NATIONAL NUTRITION INFORMATION SYSTEM

TECHNICAL NOTE

Nutrition Data Value Chain

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Module 3. What is needed to build a useful national nutrition information system?
Module 4. What are the main attributes of a national nutrition information system?
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TECHNICAL NOTE

Nutrition Data Value Chain

An effective national nutrition information system (NNIS) essentially functions as a *nutrition data value chain* that collects and analyses nutrition-related data to support informed, evidence-based decision-making.

INTRODUCTION

A *nutrition data value chain* is based on the original concept of a value chain, which was developed in the 1980s as a way for companies to understand and improve their performance by identifying and assessing the different activities involved in getting a product to market.

The original concept was later expanded to include *data value chains* to understand and improve how data are used in an organization in support of its goals and objectives. Topic-specific data value chains (e.g., a nutrition data value chain) are further adaptations to address specific issues in different sectors and/or topic areas, including the cross-cutting issues inherent in nutrition (e.g., gender and food security).
When developing or refining a nutrition data value chain, it can be useful to consider the evolution of value chains more generally and their usefulness in identifying critical issues and focusing attention and resources on activities and data that will affect outcomes.

WHAT IS A VALUE CHAIN?

A value chain is a systematic way of identifying the different activities performed by an organization, how they interact and their value to the organization's products. Michael E. Porter first described the concept of the value chain in his 1985 book, *Competitive Advantage: Creating and Sustaining Superior Performance.* As the title of the book implies, understanding the value chain allows companies to identify existing and potential sources of differentiation within their activities in order to improve their performance and gain a competitive advantage in the marketplace, including a higher margin on the products being sold. According to Porter, "Competitive advantage cannot be understood by looking at a firm as a whole. It stems

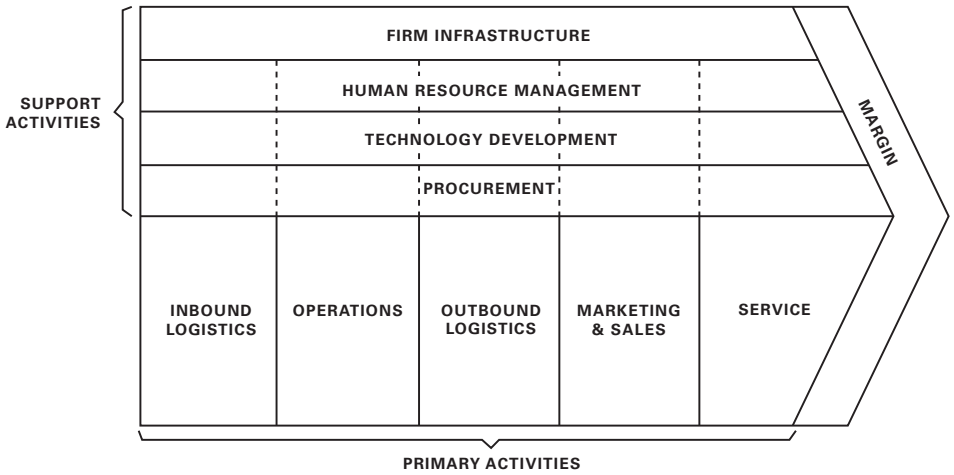

Figure 1. Generic Value Chain *(Competitive Advantage: Creating and Sustaining Superior Performance)*

Table 1. Subcategories of primary and support activities

Five subcategories of primary activities:	***Four subcategories of support activities:***
• Inbound logistics *(e.g., receiving, storage, inventory management)* • Operations *(e.g., converting raw materials or components into a finished product)* • Outbound logistics *(e.g., distribution)* • Marketing & sales *(e.g., advertising, promotion, pricing)* • *Service (e.g., customer service, maintenance, repair)*	• Procurement *(e.g., acquisition of raw materials or parts)* • Technological development *(e.g., research and development; improvements in design and manufacturing)* • Human resources management *(e.g., hiring, training, retention and administration of personnel)* • Infrastructure *(e.g., general management, planning, finance, accounting, legal, government affairs and quality management)*

from the many discrete activities a firm performs in designing, producing, marketing, delivering, and supporting its product."

Using a value chain to improve performance and gain a competitive advantage requires two basic steps: (1) documenting the key activities in the value chain; and (2) reviewing and analysing the activities to identify opportunities for improvement.

The activities in the generic value chain are split into two categories: primary and support (see Table 1). Primary activities are at the core of what a company produces, while support activities exist to facilitate the operations of the primary activities. Improvements in support activities can and should have a positive effect on the performance of the primary activities.

In addition, within each category of primary and support activities there are three different types of activities:

1. *Direct activities* are directly involved in creating value for the buyer (e.g., design, manufacturing, marketing and sales)
2. *Indirect activities* make it possible to perform direct activities (e.g., administration, scheduling and maintenance)
3. *Quality assurance activities* ensure the quality of other activities (e.g., inspections, monitoring and testing)

The generic value chain discussed and illustrated above focuses on a company that produces a physical product. However, the basic structure of the value chain can also be applied to the many organizations that provide services. The subcategories for primary activities are likely to change when developing a value chain in the service sector (see Table 2). In most cases, the subcategories for support activities (see Table 1) and the types of activities — direct, indirect and quality assurance — would apply to value chains for service-based organizations. Overall, the underlying premise of building a value chain around the critical activities remains the same in the service sector.

SCENARIO: BASIC MANUFACTURING VALUE CHAIN

Raw materials and pre-fabricated parts are acquired and stored. Raw materials are molded and/or cut into components. Components and pre-fabricated parts are assembled into products, which are tested, packaged and distributed. Sales, marketing and advertising drive demand for the products. Service and support programmes, including instructions, maintenance and repair, ensure customers are satisfied with the product. Each activity enhances the value of the product, which is ultimately measured by the price that customers will pay for the product and its success in the marketplace.

Table 2. Subcategories of primary activities for a service-based organization

• Planning *(e.g., develop a shared understanding of the vision for the service)* • Engagement *(e.g., understand customer needs; ensure transparency, develop and maintain good relationships with all stakeholders, including customers)* • Design *(e.g., ensure the service meets customer expectations)* • Production *(e.g., create and/or obtain the correct/specified components of the service)* • Provision *(e.g., market, sell, provide and support the service)* • Improvement *(e.g., collect input from customers; ensure continual improvement of the service, including activities across the value chain)*

WHAT IS A DATA VALUE CHAIN?

A *data value chain* applies to the collection and analysis of data by an organization for decision-making, actions and accountability. Data are the raw materials that drive the process of creating value. The many ways to source, sort, categorize, integrate, compare, cross-reference, analyse and/or visualize data can all add value to it. As is the case with the generic value chain, a data value chain is also focused on improving performance and gaining a competitive advantage.

A data value chain follows a similar cycle as the generic value chain: it identifies key activities and considers how they interact with each other, how they add value to the outputs and how they can be improved. In that context, a data value chain can be broken down into five subcategories of primary activities:

1. Identification, prioritization and collection of relevant data; analogous to *inbound logistics* in the generic value chain. This set of activities is a critically important step because with more types of data available from an increasing number of sources, they will guide the process of pulling together data that will be most useful for decision-making.
2. Aggregation and processing of the data; analogous to *operations.* Aggregation and processing are equivalent to the processes used by a manufacturing company to transform raw materials and/or components into products.
3. Analysis of the data; also analogous to *operations*. Analysis adds value by transforming raw materials and/or components into products.
4. Dissemination of the data and/or findings from the analysis; analogous to *outbound logistics*. It is equivalent to the distribution of a product.
5. Promotion and support of the use of the data and analysis; analogous to *marketing and sales* and *service*. The proliferation of available data places a premium on activities that ensure target audiences and end users are aware of the data in the data value chain and are supported to use it.

The same four subcategories of support activities used with the generic value chain also apply to data value chains:

1. *Procurement* (e.g., data and data sources)
2. *Technological* development (e.g., analysis tools and techniques, hardware and software systems, data visualization tools and techniques)
3. *Human resources management* (e.g., hiring, training, retention and administration of personnel)
4. *Infrastructure* (e.g., general management, planning, finance, accounting, legal, government affairs and quality management)

In addition, the different types of activities — direct, indirect and quality assurance — also apply to a data value chain. *Direct activities* create value for the target user (e.g., collection of quality data from a trusted source; careful analysis of the data; accessible dissemination platforms; and practical support on data use). *Indirect activities* enable the implementation of direct activities (e.g., administration). *Quality assurance activities* ensure the quality of the other activities (e.g., monitoring and evaluation).

There are a number of different ways to construct and implement a data value chain while remaining true to its purpose: to collect and use data in order to perform at a higher or superior level. The number of stages, steps or subcategories in a data value chain and how they are defined can vary; however, they should always be determined by considering what needs to be done to ensure relevant data move from collection through to use. The metaphor of a chain is applicable because every link in a data value chain is critical to its overall integrity and functionality.

For example, Open Data Watch proposes a data value chain with four stages — collection, publication, uptake and impact. Each stage is further divided into steps:

- *Collection:* Identify, collect and process
- *Publication:* Analyse, release and disseminate
- *Uptake:* Connect, incentivize and influence
- *Impact:* Use, change and reuse

The added value that data value chains bring to the enterprises that build them depends on how they address several key issues:

- *The relevance of the data.* When identifying data to include in the value chain, there should be a reasonable understanding of how and why the data will be used and what value they bring to the organization and its activities.
- *The quality of the data.* The trust that users place in the data value chain depends on the quality of the data included in it. Consequently, it is essential to build and maintain a system to ensure data quality, including periodic data quality assessments using proven tools and approaches.

- *The use and reuse of the data.* A data value chain is not simply a repository of data. Data are included in the value chain so they can continue to be used over time to understand and improve activities. This requires thinking creatively about how to engage with stakeholders to help them understand the many opportunities presented by the use and reuse of the data.

WHAT IS A NUTRITION DATA VALUE CHAIN?

For all practical purposes, an NNIS *is* a nutrition data value chain. It brings together key data from multiple sources on priority nutrition-related issues. It transforms raw data into a vital information resource that gives stakeholders (e.g., governments, civil society organizations, programme planners, implementers, researchers and donors) a better understanding of what is happening with nutrition and helps them make better decisions to improve programmes and outcomes.

As is the case with most data value chains, there are different ways to organize and name the various components. The six components shown in Figure 2 draw from multiple resources and are designed to capture the essential activities for a useful nutrition data value chain.

There are a number of factors to consider when building or modifying a nutrition data value chain, while acknowledging that the data value chain — and the NNIS built to operationalize it — will evolve over time. For example, new data will become available, better ways to collect and process the data will developed and the analysis and use of data will become more sophisticated. The main components of a data value chain are flexible enough to adapt to this evolution.

IDENTIFICATION AND PRIORITIZATION OF NUTRITION ISSUES AND INDICATORS

The issues and indicators included in the data value chain should align with the country's nutrition priorities. These priorities are typically found in a multisector national nutrition policy, strategy and/or plan. It may be useful to 'prioritize the priorities' to ensure the most important issues and indicators are included. It can also be useful to think about emerging and declining priorities.

The availability of timely and accurate data on the selected issues and indicators should be confirmed before they are integrated into the data value chain. Prioritized issues or indicators without any data have little or no value in a data value chain. Consequently, if critical data are not available in the country, it may be necessary to develop a system to ensure they are collected. For example, an existing data collection mechanism (e.g., the health management information system or a national survey) could be modified to collect these data or an entirely new mechanism could be developed.

Indicators are likely to come from multiple sectors (e.g., agriculture, education, health, nutrition, social welfare). Some indicators may already be included in other sector-specific value chains or data value chains (e.g., a national agriculture value chain). When considering the indicators and the associated data, it is important to think about their ability to provide useful insights on the country's nutrition priorities.

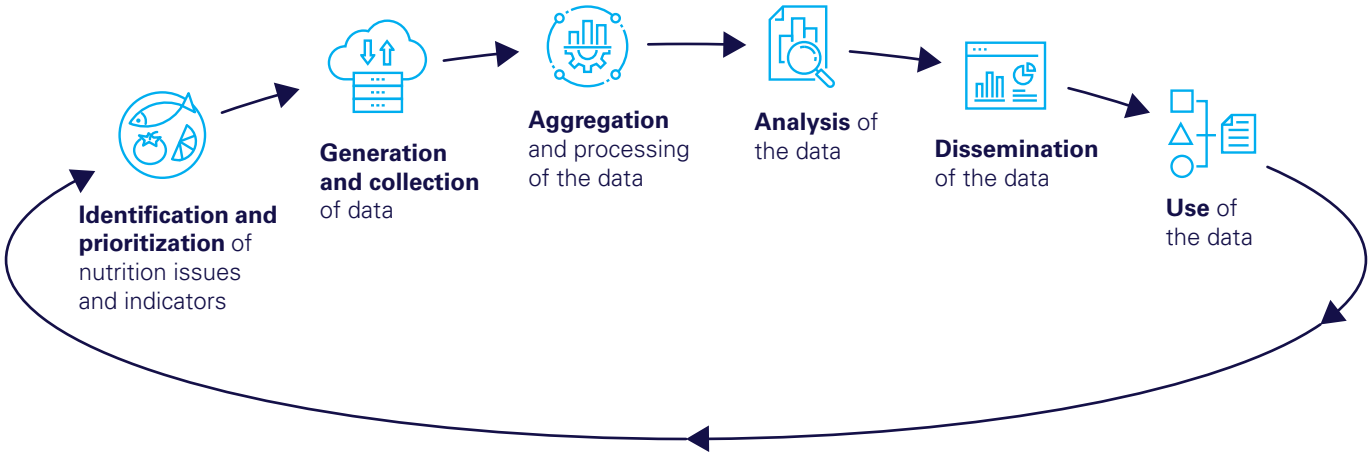

Figure 2. Components of a nutrition data value chain

COLLECTION OF DATA ON THE PRIORITY ISSUES

Data collection is central to a functioning data value chain. Consequently, when building or modifying a nutrition data value chain, it is essential to (1) identify and assess the challenges related to collecting data; and (2) develop a pragmatic plan to ensure data can be collected consistently and in ways that protect their quality. This plan (i.e., an operational data plan) should consider the full range of country-specific issues that affect data collection, including the types of data being collected, the robustness of the data collection tools and systems used in different sectors and by different organizations, the reliability of the sources of data (e.g., national or subnational government, multilateral organization, donor, local or international non-governmental organization) and the cycles for collecting and reporting used by different organizations.

Most of the data collected for an NNIS will fall into one of three categories: (1) routine data (e.g., facility data and programme/project monitoring data); (2) survey data; and (3) surveillance data. Collecting data from multiple sources can provide a more comprehensive picture of the situation, with data from various sources complementing each other. The process of reviewing the data available from different data sources is also an opportunity to reconfirm that the selected indicators actually reflect the priority nutrition issues.

In principle, the priority should be to collect 'open data', which are defined as data that can be accessed, used and shared by anyone. This is in direct contrast to 'closed data', which have restrictions (e.g., legal, technical and institutional) that limit their distribution and use for reasons such as privacy or security. It is possible that some data collected may require certain restrictions on their use, such as making them available only to approved users or ensuring the data are anonymized before being shared. Any restrictions on data use should be known before the data are integrated into the nutrition data value chain.

Even with data collected from multiple sources in various sectors, it is possible — even likely — that critical questions about nutrition status and programmes in a country may not be fully answered. For example, there may be data gaps related to coverage and quality of programmes; food availability and dietary diversity; or data disaggregation by location, population or gender. Consequently, it may be necessary to develop alternative ways to collect key data, including using new or non-traditional data sources or innovative approaches to collect data (e.g., simplified or light-touch data collection tools, mobile phone surveys, video testimonials and/or resident or embedded data collectors).

AGGREGATION AND PROCESSING OF THE DATA

The collected data must be aggregated and processed before they can be fully and properly analysed. Aggregation and processing of the data includes cleaning, classification, coordination, quality, storage, privacy and security.

- *Data cleaning* is done to identify inaccurate, incomplete and/or questionable data and correct any errors or omissions. It also identifies and removes major errors and inconsistencies that are inevitable when multiple sources of data are being aggregated in one data set. Data cleaning is an integral part of ensuring the quality of the data, the analysis and the outputs or products from the data value chain.
- *Data classification* organizes data by relevant categories (e.g., metadata) so they can be used more efficiently and effectively. It includes 'tagging' or labelling data to make them more searchable and easier to retrieve. It also enables better cross-referencing of data from different sources and sectors. Data classification can be considered a component of data coordination.
- *Data coordination*, also known as data curation or data collation, brings together data from different sources and sectors to prepare them for analysis, including identifying and addressing disparities in the data that may affect their comparability. In nutrition, disparities often exist because data are being collected from multiple sectors or at different levels (e.g., national and subnational). Data coordination is a way to manage data in order to make them more useful, including improving the interoperability in electronic systems (i.e., the ability of computer systems or software to exchange and make use of information).
- *Data quality* initiatives ensure consistently high-quality data are collected and used. There are many different frameworks and tools for assessing and improving data quality. In general, the frameworks and tools address issues such as the completeness, consistency and timeliness of the data. Many countries have data quality initiatives in place in different sectors or for different data sources, which can be adapted to assess and improve the quality of nutrition data.

- *Data storage systems* are required to maintain a secure and accessible way to store the data that are collected. The storage system must take into account how much and what types of data are being collected, who needs access to the data and how they are being used. There can be advantages to a centralized storage system, but it is also possible to develop a distributed system where different data are stored and accessed in different places.
- *Data privacy* and security standards and practices ensure the data included are compliant with the relevant laws and policies in the country. Data privacy focuses on how data are collected, processed, shared, stored and deleted. Data security refers to the policies and procedures in place to prevent any unauthorized access to and use of data.

When planning for the aggregation and processing of nutrition data from multiple sources and sectors, it is vital to consider the expertise and resources available in the country to do this critical work on the data value chain. The various tasks require a level of specialized knowledge and skill, supported with the necessary infrastructure (e.g., computer hardware and software).

ANALYSIS OF THE DATA

A critical first step in the analysis of the data is to develop a clear and thoughtful plan. The data analysis plan should focus and guide the process, align it with the national nutrition priorities and ensure the analysis provides key stakeholders in nutrition with the knowledge and insights needed to make well-informed decisions. The plan should also address the human and technical resources required to complete the analysis.

A good analysis plan does not have to be complicated, particularly at the outset. For example, it can be useful to start with a basic approach and refine the plan — and the analysis — over time. These refinements can be the result of multiple factors, including new and/or additional sources or types of data, increased precision and/or disaggregation of the data and improved capacity to conduct different types of analysis.

Opportunities to triangulate data from different sources, including data for similar or related indicators, should be an important consideration when developing the analysis plan. Triangulation is a widely accepted way to improve the analysis of findings from various data sources and types of studies. It can be an effective approach for corroborating findings in the data included in the value chain.

The four main types of analysis that are done for data value chains are: (1) descriptive analysis, which uses historical data to show *what happened* or *is happening*; (2) diagnostic analysis, which uses data/findings from any descriptive analysis as the basis for a more in-depth analysis of *why something happened*; (3) predictive analysis, which uses data/findings from descriptive and diagnostic analysis to understand *what is likely to happen*; and (4) prescriptive analysis, which is a sophisticated approach that attempts to determine *the best course of action to take*.

Data analysis frequently incorporates *data visualization* (i.e., graphic representations of data) to make findings more understandable for stakeholders. Charts, graphs and maps are some of the more commonly used visualizations, but there are many other approaches that can bring data to life in ways that spreadsheets and data tables cannot. In addition, there is the rapidly growing use of tools for interactive data visualization, which allow users to customize the types and parameters of data visualizations; these tools give users the opportunity to view and explore the data in different ways and unlock their full value.

DISSEMINATION OF THE DATA

The findings and results of the data analysis must be readily available to stakeholders if they are going to be used to make informed, evidence-based decisions. Consequently, it is important to develop a practical dissemination plan as part of the nutrition data value chain. The dissemination plan should consider six basic questions to help identify and prioritize its implementation:

- **Who** are the target audiences or end users of the data? The process of identifying the audiences/users should also include grouping and prioritizing them. It can be useful to group target audiences by their role, the types of data they will use and/or how they will use different data. For example, government decision-makers (e.g., policies, planning, finance, statistics) may want data to better understand the existing and potential contributions of different ministries to nutrition activities; donors and multilateral organizations may be more interested in data on national and subnational resource allocations for nutrition; and programme implementers would use data to improve the targeting and efficacy of nutrition-related services.

In addition to identifying the target audiences or end users, the plan should also specify who will implement the dissemination and who be involved the process. There are likely to be different types of dissemination partners, ranging from direct stakeholders or participants in the data value chain to targeted and mass media organizations.

- **What** is being disseminated? The plan should consider what data 'products' would be useful for specific target audiences and end users; for example, data packaged around a particular theme (e.g., stunting), event (e.g., drought), location (e.g., urban), type (e.g., client/consumer survey) or cross-sectoral (e.g., correlation between food production and consumption patterns).
- **When** will the data be disseminated? Knowing the time frame and cycle of data collection, analysis and/or dissemination (e.g., quarterly, annually, biennially) provides valuable context for data users. More specifically, knowing when and how often new data are available makes it easier to plan decisions and activities around the release and use of these data.
- **Where** can end users can access the data in the nutrition data value chain? The issue of where data are available (e.g., searchable online database, downloadable data sets, summary reports) is likely to intersect with how they are made available, including issues of access/accessibilityincluding issues of access/accessibility.
- **Why** does the data value chain exist and why are the data included in it important and useful? This is an important — and often overlooked — component of a data dissemination plan. To a large extent, this is an opportunity to advocate for the resources and support required to build and maintain a robust and respected nutrition data value chain. It can also be an opportunity to promote participation in and use of the data value chain to improve the understanding of the nutrition situation in the country and the outcomes of nutrition programmes across different sectors.
- **How** is the dissemination plan implemented? This is linked to different operational issues, and identifying and addressing these issues will depend largely on decisions made about the other issues of who, what, when, where and why. Three critical factors to consider include: (1) how the data can be actively disseminated to ensure key audiences/users are aware of and are receiving updates on a regular basis; active dissemination is the opposite of passive dissemination, which relies simply on making the data available in one or more outlets; (2) how access to data is determined and implemented; as mentioned above, the priority should be to collect 'open data' for the data value chain so they can be accessed, used and shared by anyone; and (3) how the effectiveness of the dissemination plan is regularly assessed and, as needed, improved.

USE OF THE DATA

The purpose of building a data value chain is to provide stakeholders with high-quality data products that can and will be used to support an evidence-based approach to assessing, planning, developing and implementing nutrition programmes. In general, the availability and use of good data generates demand for more and better data to continually improve the ability to make good decisions about nutrition programmes.

The integrated challenge and opportunity is to build a culture of data use in nutrition; to have stakeholders at every level — from frontline workers to policymakers — use relevant data when making decisions about nutrition. Data are as useful to frontline workers trying to refine how nutrition services are delivered in facilities and communities as they are to policymakers updating and costing plans to address systemic nutrition issues in countries.

Building a culture of data use requires a sustained commitment by institutions and individuals. Institutions must ensure quality data are readily available and understandable (e.g., the nutrition data value chain / NNIS). They must encourage and support the consistent use of data, including by providing people working on nutrition with the necessary knowledge and skills to maximize data use. They must also regularly assess the effectiveness of data-driven actions to determine how data affected various outcomes and if additional and/or different data are needed to improve decision-making and programme performance.

Similarly, individuals need easy access to relevant data. They need to understand the benefits of using these data, be empowered and motivated to use them, and have the knowledge and skills to use them effectively. They also need to understand how the use of data affects their perspectives and decisions as well as the outcomes of their decisions.

A strong culture of data use is likely to raise important questions about nutrition priorities and programmes. While a commitment to data may not always lead to a single conclusion or an obvious course of action, it will provide stakeholders with a strong foundation for realistic discussions about the current situation and possible ways forward.

KEY TERMINOLOGY

Data	Facts and/or figures; pieces of quantitative or qualitative information
Database	An organized collection of data stored electronically for rapid search and retrieval
Data provider	An organization that produces data; may be referred to as a data generator; see also data source
Data source	Type of data and/or modality of data collection (e.g., routine data, survey data); can also be synonymous with data provider
Data value chain	A framework used to guide the transformation of raw data into a valuable resource to better understand situations and improve decision-making
Disaggregated data	Data that have been broken down into detailed subcategories (e.g., by age, gender)
Indicator	Indicators make collected data understandable and useful for monitoring performance, assessing achievement and determining accountability. They can be used to determine a proportion (e.g., prevalence) and are often designed to track inputs, outputs, outcomes and impact.
National data	Data that are common to or characteristic of a whole nation; see also subnational data
Qualitative data	Data collected using qualitative methods, such as interviews, focus groups, observation and key informant interviews; generally expressed in narrative form, pictures or objects (i.e., not numerically)
Quantitative data	Data that are measured on a numerical scale, can be analysed using statistical methods and can be displayed using tables, charts, histograms and graphs
Routine data	Data continuously collected as part of a regular activity/procedure
Sentinel site	A dedicated location (e.g., facility, community) where surveillance data are collected
Subnational data	Data disaggregated by administrative units below the national level (e.g., provinces, districts, counties); may also include other breakdowns below the national level (e.g., urban, peri-urban, rural)
Surveillance data	Data collected on a recurring basis from designated locations (see sentinel sites) to provide insights on trends into a broader area and/or larger population

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