

What are the characteristics of a strong health information system?

Introduction

Every country is meant to safeguard and promote the health of its citizens. To achieve this end, a country needs to identify health needs within its borders, prepare strategies to address those needs, and gather resources to enact plans. A national health information system (HIS) encompasses the sources of health data needed for a country to plan and implement its health strategy. Examples of these data sources are electronic health records on patient care, health facility data, surveillance data, census data, population surveys, vital event records, human resource records, financial data, infrastructure data, and logistics and supply data.

Strong HIS must then make use of these available data to meet health goals. The system should function to collect, manage, analyze, and disseminate health data in a timely manner, so that managers can track progress and provide feedback on HIS performance to improve data quality and use for making sound decisions. Beyond a country's borders, HIS data shared globally are critical for monitoring, tracking, and solving some of the world's most important

health threats. We need to know if we are making progress in eradicating and preventing disease, to plan for and allocate needed resources and to evaluate the effectiveness of health interventions. Other government sectors can also benefit from the data that a strong HIS provides.

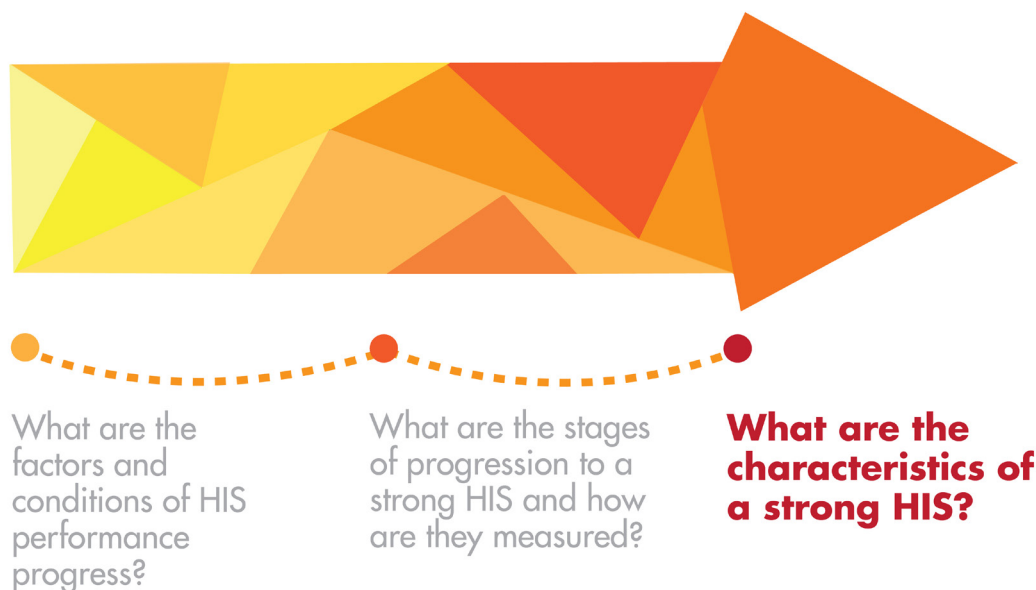
To accomplish all of this, a strong HIS should be **well-defined, comprehensive, functional, adaptable and scalable, and resilient**.

MEASURE Evaluation—a five-year cooperative agreement funded by the United States Agency for International Development (USAID)—works with countries to strengthen their HIS so that they have those four attributes.

The Learning Agenda

In July 2014, USAID asked us to build an evidence base on investments in HIS management, governance, and performance that are effective and useful. In response, the project developed the HIS Learning Agenda (LA), whose purpose is to explore what works to strengthen HIS. The LA addresses the following questions (Figure 1):

Figure 1. MEASURE Evaluation HIS Learning Agenda



- **What are the factors and conditions of HIS performance progress?** The answer to this question describes the HIS design and the technical, human, organizational, economic, political, legal, and ethical factors that influence HIS performance. HIS performance includes the dimensions of data quality (accuracy, reliability, precision, completeness, timeliness, integrity, and confidentiality) and the continuous or systematic and institutionalized use of information for decision making.
- **What are the stages of progress to a strong HIS and how are they measured?** The answer to this question describes the process, people, institutional, and system (technology/infrastructure) subcomponents that compose an HIS and presents stages of progress across five levels of improvement.
- **What are the characteristics of a strong HIS?** The answer to this question describes the qualities of a strong

HIS—a state in which the HIS produces high-quality data that are used to inform health-sector decision making and ultimately enable a country to meet its health goals.

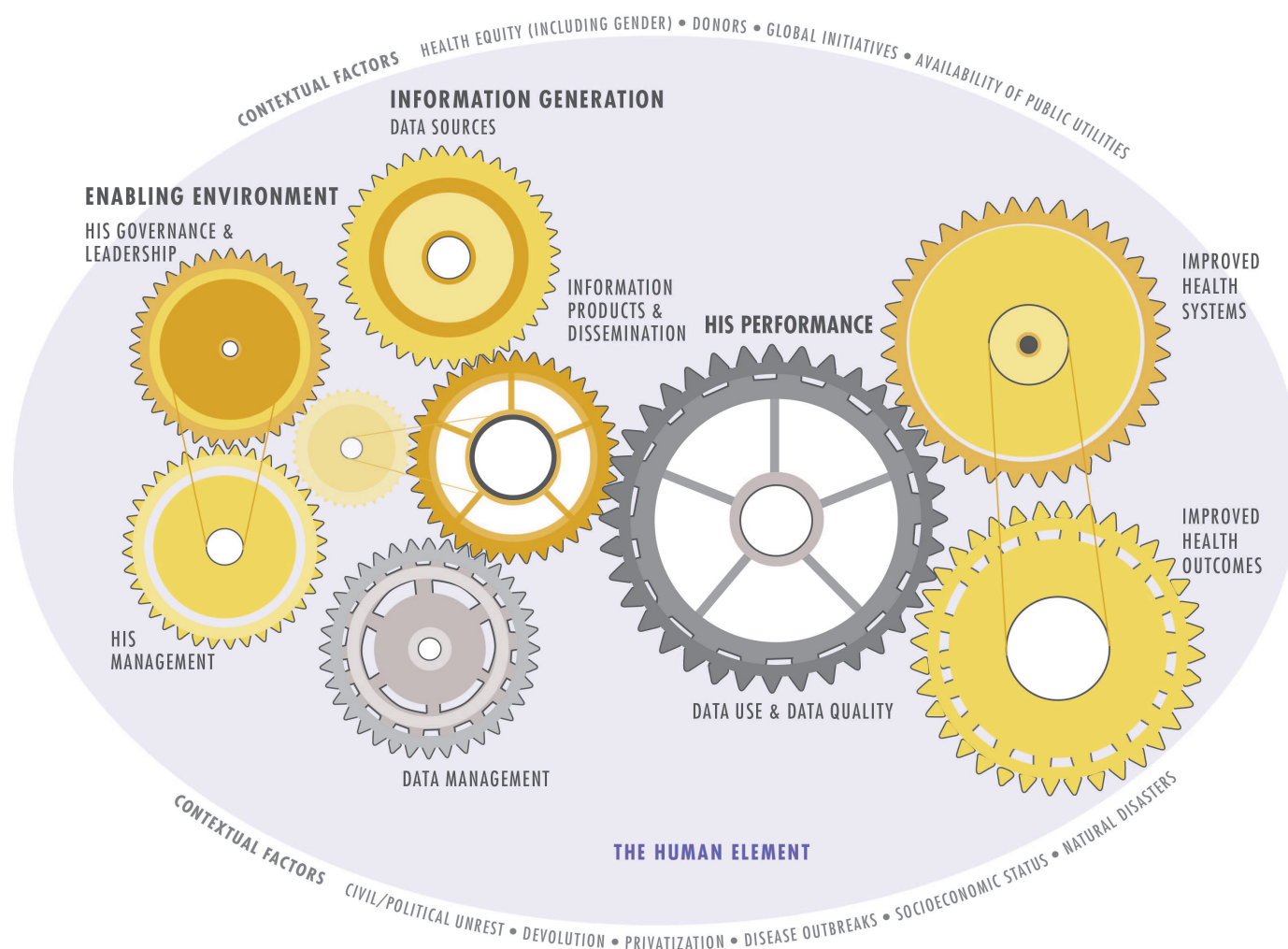
This brief addresses our answers to the third question: the characteristics of a strong HIS.

HIS Strengthening Model

One of the first activities under the LA was the development of the HIS Strengthening Model (HISM) (Figure 2) (MEASURE Evaluation, 2017).

The model illustrates the logical progression of the effects of HIS strengthening activities to improve management, data, and data use on improvements in health systems and health outcomes. The development of this model is one of several MEASURE Evaluation activities and products that are contributing to the LA, as described in the text box.

Figure 2. HIS Strengthening Model



Activities and Products Contributing to the Learning Agenda

- **An HIS Assessment Tools Database.** This searchable database contains several tools for assessing aspects of HIS. Information is provided on each tool's purpose, the tool's prescribed uses, and the area(s) of the HIS that the tool is designed to assess: <https://www.measureevaluation.org/his-strengthening-resource-center/his-assessment-tools>.
- **Stages of HIS Improvement.** This brief describes a suite of tools under development by MEASURE Evaluation to provide systematic guidance on how to assess the status of an HIS and to identify improvements that take an HIS through a defined progression toward optimum functioning. The document is available here: <https://www.measureevaluation.org/resources/publications/fs-17-246>.
- **HIS Interoperability Maturity Toolkit.** This resource identifies the major components of HIS interoperability and lays out an organization's growth pathway through these components. It is available here: <https://www.measureevaluation.org/resources/tools/health-information-systems-interoperability-toolkit>.
- **HIS country profile pages.** Part of the HIS Strengthening Resource Center, the country profiles provide practical resources and learning for countries and organizations working to strengthen their HIS. The country profiles include national health strategies, streamlined health indicators, links to national health statistics websites, and health statistics reports. This rich country-level guidance provides a learning space for countries seeking examples and resources to guide HIS strengthening plans: <https://www.measureevaluation.org/his-strengthening-resource-center/country-profiles>.
- **HIS interventions pages.** In 11 of the countries where MEASURE Evaluation works, the project has documented its interventions and mapped them to the HISSM. This information is available here: <https://www.measureevaluation.org/his-strengthening-resource-center/his-interventions>.
- **HIS Standards and Best Practices for Data Sources.** This guide helps health authorities and health information officers align HIS data sources with standards and best practices, maximizing the likelihood that information on health conditions, services, and resources is recorded in a consistent way and ensuring that reliable data produce comparable statistics at all levels of a health system. This resource is available here: <https://www.measureevaluation.org/resources/publications/tr-17-225>.
- **Conceptualizing and Measuring Data Use: A Review of Assessments and Tools.** This review expands on the HISSM definitions and conceptualization of the use of data, especially for acting on and implementing decisions related to health system performance. It also describes activities to strengthen the demand for and use of data for decision making; summarizes indicators to measure the process; and reviews tools to measure the dimensions of data use. This document may be downloaded at <https://www.measureevaluation.org/resources/publications/wp-18-214>.
- **MEASURE Evaluation studies.** Studies conducted in Kenya, Madagascar, Côte d'Ivoire, and Eswatini are documenting the factors and conditions and interventions for improving HIS performance.

Methods

Our identification of the characteristics of a strong HIS emerged from the following activities. First, we reviewed the literature we had gathered to develop the HISSM and the documents and resources available in MEASURE Evaluation's HIS Strengthening Resource Center: <https://www.measureevaluation.org/his-strengthening-resource-center>. Second, the LA team held a brainstorming session to define the approach to answer this question. Third, a team of MEASURE Evaluation HIS experts with deep knowledge of HIS strengthening interventions across countries was organized to define the terms "characteristic" and "strong," and to outline a technical document based on feedback from the larger LA team. Fourth, both teams reviewed and mapped relevant examples from MEASURE Evaluation activities to each characteristic, and finalized the technical document based on numerous reviews by the LA team and other MEASURE Evaluation HIS experts.

MEASURE Evaluation continues to review and discuss the characteristics of a strong HIS with a wider audience outside the project and update this document as needed.

Characteristics of a Strong HIS

A strong HIS should be **well-defined, comprehensive, functional, and resilient and scalable**.

► Well-Defined

A strong HIS has clear definitions and documentation.

1. **An HIS strategy or plan.** The plan outlines a deliberate system of principles to guide decisions and achieve HIS outcomes; describes expectations both for producers and users of HIS-generated data at all levels of the health system; and documents the guiding principles, mission, and vision for the HIS. The strategy or plan is informed by ongoing assessments of HIS performance that identify gaps and needs.

2. **Health indicators.** The indicators meet the information needs of the health system; have clear definitions and calculations; and are uniformly used throughout a country.
 3. **A clear HIS architecture, developed collaboratively with stakeholders, that defines and includes several data sources.** The HIS architecture clearly maps the data standards, technologies, and information to support the health goals of a country. HIS architecture is the fundamental organization of a system embodied in its components; their relationships to each other and to the environment; and the principles guiding its design and evolution.
 4. **Data collection tools and methods.** This means clear and updated guidance on how data should be collected, processed, analyzed, and reported, and how information should be disseminated. It also means standard operating procedures or guides based on data management principles and policy, including data quality security, to assure the uniformity and quality of data.
2. The data elements collected represent the full range of health services and programs available in a country, including disease-specific programs. The data can be disaggregated, enabling health workers and managers to make decisions on individual and composite cases. A strong HIS collects data on all health programs and meets the needs of the entire health sector. It does not prioritize one or more diseases over others. Health is comprehensive; monitoring progress and improving services across the sector is difficult if information is missing from the HIS.
 3. The HIS covers all levels of a health system, from community-based programs to each level of health facilities (clinic, health center, and hospital), and all administrative levels (district, regional, and national). A strong HIS encompasses public and private providers and facilities.
 4. A strong HIS contains comprehensive data sources. Investment in routine data sources has been substantial, but a strong HIS also has other key data sources: for example, a regular population census, a well-functioning civil registration and vital statistics system, population-based surveys conducted on a schedule, and a master facility list. Additional information, including descriptions and standards for data sources, is available here: <https://www.measureevaluation.org/resources/hisdatasourcesguide>.
 5. The HIS is integrated or interoperable: that is, health program data can be exchanged, triangulated across data sources, and used across multiple sectors.

► Examples of MEASURE Evaluation's Work to Support Well-Defined HIS

MEASURE has worked in seven countries on indicator development or harmonization. In Burundi, we worked with the National Health Information System Directorate, the National AIDS Control Program, and the Belgium Technical Cooperation HIS Project to review and select routine national HIV indicators. The committee selected 11 HIV indicators that are being collected and reported by all partners. Information on this activity is available at <https://www.measureevaluation.org/resources/publications/fs-17-249>.

To date, the project has worked in six countries on the development of HIS strategic plans. In Madagascar, MEASURE Evaluation supported the development of the national HIS strengthening joint action plan, and conducted a workshop to validate the National HIS Strategic Plan (2018–2023) and the associated supervision tools and guidelines. Information on this activity is available at <https://www.measureevaluation.org/resources/publications/fs-17-234> en.

► Comprehensive

A strong HIS captures health system information needs.

1. The HIS covers all health system functions (i.e., human resources; medicines, vaccines, and technologies; finances; and service delivery). For example, collecting information on the number of workers by cadres enables a country to make decisions about training needs and the distribution of workers throughout the health system.

► Examples of MEASURE Evaluation's Work to Support Comprehensive HIS

MEASURE Evaluation has worked in four countries to integrate different systems. For example, in Côte d'Ivoire, the project assisted the Ministry of Health (MOH) to develop and deploy the DHIS 2, the national Management Tool for Electronic Patient Files (referred to as SIGDEP-2), and an electronic logistics monitoring information system, making the national health management information system the main source of routine health data. Information about this activity is available at: <https://www.measureevaluation.org/resources/publications/fs-17-237> en.

In Senegal, the project is improving the surveillance system by enhancing community-level data collection in target regions and strengthening data management through the integration of the surveillance system in the DHIS 2. Information about this Senegal program is available at: <https://www.measureevaluation.org/resources/newsroom/blogs/in-taking-the-one-health-approach-is-senegal-showing-the-way>.

► Functional

An HIS may be well-designed, but it also needs infrastructure and people to make it functional, meaning that it is producing high-quality data that are trusted and accepted by key stakeholders and used for informed decision making. The HIS needs:

1. **Leadership with authority.** This means a diversely-skilled team and resources to oversee and guide the optimal functioning of a country's HIS. The team is the custodian of HIS-related tools, guidelines, and technologies, and helps manage the needs of collaborators and stakeholders.
2. **Clear roles and responsibilities for health workers and HIS managers.** At all levels of the health system, everyone must be clear on what is needed and expected of them to support the HIS as part of their job.
3. **An appropriate mechanism to collect data.** Although there is enthusiasm about adopting electronic systems, the systems in many low- and middle-income countries are paper-based or mixed. A functional system may use an electronic system, a paper-based system, or a mixed system, depending on the country context.
4. **Procedures to regularly assess the quality of data collected and data quality assurance practices to prevent poor-quality data from being entered in the HIS.** Procedures can include routine checks of data that are submitted to higher levels, formal audits, or supportive supervision. The procedures and their documentation are essential for each HIS data source. A strong HIS produces high-quality data with safeguards that protect them from malicious or inadvertent access and alteration.
5. **Strategies for disseminating HIS data and data use plans.** The strategies will vary by country, health program, and type of platform used for the aggregation and reporting of data. For example, annual health statistics reports are produced in some countries; other countries may need more frequent, routine reports. In countries adopting DHIS 2 software, dashboards are being developed and tailored to meet country-specific needs. In all cases, the existence of a clear plan for data use and dissemination is essential for a strong HIS.
6. **Capacity building of health workers in HIS implementation.** Health workers should be trained and supported to perform their duties associated with the collection of health data, data analysis, and data use. They

also require the capacity to maintain, adapt, and develop electronic or paper-based data collection systems.

7. **A mechanism to measure HIS performance.** Monitoring and evaluation of an HIS or its components is necessary to ensure that the system is functioning as intended. All new interventions should have an evaluation component prior to national scale-up.
8. **Strategies to secure privacy and security of the system.** As systems become more technologically advanced, it is important to have in place policy and mechanisms to ensure trust in the system.

► Examples of MEASURE Evaluation's Work to Support Functional Systems

In Bangladesh, the Democratic Republic of the Congo, Guinea, and Madagascar, MEASURE Evaluation has trained personnel in data quality assurance (DQA) and implemented DQA exercises.

Another activity has been the development and piloting of a specific HIS. For example, the project has supported the adoption of DHIS 2 in many countries. In Botswana, we worked with stakeholders to develop and pilot a gender-based violence referral system. Information about the Botswana activity is available here: <https://www.measureevaluation.org/resources/publications/fs-17-250>.

In Mali, we trained national and subnational staff to use mobile phones for data transmission. We also conducted training there at the regional and district levels in data analysis, presentation, use, and dissemination. These interventions are described here: https://www.measureevaluation.org/resources/publications/fs-17-236_en.

► Adaptable and Scalable

A strong HIS should be adaptable and scalable. In-country capacity to redesign, reform, expand, or roll out the HIS at national and subnational levels should be available. A system needs the following:

1. **Procedures for the regular review of data needs and adaption of the HIS to meet health sector needs.** As national needs or global disease priorities change, new indicators may be required. Revising how indicators are collected—for example, how they are disaggregated—may also be needed. Any changes may require new data collection forms and/or software updates.
2. **Clear standards and governance to guide the full implementation of new systems,**

interoperability, and integration. Multiple areas of the HIS require standards.

3. **A sustainability plan to promote self-reliance and country ownership to guide system operationalization** This means having a plan for financing, training, resources, and adaptation of the system.
4. **Continued support for building human capacity to manage the HIS.** The sustainability of a system will rely on having people with the skills to maintain, adapt, and train others on the system.
5. **Methods to evaluate new interventions prior to rollout.** Despite pressure to implement new systems at scale, it is important to properly evaluate a system to ensure that major issues are addressed prior to scale-up.

► Resilient

Finally, a strong HIS must be resilient and able to withstand social, political, and biological crises. The system needs:

1. **Mechanisms for resilience,** which is the ability to prepare for and effectively respond to crises and to maintain core functions in the event of a crisis and in its aftermath. Lessons learned from a previous crisis should inform preparation for any future crisis. An example is making sure that there are data backup systems that will be protected from floods.
2. **Coordination with other health system functions.** Because an HIS is only as strong as the entire health system, it is important for the entire health system to be prepared to deal with an emergency. Experience has shown that an emergency situation can deteriorate into a disaster in the face of a weak health system.
3. **Assessments of system capacities and weaknesses during noncrisis periods.** The assessments identify areas that require improvement in normal situations.

► Examples of MEASURE Evaluation's Work to Support Resilient and Scalable Systems

The project published a lessons-learned document on building capacity for resilient health systems using the Ebola epidemic in three countries as an example. The document is available here: <https://www.measureevaluation.org/resources/publications/tr-17-158>.

Following the 2014 Ebola epidemic, Guinea's health ministry committed to updating and transitioning the existing fragmented, largely paper-based HIS to an electronic platform. To achieve that goal, MEASURE Evaluation worked with partners on several HIS strengthening activities, including supporting the ministry to develop an HIS strategic plan and a costed operational plan to implement DHIS 2. We then trained and supported a central-level DHIS 2 technical team to customize the DHIS 2. The team also developed and supported a pilot training of trainers on DHIS 2 and cascade training for regional statistical officers. These interventions are described here: <https://www.measureevaluation.org/resources/publications/fs-17-251>.

In the Democratic Republic of the Congo, we assessed monitoring and evaluation capacity and completed the development of capacity building plans in the provinces of Kinshasa, Lualaba, and Upper Katanga to improve information management and human resource management. These activities are described here: https://www.measureevaluation.org/resources/publications/fs-17-233_en.

Conclusion

The characteristics we've discussed here—**well-defined, comprehensive, functional, adaptable and scalable, and resilient**—are based on our learning to date. MEASURE Evaluation is meeting country demands in these areas and will continue to support countries to achieve these characteristics.