastructure data can be obtained from the national Master Facility List (MFL) which should include facility location, type/level, ownership/managing authority (public, private-for-profit, nongovernmental organization, military, etc.) and operational status. It may also include types of services offered and numbers of beds. However, the MFL may not be up-to-date and often includes only public sector facilities. The RHIS can also serve as a data source, although it usually only lists facilities reporting into the RHIS and private sector facilities may not be included.

Data on availability and functional status of **equipment** are usually obtained from facility assessments, e.g. WHO SARA or HHFA. However, such assessments are conducted only every few years and the available information may therefore be outdated. Alternately, proxy information on equipment availability can often be obtained from the RHIS, e.g. reports on the number of x-ray examinations or CT scans performed each month implies the presence of the relevant equipment.

National-level **health workforce** data are obtained from four main sources: population censuses, labour force surveys, health facility assessments and administrative systems. As an example of an administrative system, most countries have databases with individual records of their health workforce members. As another example of an administrative system, in some health systems, facilities are required to report their numbers of staff, by occupation, through the RHIS at regular intervals, e.g. quarterly or bi-annually.

[60] Density may be expressed as the amount of the resource per person ("per capita") or per population (e.g. per 1000 or per 10 000).

[61] Locations may include geographic location, facility type/level and provider (e.g. public, private, NGO, etc.)

Workforce statistics should ideally include workers of all managing authorities. Health workforce databases may, however, vary substantially in comprehensiveness (e.g. inclusion or not of private sector workers).

Data on **medicines and medical products** present specific challenges. A specialized logistics management information system (LMIS) is often used for stock management. Where there is a well-developed but separate LMIS, data on stockouts as well as data on consumption of items can be exported from the LMIS to the RHIS and used in the analysis and interpretation of other health facility data. However, the LMIS may not be set up to enable such extraction of data. Alternately, the RHIS may provide some information on availability by reporting on stock-outs of individual items or groups of "tracer" items. A further option is to monitor expenditures. This approach has the advantage that consumption of multiple items can be summarized in a single common monetary unit. Central supply chain managers usually have estimates of the prices of items they purchase or distribute. Documents (e.g. way bills) accompanying medicines to their final destinations often also include the assigned price and this information is often included in the LMIS.

Financial data also pose challenges. These data are typically managed using separate financial management information systems (FMIS). Even when analysts can access the FMIS data, it may be difficult to attribute expenditures to specific activities, geographic areas and periods (e.g. expenditures for activities in one period may be attributed to an earlier or later period). In this guidance, analysis is limited to only two broad indicators of financing: total health services expenditure per capita and budget execution by major budget line. Further analyses are possible where more detailed financial data can be obtained and reliably interpreted. Such analyses are beyond the scope of this guidance.

Health resources are not distributed evenly across administrative units, but according to the structure of the health system. The health network consists of facilities of increasing levels of complexity, e.g. from health posts to referral hospitals. Higher-level facilities require additional resources and may serve several administrative units. Most resources (health workers, medicines, funds) tend to "follow" the network of facilities and their level (e.g. medical doctors may be present only at hospital level and specialists only at facilities above district hospital level). These two issues (referral facilities serving more than one administrative unit and resource concentration at higher-level facilities) must be considered when calculating and interpreting availability indicators. If possible, comparisons should be made only among administrative units that have the same level of resources (e.g. between districts with a district hospital, or between provinces with provincial and district hospitals). This avoids comparison among units that include a referral facility and other units that refer to this facility.

Some resources (e.g. staff, medicines, budget) may be assigned to central or provincial levels but not to districts or facilities. The data can therefore be used to calculate only national and provincial level indicators, unless ways exist to estimate their distribution and use by lower levels of the health system.

5.1.3 Assessing data quality

Health service resource data face the same quality issues as RHIS data, as well as some additional challenges resulting from their generation by or for various agencies with varying definitions, classifications and reporting periods.

Definitions and terms

Resources may be defined in different ways in different health systems and may even vary among different agencies within the same health system. Adjustments may therefore be necessary when data from the diverse reporting systems are compared or merged/aggregated. Clear definitions of the terms used in each context must be presented along with the indicators.

Health facility types/levels are named according to the tradition of each health system. For example, Basic Health Units, Health Posts and Health Sub-Centers may all represent the same general facility type in different contexts. Each facility type is usually defined by the services it provides, the team staffing the facility and the range of medicines that can be dispensed. However, boundaries between levels may be blurred. In some systems, levels are defined by the provision of a service (e.g. all district hospitals must provide emergency surgery). In others, the level is defined by the location (e.g. all referral facilities located at the capital of a district are considered district hospitals, regardless of the range of services provided). Therefore, when assessing facility densities, it is important to consider that the indicators could represent access to different service types in different contexts.

The definition of “hospital bed” may also vary. Some health systems report only acute care beds, while others may include beds for chronic care (e.g. mental health) or beds used for periods shorter than one day (e.g. emergency room, post-surgery recovery, day surgery, etc.). These differences may substantially affect estimations of bed density, as well as the calculation of bed occupancy rates.

Health workforce classification is complex. Countries may have adopted different training strategies and qualifications over the years. While physicians usually represent the same general definition, the term “nurse” may group together workers of different training levels (e.g. from nurses with certificates for training of up to 18 months, to nurses with four-year bachelor’s degrees.) Depending on the health system context, it may be necessary to calculate workforce indicators that disaggregate such training levels.

The definition of medicine availability also varies. Many systems define it as the presence (in any quantity) of a defined list of selected tracer items. Some RHIS report it as percentage of facilities with no stockout of individual tracer medicines in a specified period. Stockouts ranging from one day to 30 days in a month are often recorded in the same way.

Budgets and expenditures are grouped according to budget lines which may also vary among agencies.

Such variations in classifications and definitions must be considered and documented when extracting, cleaning, combining and interpreting the data from diverse reporting systems.

Completeness and timeliness

The primary sources of resource data are forms and databases outside the control of RHIS analysts. It may therefore be very difficult to ascertain the completeness of the data. Information on the completeness of the data from each of these sources may not be easily accessible. Moreover, different departments/agencies may have different reporting periods and timing (e.g. budgets typically refer to the financial year rather than the calendar year; infrastructure data and some health workforce data may be updated only once a year; some procurement expenditures (e.g. medicines) may be consist of one or two large purchases rather than being spread throughout the year, etc.). Funds budgeted for in one year may not be spent until a subsequent year. This makes it challenging to know to which period the data correspond.

Internal consistency

Data showing large discrepancies between geographic areas in the population density of resources may reflect a real disparity resulting from, for example, the inclusion of referral facilities in some administrative units but not in others. On the other hand, such inconsistencies may reflect data quality issues or inconsistencies in definitions and terms, as discussed previously. RHIS analysts may have less experience in cleaning and interpreting resource data than RHIS data. Therefore, identifying outliers or unusual patterns may be more difficult than for RHIS data. Nevertheless, some quality problems can be identified easily, e.g. budget execution above 100%, or large variability in BOR across facilities of the same level.

External consistency with other data sources

As resource data may come from multiple sources outside of the RHIS, it is important to compare the extracted/summarized data with the primary data from these other sources. Much of the resource data is obtained from summaries (e.g. reports of facility surveys, accounting reports) that may be of variable reliability. The data used to calculate indicators should therefore be checked against the detailed reports and, if possible, against the databases that are the sources of the reports (e.g. accounting database, health workforce database).

5.1.4 Analysis of core indicators

Resource data are used to calculate indicators of availability and efficiency when combined with population figures and service outputs respectively

Availability indicators can be used for comparisons between countries or with international standards. They can be used to motivate for or plan for additional resources to reach required standards. They can also be used to assess equity among sub-national administrative units and to inform resource allocation.

Efficiency indicators are usually more context-specific than availability indicators and do not have defined standards. They can be used to assess technical or allocative efficiency[62], as well as to identify values that differ significantly from the average and which should trigger further investigations, e.g. if medicines expenditure per capita in one province is double the average for the country.

5.1.4.1 Health infrastructure

The physical availability of health infrastructure is a component of access to health services and can be used to assess equity and to inform decision-making on investments in additional infrastructure and services.

Health facility density is a crude indicator of overall geographic access to health services. It can be expressed as the number of facilities per 10 000 population or as the number of hospitals per 100 000 population. Alternately, health facility density may also be expressed as population per facility.

Density of selected medical devices and essential technologies assesses the availability of diagnostic and treatment technologies, which may reflect the level of development of the health system. Availability of selected equipment can also serve as proxy indicators of access to specific services. For example, the availability of radiotherapy equipment is required for access to treatment of certain cancers.

1. Health facility density

Overall health facility density data should include facilities of all managing authorities. If the facility density data do not include all facilities or managing authorities, this should be clearly stated when presenting the indicator. There is no global norm for overall health facility density. Targets should be defined according to the local context.

Interpretation of facility densities is not straightforward and additional information is needed to provide a meaningful picture of the situation. Lower facility density does not necessarily mean poorer access, or vice versa. Other aspects should be considered. For example, facility density may be lower in urban areas than rural areas. However, urban facilities tend to be larger than those in remote areas, with better staffing and more services; urban areas also imply high population density and short distances. Large, sparsely-populated areas might require relatively high facility densities to ensure equity of access. Facilities do not all provide the same selection of services. In many countries, outpatient services for

[62] Technical efficiency is concerned with achieving the maximum outputs at least cost. Allocative efficiency looks at how different inputs are combined to produce a mix of different outputs.

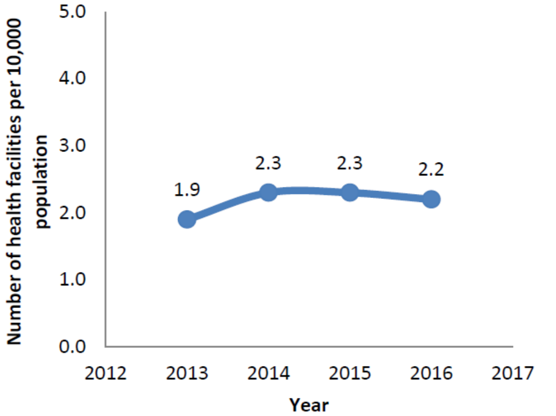
diseases such as TB, HIV or NCDs are available only in hospitals or higher-level PHC facilities. Therefore, facility density should also be assessed in relation to facility type/level and the services available.

The following section provides examples of various uses, limitations and interpretation issues related to facility density indicators.

Inter-country comparisons have shown little consistent relationship between facility density and UHC service coverage. In fact, as country health systems and contexts vary widely, comparisons of facility densities among countries may be of limited use.

It may be more useful to use facility density to assess network growth at country level over time. Figure 50 shows trends in facility density over four years in Kenya. There was an initial increase from 1.9 to 2.3 which may reflect implementation of a national infrastructure development plan. The subsequent decrease may reflect that the increase in infrastructure has not matched population growth.

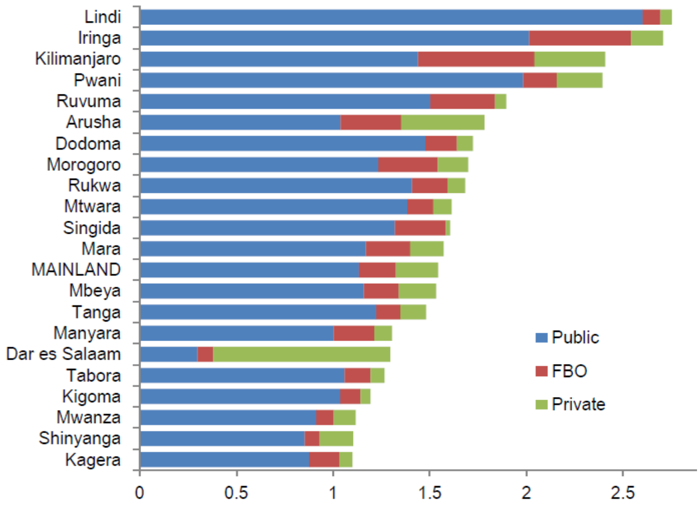
Figure 50 : Trends in health facility density 2013-2016 (all facility types)



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

Facility density can be compared among sub-national administrative units to help identify underserved areas. Figure 51 shows higher facility density in some peripheral regions of Tanzania than in the region of the main city (Dar es Salaam). As previously discussed, urban areas usually have fewer but larger and better-equipped facilities than rural areas. The figure also shows that more than half of the facilities in Dar es Salaam are managed by private providers and these may not correspond to the facility types/levels of the public sector, making comparison with other regions difficult.

Figure 51 : Health Facility density by managing authority and region. Tanzania 2013



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

Geographic Information Systems (GIS) are often integrated within the RHIS and can map the locations of health facilities as well as showing geographic differences in indicators. Geographic access can also be crudely assessed with an indicator such as the radius of the average catchment area (RMAT in French language[63]; see Figure 52) which rather simplistically assumes that all health facilities in an area have an

[63] Le rayon moyen d'action théorique = square root (area/(□*number of health facilities)

equivalent catchment area. GIS can map the locations of facilities in relation to the population and calculate more robust indicators, e.g. percentage of the population living within a certain distance of a facility. As shown in Figure 53, approximately half of the population of the Sahel health region of Burkina Faso (outlined in blue on the map) live more than 10 km from a facility.

Figure 52 : Radius of the average catchment area, by district of Burkina Faso, 2015

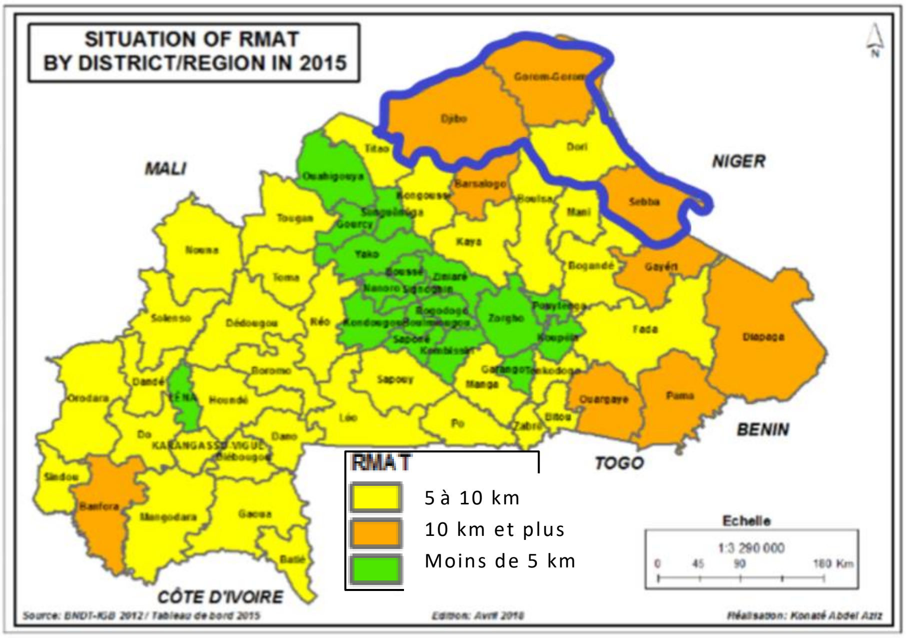


Figure 53 : Access to health facilities of the Sahel Region (outlined in blue on the map) of Burkina Faso, 2015

Communes	Population 2015	Area (km²)	Nber of FS	RMAT	Pop 0-4 km (in %)	Pop 5-9 km (in %)	Pop 10 km (in %)
Boundoré	32 791	954	2	12,33	32,24%	19,01%	48,75%
Mansila	56 167	1 430	3	12,32	36,95%	11,83%	51,21%
Sebba	42 441	1 075	4	10,68	31,27%	17,79%	50,94%
Solhan	32 398	1 341	2	14,61	31,00%	23,91%	45,09%
Tankougounadié	18 084	863	1	16,57	34,00%	12,34%	53,65%
Titabé	29 004	873	2	11,79	34,59%	15,67%	49,74%
Total (06)	**210885**	**6 536**	**14**	**12,65**	**33,58**	**16,58**	**49,84**

Source: Geospatial Information in the Service of Achieving the Objectives of Sustainable Development in Burkina Faso. Geographic Institute of Burkina Faso. 2018 http://ggim.un.org/meetings/2018-Addis_Ababa/documents/1.5.Abdel_Konate-SDG_Indicator_Demos.pdf

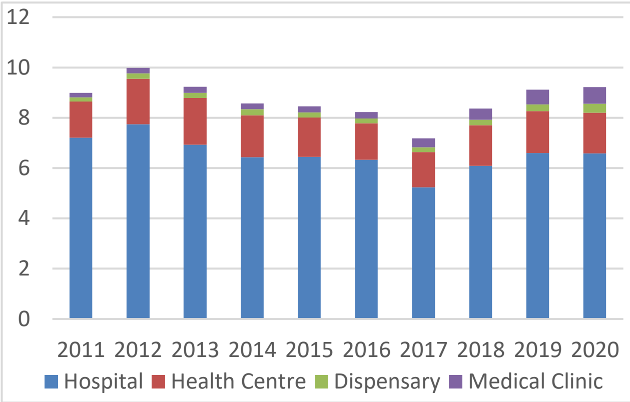
2. Hospital bed density

Hospital beds are assumed to be present only in facilities offering inpatient care. Hospital bed density, expressed as the number of beds per 10 000 population, is an indicator of access to inpatient care and, indirectly, to referral services.

The indicator includes all hospital beds (acute and long-term beds) but excludes “non-ward” beds (labour and delivery beds, emergency room beds, etc.). However, some countries may include only acute care beds. The definition of the indicator should therefore be presented along with the data. The indicator can be calculated for all beds as well as for beds with specialized use, such as maternity, intensive care or paediatric beds.

There is no global norm for hospital bed density. The global average is 27 beds per 10 000 and the average in the African region is 12.[64] The WHO SARA suggests benchmarks of 18 and 39 beds per 10 000 for lower and upper-middle-income countries, respectively. Data for international comparisons are available in the Global Health Observatory.[65]

Figure 54 : Inpatient beds per 10 000 population, nationwide, by type of facility of an East African country, 2011 – 2020



There can be considerable variation in numbers of beds per hospital and beds per specialty, making comparisons difficult. In addition to development and affordability issues, bed density depends to a large extent on the health care delivery model. Hospital-centered systems usually have higher bed densities than PHC-focused systems. Figure 56 shows higher bed densities in some former Soviet countries than in countries with strong PHC-based systems, e.g. India and Pakistan.

Figure 55 : Comparison of hospital bed density, selected countries

Country	Year	Beds/10,000 pop.
Afghanistan	2015	5
China	2012	42
India	2011	7
Iran	2014	15
Kazakhstan	2013	67
Kyrgyzstan	2013	45
Pakistan	2014	6
Tajikistan	2013	48
Turkmenistan	2013	74
Uzbekistan	2013	40

Source: Global Health Observatory

When assessing smaller administrative units, e.g. districts, it is important to note that the population living in the district may not be using the hospitals in the district for various reasons, including logistics, sociocultural preferences and perceptions of quality. Also, large, more-sophisticated hospitals may serve more than one administrative unit.

Figure 56 : Inpatient beds per 10 000 population, by district, 2020

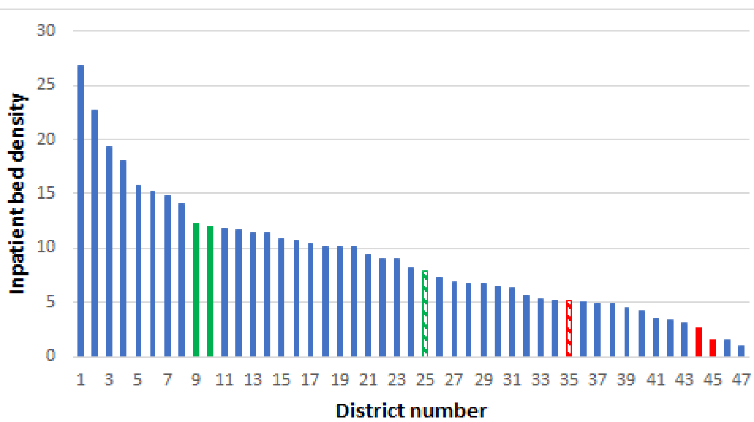


Figure 56 ranks districts of a country by their inpatient bed densities. The districts with the two highest populations per square kilometer (average = 6,116) are shown in green while the districts with the two lowest populations per square kilometer (average = 8) are shown in red. Bed density is thus clearly influenced by population density, as referral facilities are typically located in the most densely populated cities and it is expensive to provide a high number of beds per person if the population is widely dispersed. On the other hand, the rankings of the districts with the third highest

[64] Global Health Observatory Data Repository (African Region) https://Apps.Who.Int/Gho/Data/Node.Main-Afro.Hs07?Lang=En

[65] https://www.who.int/data/gho

number of people per square kilometer (1,145; striped green) and the district with the third lowest number of people per square kilometer (11; striped red) show that bed density may be determined by factors other than population density.

3. Bed Occupancy Rate (BOR)

BOR is an indicator of the efficiency of hospital bed utilization. It is defined as the percentage of available beds that were occupied by patients over a defined time period. For example:
BOR for 1 year = (Sum of daily occupied beds during the year) x 100 / (Number of available beds x 365)

Maternity, delivery and emergency room beds are usually excluded from BOR calculations, as well as beds reserved for day cases, e.g. day surgeries or diagnostic procedures. (BOR for these and other specific bed categories may be analysed separately.) Traditionally, a BOR of around 85% has been considered adequate[66], as it means that most beds are occupied on an ongoing basis, but that the facility has room to respond to unexpected emergencies, e.g. outbreaks, accidents. BOR's of above 90% have been associated with quality of care problems.

4. Average Length of Stay (ALOS)

ALOS is also an indicator of efficiency. It is the average number of days that a patient occupies an inpatient bed in a facility over a specified period. There is no standard for ALOS as it depends on the hospitalization policies of each health system. When calculated for individual facilities, it also depends on the types of cases and types of care provided. For example, elective surgeries usually have short ALOS (e.g. two to three days), while mental health admissions may generate ALOS of over 30 days.[67] ALOS does not usually include hospitalization for uncomplicated deliveries. These may be analysed separately.

Figure 57 presents findings from a study of utilization of 40 hospitals in Malawi where the ALOS of both public and mission hospitals was within the range of 3 to 5 which is typical for acute care hospitals. Note that the BOR, while considerably below the recommended threshold of 85%, was somewhat higher for public than for mission hospitals.

Figure 57 : ALOS, Bed turnover ratio (patients per bed per year) and BOR, 40 hospitals in Malawi, 2005/2006

	Average length of stay (days)		Bed turnover ratio		Bed occupancy rate (%)	
Ownership	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Mission	4.3	1.7	34	14.3	40	21.2
Public	3.8	4.4	62	40.2	56	26.9
Total	4.0	3.6	51	35	50	25.6

Source: Assessing the efficiency of hospitals in Malawi: An application of the Pabón Lasso technique. The African Health Monitor. Special Issue September 2014. https://afrolib.afro.who.int/documents/2012/En/AHM14_25-33.pdf

Equipment availability

Service availability is often determined by presence of specialized equipment (e.g. laboratory and radiology equipment). Availability of such items may provide an indication of the stage of health system development. These data are usually not reported through the RHIS but are obtained from facility assessments (e.g. the WHO SARA or HHFA or, in emergency contexts, the Health Resources Availability Monitoring System - HeRAMS). The Global Health Observatory provides data on national-level

[66] National Institute for Clinical Excellence United Kingdom. 2018. Chapter 39 Bed occupancy. Emergency and acute medical care in over 16s: service delivery and organisation. *NICE guideline* 94 https://www.nice.org.uk/guidance/ng94
[67]Hospital average length of stay by diagnostic category; Https://stats.oecd.org/index.aspx?queryid=30165

availability of selected specialized equipment. Sub-national comparisons for such items may be relevant only in higher-income countries.

RHIS data can be used to obtain indirect information on the availability of selected equipment, based on the assumption that reporting of an activity implies that the required equipment is present (e.g. reporting of selected laboratory tests in the RHIS means that the facility has a functioning laboratory with the necessary equipment.) Refer to the coverage and quality chapter for further discussion on service-specific availability.

5.1.4.2 Health workforce

Effective health systems require a strong health workforce, i.e. adequate numbers of health workers with knowledge, skills and motivation that are equitably distributed by occupation to deliver services across the country. When assessing geographic equity and comparing health worker density among subnational units, best practice is to exclude from the analysis health professionals engaged in administrative tasks rather than provision of clinical services. Some analyses may also exclude staff of tertiary referral hospitals. Without such exclusions, the analysis will exaggerate the access to health services in national and provincial capitals and other large cities.

5. Health Worker Density

WHO has defined minimum standards for health worker density that include medical doctors, nurses and midwives and, in some countries, other occupations that perform similar clinical work after formal training (e.g. medical assistants, clinical officers). The *2006 World Health Report*, proposed 22.8 such health workers per 10 000 population. In the *Global strategy on human resources for health: Workforce 2030*[68], this figure increased to 44.5 per 10 000 as a requirement for achieving UHC.

Indicators of selected workforce density are available in the Global Health Observatory and in WHO's annual World Health Statistics reports. These data enable international comparisons and can be used to advocate for additional resources for the health sector. Figure 58 compares health worker density among southern African countries. Almost half of the countries do not reach the 2006 target of 22.8 staff per 10 000 population and only countries with the smallest populations have achieved the new global target.

Figure 58 : Density of selected health workers per 10,000 population. Southern Africa

Country	Density of medical doctors (per 10 000 population)	Density of nursing and midwifery personnel (per 10 000 population)	Health worker Density (per 10,000 population)
Angola	2.10	4.10	6.20
Botswana	5.30	54.00	59.30
Eswatini	3.30	41.40	44.70
Lesotho	0.70	32.60	33.30
Madagascar	1.80	1.50	3.30
Malawi	0.40	4.40	4.80
Mauritius	25.30	35.20	60.50
Mozambique	0.80	6.80	7.60
Namibia	4.20	19.50	23.70
Seychelles	21.20	80.80	102.00
South Africa	9.10	13.10	22.20
Zambia	11.90	13.40	25.30
Zimbabwe	2.10	19.30	21.40

Source: World Health Statistics 2020

[68]Global strategy on human resources for health: Workforce 2030. 2016. World Health Organization. https://www.who.int/hrh/resources/pub_globstrathrh-2030/en

At country level, comparisons of health worker densities across subnational administrative units can be used to inform decisions on staff deployment. However, health worker distribution also depends on several additional criteria. Staff tend to "follow" the facility network, often in the form of standard teams and low health worker density in a subnational unit may be the result of an insufficient number of facilities (rather than inequitable staff deployment).

Figure 59 : Health Worker density per 10,000 population by cadre and by region. Mainland UR Tanzania 2013

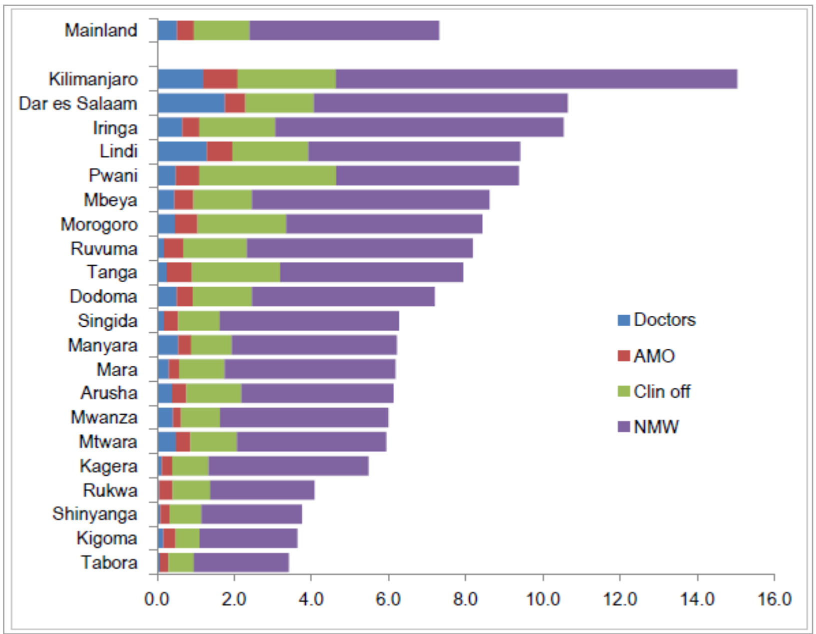
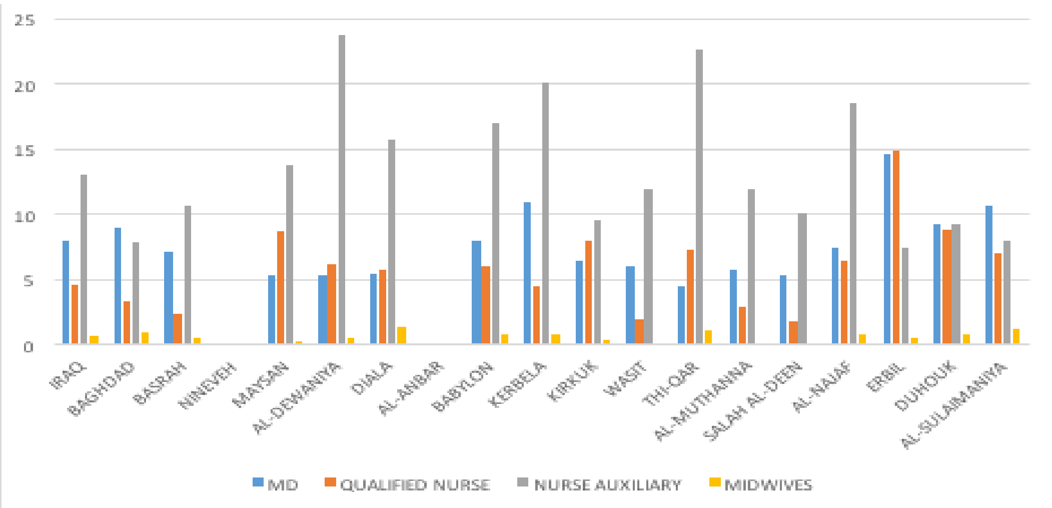


Figure 59 shows health worker density in the United Republic of Tanzania, with substantial differences across regions. In this example, some of the differences may be due to the presence of large hospitals in some of the regions, e.g. Dar es Salaam.

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

Some contexts may require analysis of health worker characteristics in additional detail. For example, Iraq has made efforts to reduce underqualified nursing personnel and to increase deployment of qualified nurses. Figure 60 shows the comparative density of both groups by governorate; note the differences between the three governorates that compose the autonomous Kurdistan Region (Erbil, Duhouk and Al-Sulaimaniya) and the remaining administrative areas.

Figure 60 : Health worker densities per 10,000 population, by province of Iraq, 2015



Source: Annual Report 2015. Ministry of Health. Republic of Iraq

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

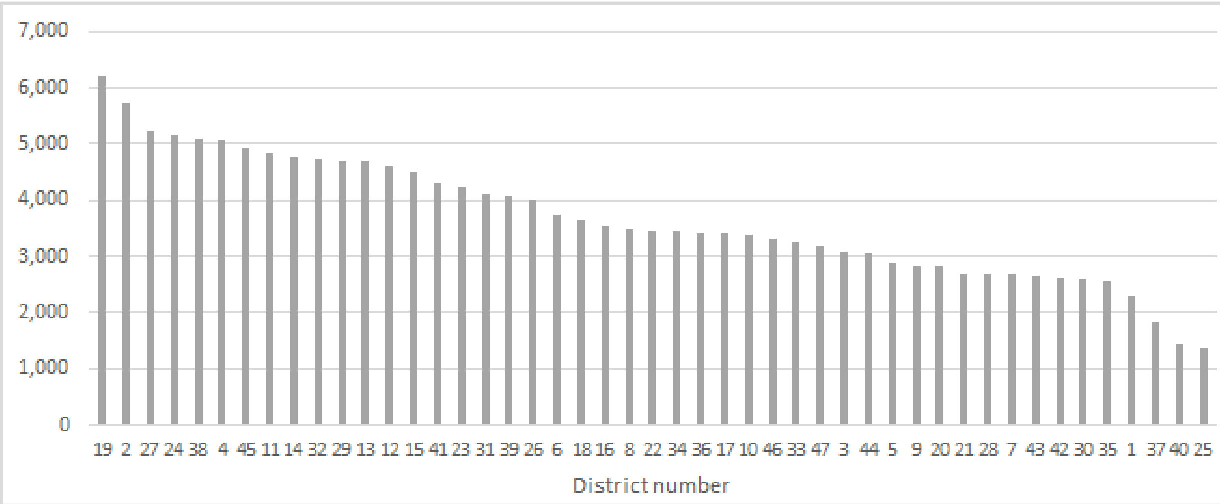
6. Health worker productivity

This indicator assesses the relationship between health workforce inputs and health service outputs. Measurement of productivity can help in assessing workloads and making decisions about where additional staff should be allocated.

The simplest way to calculate a productivity indicator is: Productivity = number of service units (e.g. consultations) reported / number of health workers providing the service

Figure 61 provides an example of a simple productivity estimation comparing districts based on the average number of outpatient consultations per nurse working in a dispensary.

Figure 61. Average number of outpatient consultations per nurse per year in dispensaries, by district, Country X



These estimations can also be converted into daily productivity, by dividing the annual number of consultations by the estimated number of working days per year.

Estimated working days per year:
(52 weeks x 5 days/week) – (20 days annual leave + 10 days sick leave + 10 days other activities) = 220

In the above example, District 19 (on the far left of the chart) had approximately 6200 outpatient consultations per nurse per year or 6200 / 220 = 28 outpatient consultations per nurse per day.

The analysis above focuses only on a single service output and a single group of health workers. Many health workers are however involved in more than one activity (e.g. physicians may provide consultations, assist in complicated deliveries and perform surgical procedures). Also, the average time needed to provide each service unit varies substantially, from a few minutes to give a vaccine to several hours to attend a complicated delivery. Comparing the productivity of different activities and workers may therefore be difficult.

A solution to these challenges is to convert reported activities into a single unit of measure (usually minutes of staff time). This enables comparison of productivity for different activities. Box 6 presents findings from Namibia[69], using a WHO methodology, the Workload Indicators of Staffing Need (WISN).[70]

[69] Titus M et al 2015. Namibia national WISN report 2015: A study of workforce estimates for public health facilities in Namibia. Ministry of Health and Social Services.

[70] WHO. 2015. Workload Indicators of Staffing Need (WISN). User's manual. https://www.who.int/hrh/resources/wisn_user_manual/en/

Box 6: Assessing staff productivity using the WISN methodology

To calculate staff productivity where more than one type of service is provided, it is necessary to estimate the optimal time required to provide each service. For example, the optimal time for an ANC consultation may be 15 minutes, while two hours (120 minutes) may be needed to attend a normal delivery. One hundred ANC consultations would require 1 500 minutes of staff time, while ten deliveries would need 1 200 minutes.

The WHO WISN methodology requires agreement among local experts on an adequate length of time required for the most common activities (e.g. OPD consultation, C-section, delivery, immunization, etc.). Using the agreed time durations, a survey is then conducted to assess current productivity, and overall staffing needs can be projected. Figure 62 shows a partial summary of standard contact time by activity for nurses in Namibia, produced as part of a WISN exercise.[1]

Figure 62 : Standard length of contact time for selected activities by nursing staff in Namibia. 2015

NURSES ACTIVITIES AND ACTIVITY STANDARDS IN NAMIBIA FOR HEALTH CENTRES				
Activities	Activity Standard EN	Workload EN	Activity Standard RN	Workload RN
Admit a patient	20 minutes / admission	40% of Total admissions	20 minutes / admission	60% of Total admissions
ANC 1st visit	30 minutes / ANC 1st visit	80% of Total ANC 1st visits	30 minutes / ANC 1st visit	20% of Total ANC 1st visit
ANC revisit	20 minutes / ANC revisit	80% of Total ANC revists	20 minutes / ANC revisit	20% of Total ANC revists
Conduct a daily ward round	10 minutes / inpatient	40% of Total admissions	10 minutes / inpatient	60% of Total admissions
Death: Last office	60 minutes / death	40% of Total deaths	60 minutes / death	60% of Total deaths
Discharge a patient	10 minutes / discharge	40% of Total discharges	10 minutes / discharge	60% of Total discharges
Do a DBS blood test	15 minutes / DBS test	40% of Total DBS tests	15 minutes / DBS test	60% of Total DBS tests
Dressing wounds	20 minutes / dressing	40% of Total dressings	20 minutes / dressing	60% of Total dressings
Family Planning 1st visit	20 minutes / FP 1st visit	40% of Total FP 1st visits	20 minutes / FP 1st visit	60% of Total FP 1st visits
Family Planning revisits	10 minutes / FP revisit	40% of Total FP revisits	10 minutes / FP revisit	60% of Total FP revisits

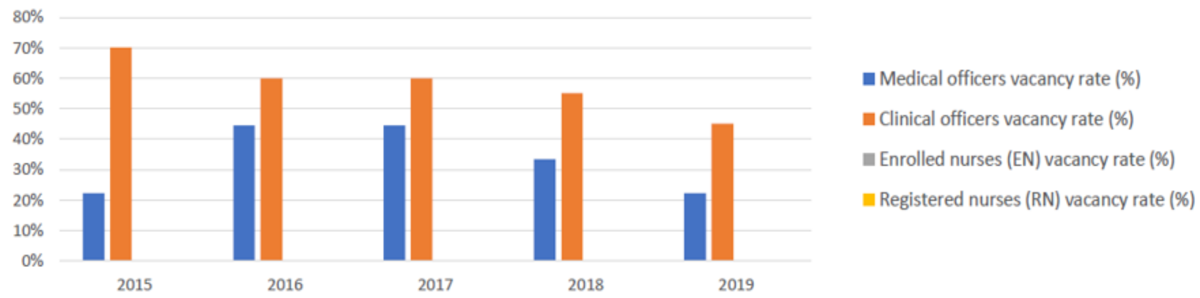
EN = enrolled nurse; RN = registered nurse

7. Vacancy rate

Many health systems have defined standard staffing requirements (or "teams") by facility type and level, based on the range of services that should be provided. Actual staffing (i.e. positions filled) can be compared with the standard, to identify which facility levels are furthest from the defined standards, and which occupations are in shortest supply.

Figure 63 presents vacancy rates for selected health worker occupations in Lupara District. In this example, positions remained vacant for medical officers and clinical officers but the numbers of enrolled and registered nurses exceeded the staffing standards, resulting in negative vacancy rates for these groups of workers.

Figure 63 : Vacancy rates, Lupara District



However, such staffing standards may not reflect the actual amounts of activities performed in all facilities. In facilities receiving low numbers of patients, allocated health workers are underutilized, while in facilities with high numbers of patients, there may not be enough workers to meet patient needs. In

Uganda, the WHO WISN methodology was used to define staffing norms for a sample of health facilities based upon the actual workloads of facilities.[71] Figure 64 shows how actual staffing compared to workload-based staffing norms. The report stated "all three types of health centres had fewer nurses and midwives than required and consequently exhibited high workload pressure for those cadres. Health centres IV and hospitals lacked doctors but were adequately staffed with clinical officers. All facilities displayed overstaffing of nursing assistants."

Figure 64 : Current staffing as a percentage of WISN requirements, selected health facilities of Uganda, by facility type, 2011

Type of health facility (*N* = 136)	Doctors (%)	Clinical officers (%)	Midwives (%)	Nurses (%)	Nursing assistants (%)
Health centre II	–	–	67	70	167
Health centre III	–	56	62	42	145
Health centre IV	39	140	53	52	191
General hospital	42	113	126	134	119

Figure 65 shows that for Health centre II facilities, the workload-based staffing norms (WISN) for nurses exceeded the official staffing standards ("LG Norms"). In fact, this was the case for all types of health centres and all health worker occupations other than nursing assistants.

Figure 65 : Current staffing versus staffing norms ("LG norms") versus workload-based staffing requirements (WISN), selected Level II health centres of Uganda, 2011

Facility/cadre	Current	LG norms	WISN
Health centre II (*n* = 59)			
Nursing assistants	92	118	55
Nurses	48	59	69
Midwives	45	59	67

5.4.1.3 Medicines and medical products

A well-functioning health system ensures equitable access to essential medicines and medical products. This section presents two types of medicine availability indicators: stockouts (or, conversely, "no stock-outs") and medicines expenditure per capita.

Indicators of medicine availability enable decision-makers to re-distribute existing items according to explicit criteria, or to advocate for additional funding. Indirectly, they also provide information about the performance of the supply chain.

8. Health facilities with no stockout (of defined items)

Many health information systems use "no stockout" to define availability.[72] Given the large variety of items, a limited number of essential medicines are used as tracers for this indicator. In the RHIS, "no stockout" often means that the item has been present in the facility on every day of the reporting period. The indicator does not distinguish between stock-outs of one day and those of several days. Some systems may however define "stockout" as an amount below a defined minimum level; in other systems, the item must be unavailable for a defined number of days in order to consider it out of stock. For example, the WHO malaria programme defines a stockout as an absence of the item for at least seven days in three-month period.[73] The definition of "stockout" or "no stockout" should therefore be made explicit when presenting the indicators.

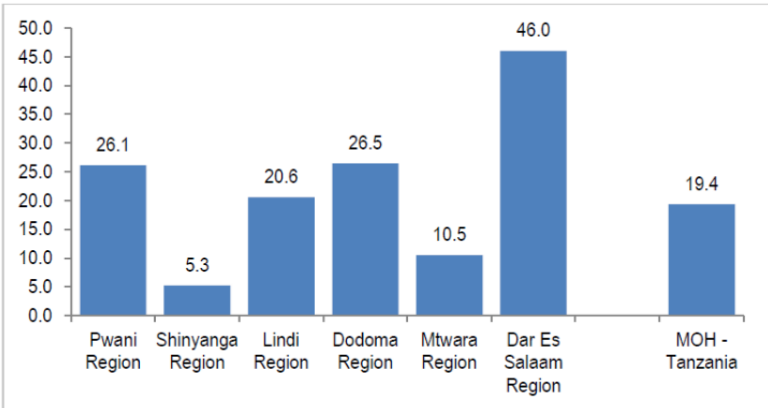
[71] Namaganda, G., Oketcho, V., Maniple, E. *et al.* Making the transition to workload-based staffing: using the Workload Indicators of Staffing Need method in Uganda. *Hum Resour Health* 13, 89 (2015). https://doi.org/10.1186/s12960-015-0066-7

[72] The stock-out indicator is different from other availability indicators in that it reflects stock control, rather than resource availability per population or in relation to service outputs.

[73] WHO 2018. Analysis and use of health facility data. Guidance for malaria programme managers

Figure 66 shows the percentage of facilities reporting no stockout of a basket of 10 tracer medicines, by Region in Tanzania.[74] The chart highlights two issues that require investigation: medicine availability is low, as less than 20% of facilities nationwide had no stock-outs during the period and there are large differences across the regions.

Figure 66. Percentage of facilities reporting "no stock-out" of 10 tracer medicines during March 2013, United Republic of Tanzania



At district level, health facility stockouts of individual medical products can also be monitored as shown in Figure 67.

Figure 67 : Stockouts of medicines for NCDs, by clinic of District X, over a six- month period in 2013

Clinic name	Thiazide diuretic	Ca channel Blockers	Beta Blockers	ACE inhibitors	Statins	Metformin	Glibenclamide	Furusemide	Salbutamol inhaler	Prednisone	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**

9. Medicines expenditure per capita

As another way of assessing medicine availability, quantities of medicines purchased or distributed can be converted into a common unit of measure: monetary values. The indicator combines medicine

[74] 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

expenditure with population figures to provide medicines expenditure per capita. This enables inclusion of multiple items as well as comparisons across administrative units.

The indicator can be calculated for all administrative units, down to district level. This requires an estimate of the cost of the distributed medicines, obtainable from the LMIS or from bills of lading accompanying the items. Ideally, all medicines, vaccines and other medical products should be included. However, essential medicines used for curative care may be the most relevant, as they reflect the system's purchasing capacity and allocative decisions. (In contrast, for example, vaccines usually are distributed according to the estimated number of children in the target population.)

When this indicator is used to compare administrative units such as districts, it can be used as a measure of equity. However, various factors must be considered in the interpretation. For example, in some administrative units, the indicator may be influenced by the presence of large referral facilities which use large quantities of expensive medicines

5.1.4.4 Financial resources

Funds are resources in themselves, but they are also a common unit of measure of resource availability, as all other resources (e.g. health workers, medicines) can be converted into monetary values. Financial resource availability is therefore a measure of general resource availability.

However, many health systems are financed by funds from several sources including government, external donors and private payments (e.g. pre-payment schemes or out-of-pocket contributions). A complete analysis of this resource would require updated information on all the sources and is beyond the scope of this guidance. This section proposes two relatively simple indicators reflecting availability (and equity) and efficiency of financial resource use for health services delivery.

10. Health services expenditure per capita combines financial resource data (either budget or expenditure) with population numbers. This enables decision-makers to compare administrative units and identify units with relatively less funding and therefore to correct the imbalances in subsequent budget exercises. The indicator may however be influenced by the presence of large referral facilities in some but not all administrative units. Such facilities disproportionately consume financial resources through highly-specialized staff, sophisticated equipment and expensive medicines. These facilities may require a separate calculation and their assigned funds should reflect the combined populations of all the administrative units they serve.

Most countries conduct periodic National Health Account exercises to produce health financing indicators, such as the proportions of government funding or out-of-pocket expenditure relative to the total health expenditure of the country. Health expenditure reviews or public expenditure tracking surveys may also be conducted, where public funding is analyzed in detail. All these products are useful for informing policy, but less so for shorter-term management decision-making. Furthermore, none of this information is reported through the RHIS, but is obtained through complex exercises.

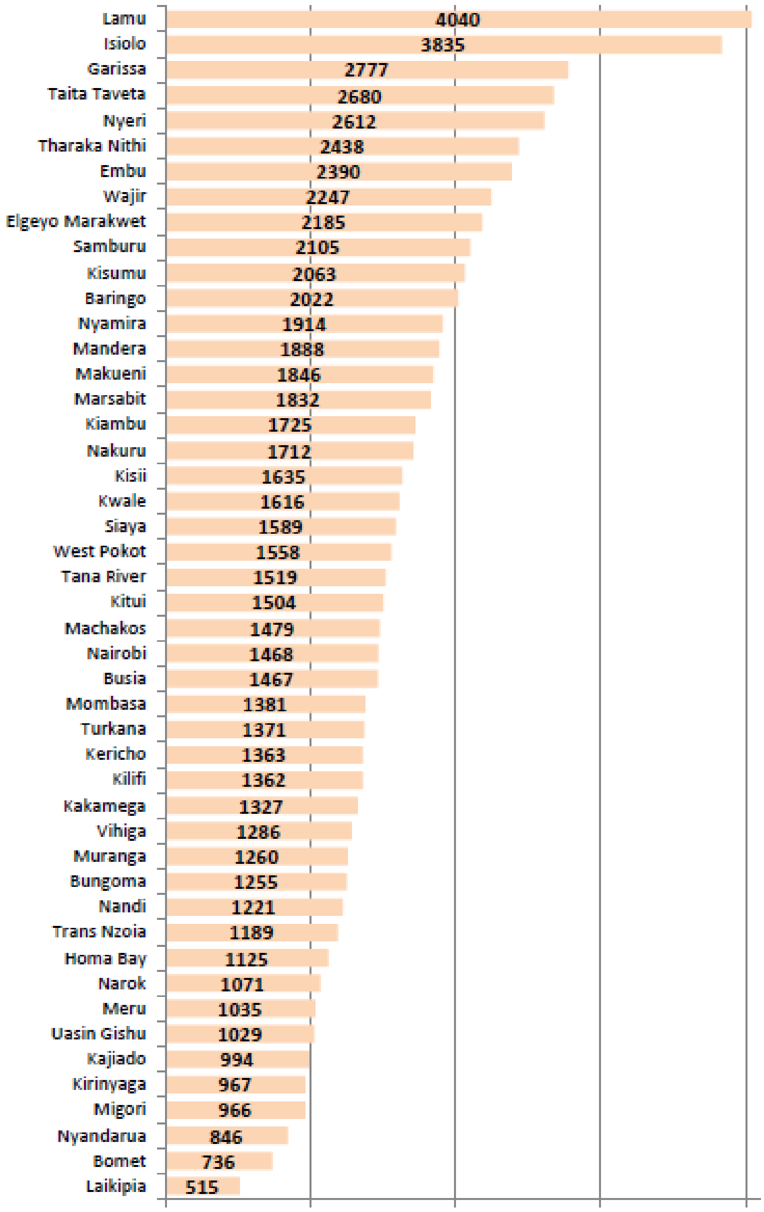
Producing financial indicators that are useful for allocation and management (and that are available from close-to-routine sources) has some challenges. Sources of information are limited to the public sector. Depending on the administrative structure of a country, annual health budgets and expenditure may either be centralized and obtainable from the ministry of health or decentralized and in the possession of local health authorities or district/provincial governments. In some cases, where budgets and their execution (payment of salaries, procurement of medicines, etc.) are significantly centralized, this information may simply not be available for lower administrative levels.

Expenditure per capita is useful for comparisons across subnational administrative units with allocated health budgets. Figure 68 shows significant variation among the counties of Kenya[75] in the amounts

[75] Statistical Review of Progress Towards the Mid-term Targets of the Kenya Health Sector Strategic Plan 2014–2018

budgeted for health. Although per capita health budget allocations should in general be similar across subnational units within a country, there may be reasons to justify some differences, such as the presence of large referral facilities as previously noted, or the need to provide services to scattered or vulnerable populations, which is inherently more expensive.

Figure 68 : Health budget (Schillings) per person per year, average for the period 2013/14-2015/16, by county of Kenya



11. Budget execution

This indicator measures the percentage of a budget that has been spent. It may be calculated for the total budget or by budget line/item.

Budgets usually are allocated for a fiscal year and their execution is reported continuously, monthly or quarterly, according to the system enforced by the ministry of finance. At the end of the fiscal year, execution should be close to 100%. If it is substantially lower, the reasons should be investigated, e.g. cash flow problems in the ministry of finance resulting in failure to disburse allocated budgets, cumbersome execution procedures or poor performance of health system managers. Figure 69 shows that the Ministry of Health of Ghana selected this as one of 53 core indicators for monitoring their Programme of Work.[76]

Figure 69 : Trend in MoH budget execution, Ghana, up to 2014

2.3 Budget execution rate (Goods and Service as proxy)

2014 Performance: 61%
2014 Target: > 80%
Source: MOH
Trend: Improving (9%)
Target: Not achieved

	2010	2011	2012	2013	2014
Disbursed (mill GHc)	452.1	-	-	998.9	**998.4**
Budget (mill GHc)	480.8	-	-	1,770.5	**1,630.4**
Rate	94%	82%	87%	57%	**61%**

Source: Ghana Ministry of Health. Holistic Assessment of the Health Sector Programme of Work. 2014

Calculation of the indicator for different budget lines (salaries, medicines and commodities, other goods and services, etc.) is useful as a quarterly exercise. The pattern of execution for the various lines may be very different (e.g. salaries are systematically paid each month, while medicines may be purchased in one or two annual procurement exercises). A quarterly exercise can therefore identify issues in individual budget lines and so enable timely corrective actions.

Figure 70 presents a simple table used to monitor cumulative quarterly expenditures against the major lines of an annual district budget. The most revealing information is seen in the two columns at the far right of the table: the expected balance at the start of Quarter 4 is equal to 25% of annual budget; the actual balance is the actual amount of the annual budget that is remaining.

The example shows that Lupara District has spent more than was originally budgeted on line 1 and line 2 during Quarter 3. This resulted from of unanticipated field expenses in Quarter 3, related to a vaccination campaign in response to a measles outbreak. Consequently, the actual balance is less than the expected balance for lines 1 and 2 and for the budget overall.

Figure 70 : Summary of 2019 budget execution, Lupara District, as of the end of Q3 2019

Budget line	Annual allocation	Expenditure this quarter	Cumulative Execution				Balance	
			Actual		Expected		Actual	Expected
			Amount	annual	Amount	% of annual		
1. Personnel	696,000	255,000	675,000	97%	522,000	75%	21,000	174,000
2. Operations	1,020,000	345,000	855,000	84%	765,000	75%	165,000	255,000
3. Administration	180,000	44,000	134,000	74%	135,000	75%	46,000	45,000
4. Investments	240,000	58,000	178,000	74%	180,000	75%	62,000	60,000
Total	**2,136,000**	**702,000**	**1,770,000**	**83%**	**1,602,000**	**75%**	**366,000**	**534,000**

[76] The 2014 Holistic Assessment of the Health Sector Programme of Work notes that "One possible contributing factor to low execution rate is difficulties in accessing the funds through the GIFMIS [Ghana Integrated Financial Management Information System of the Ghana Ministry of Finance]. Procedures are cumbersome and funds get locked up in the system inaccessible to the recipient."

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