What are the stages of progression to a strong HIS and how are they measured?

Introduction

Strong health information systems (HIS) are essential for a country to meet its health goals. Health information is 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. A national HIS encompasses all sources of health data to answer these questions and to help a country plan and implement its national health strategy.

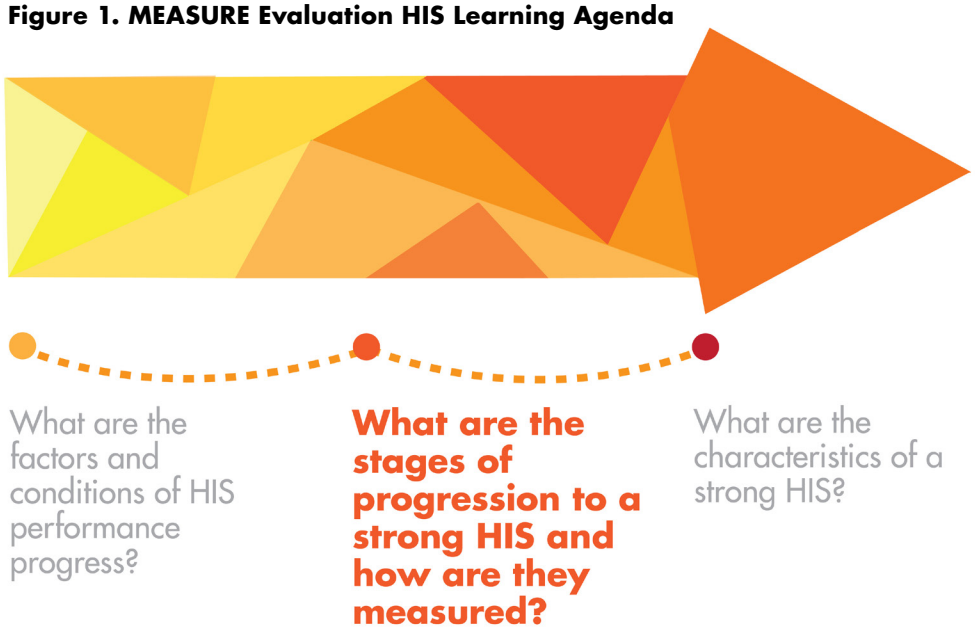
Examples of HIS data sources are records on patient care, health facility data, surveillance data, census data, population surveys, vital event records, human resource records, financial data, infrastructure data, and logistics and supply data (MEASURE Evaluation, 2017a). A strong HIS should be **well-defined, comprehensive, functional, adaptable and resilient, and scalable** (MEASURE Evaluation, 2018). The system should be able to collect, manage, analyze, and disseminate health data in a timely manner so that managers can make decisions, track progress, and provide feedback on HIS performance to improve data quality and use.

To accomplish these tasks, it is essential for HIS stakeholders to know the state of their system on the continuum to a strong HIS and to understand what is needed to achieve an optimized HIS. This document defines five stages of progression to a strong HIS, as described in our HIS Stages of Continuous Improvement (SOCI) tool kit. The five stages are: (1) emerging/ad hoc, (2) repeatable, (3) defined, (4) managed, and (5) optimized.

The Learning Agenda

MEASURE Evaluation is a five-year cooperative agreement funded by the United States Agency for International Development (USAID). One component of MEASURE Evaluation is to help countries improve HIS governance, management, and performance. In July 2014, USAID asked MEASURE Evaluation to build an evidence base on which HIS interventions are effective and useful. In response, the project developed the Learning Agenda (LA) to explore what works to strengthen HIS. The LA addresses three questions (Figure 1):

Figure 1. MEASURE Evaluation HIS Learning Agenda



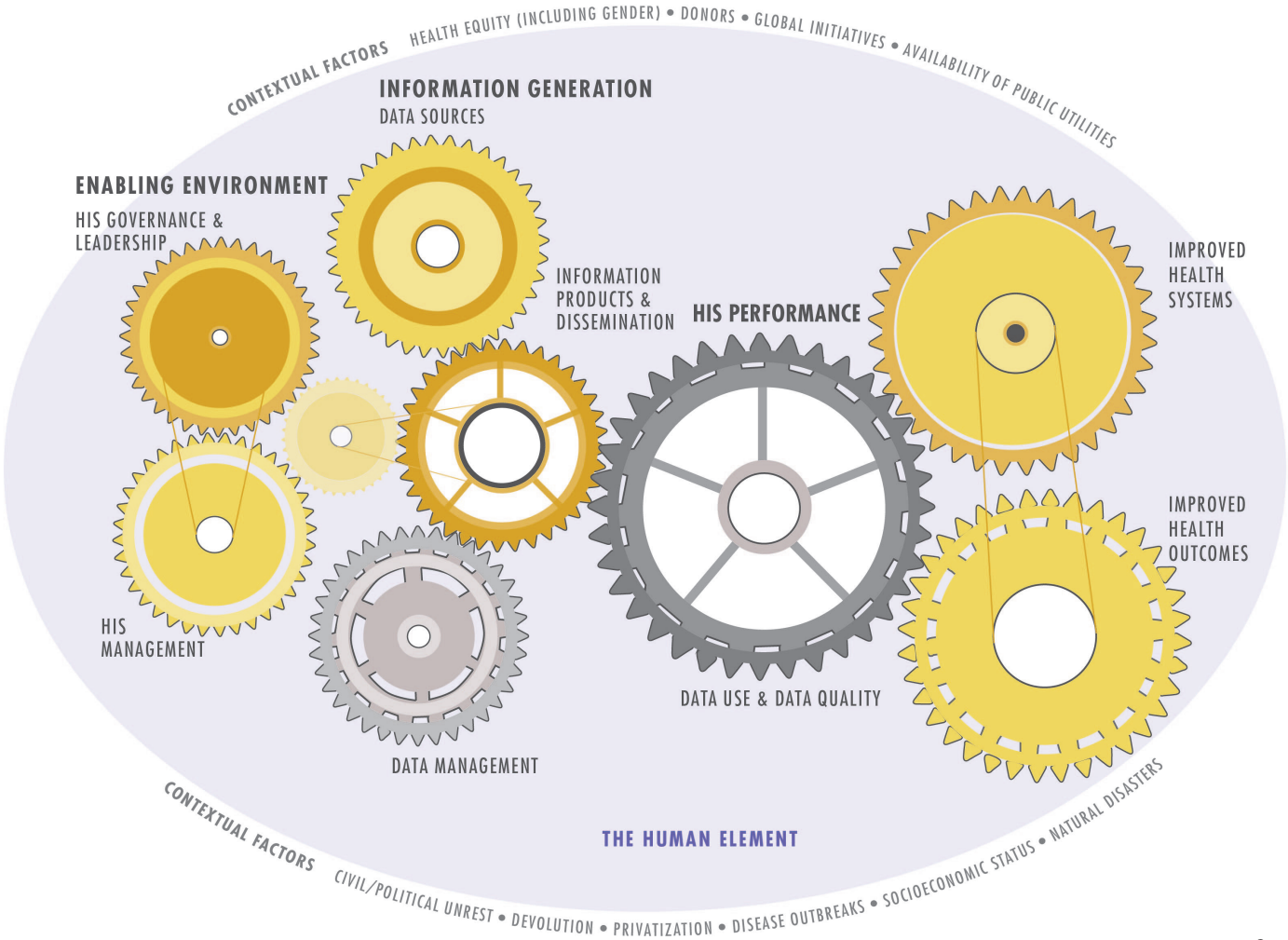
Source: MEASURE Evaluation (https://www.measureevaluation.org/resources/publications/fs-15-142?searchterm=learning+agenda+framework)

- **What are the factors and conditions of HIS performance progress?** The answer to this question describes the underlying structures that create a favorable environment for interventions to improve 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 progression to a strong HIS and how are they are measured?** The answer to this question describes the technology and 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 quality data that are used to inform health sector decision-making and, ultimately, enable a country to meet its health goals.

This paper addresses the second question: what are the stages of progression to a strong HIS and how are they measured?

MEASURE Evaluation is learning from all of its HIS strengthening activities, while also designing and implementing specific activities focused on building the evidence base for HIS strengthening. One of the first activities under the LA was the development of the MEASURE Evaluation Health Information Systems Strengthening Model (HISSM) (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 box on the next page.

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.

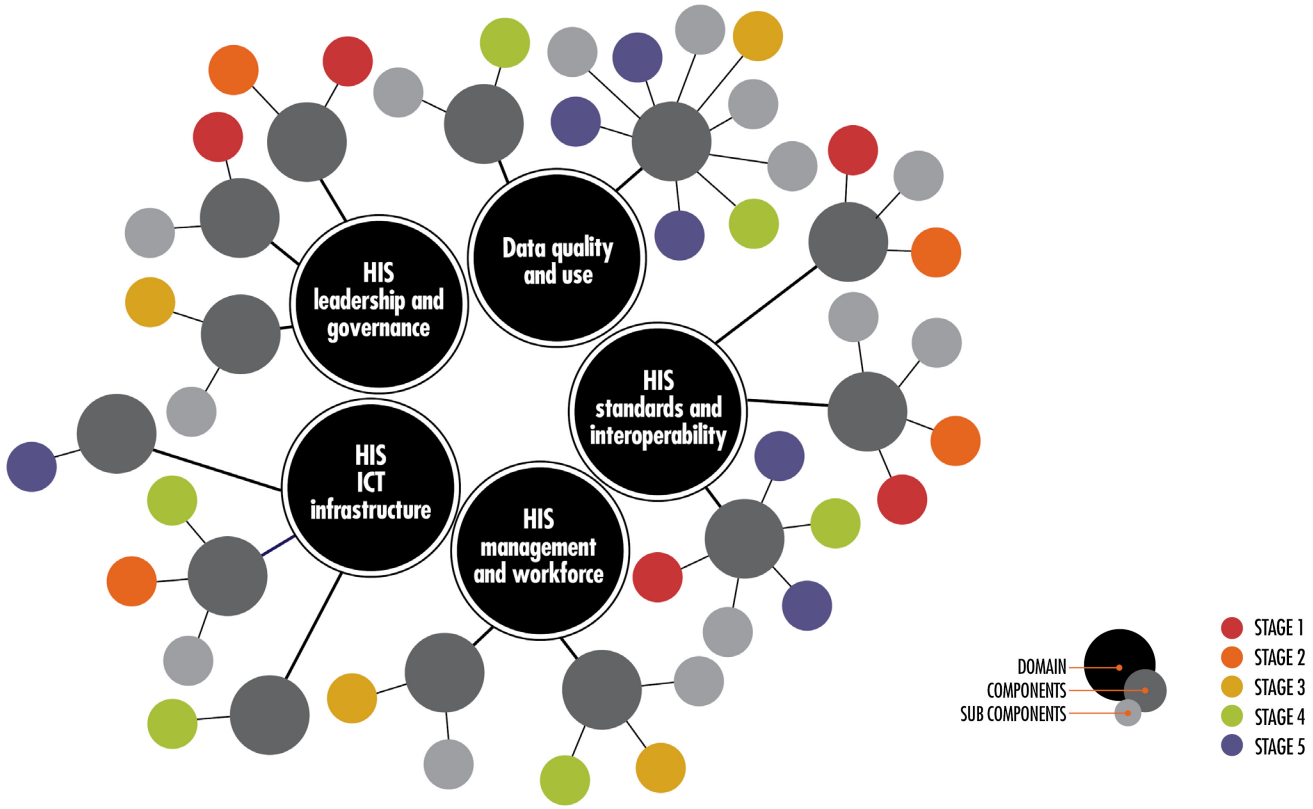
Methods

MEASURE Evaluation's five stages of progression to a strong HIS were identified through the development of our HIS SOCI tool kit and measurement scale.

The SOCI measurement scale was developed by a team of HIS experts from MEASURE Evaluation, the Centers for Disease Control and Prevention, and the Health Data Collaborative (HDC) Digital Health and Interoperability technical working group (TWG). The stages outlined in this framework were developed in a collaborative, iterative process, with regular input from HIS experts. A core group first conducted a survey of the literature on maturity models and reviewed existing HIS models and frameworks, including the second edition of the Joint External Evaluation Tool: International Health Regulations (World Health Organization, 2018).. The team then gathered input from HIS experts across MEASURE Evaluation, the CDC, the HDC, and the University of Lausanne, Switzerland, to identify stages of HIS improvement and associated domains, components, and subcomponents of each stage.

After drafting the initial HIS stages and subcomponents, the team validated the content with a subgroup of the Digital Health and Interoperability TWG. Members of the Community Data subgroup of the HDC, Ministry of Health representatives, and other HIS experts provided additional

Figure 3. HIS stages of continuous improvement



feedback at the Open Health Information Exchange community meeting in Tanzania, held July 31–August 2, 2018.

HIS Stages of Continuous Improvement

The five stages of progression toward a strong HIS, as described in MEASURE Evaluation's HIS SOCI tool kit, are, as mentioned earlier, (1) emerging/ad hoc, (2) repeatable, (3) defined, (4) managed, and (5) optimized. A stages model, by definition, describes the stages through which systems can evolve to reach greater capability and functionality, describes strengths and weaknesses of each stage, and defines priorities to improve system performance (Carvalho et al., 2016). Prior to our work, no model existed for describing stages of HIS in low- and middle-income countries, available models only partially addressed essential components and elements of an HIS, and none identified a path toward improvement.

HIS improvement is a continuous, non-linear, and dynamic process, and MEASURE Evaluation's stages of continuous improvement reflects this understanding. Our SOCI tool kit establishes a systematic basis of measurement for describing HIS components, to facilitate users' abilities to set goals for future levels of maturity, and to inform the development of improvement plans to progress to stronger HIS. Each stage is measured across five HIS domains, and the domains are further differentiated into 13 components and 39 subcomponents (see Figure 3 for a schematic of the SOCI model and see Table 1 for a list of HIS core domains and components).

The domains and components are derived from and map to elements from MEASURE Evaluation's HISSM[1] (MEASURE Evaluation, 2017a), the HIS Performance Management Tool (MEASURE Evaluation, 2017b), and the HIS Interoperability Maturity Model (MEASURE Evaluation, 2017c).

1 The SOCI HIS Core domains are derived from and consistent with the three domains of the HISSM: enabling environment, information generation, and HIS performance. The difference in presentation between the HISSM and SOCI reflects the collaborative, consensus-building process used to develop both the HISSM and SOCI.

Table 1. HIS Stages of Continuous Improvement core domains and components

HIS Core Domains	HIS Components
Leadership and governance	• HIS strategic plan or HIS strategy • Policy, legal, and regulatory framework and compliance • HIS leadership and governance organizational structures and functions
Management and workforce	• HIS workforce capacity and development • Financial management
ICT infrastructure	• Operations and maintenance • Communication network • Business continuity
Standards and interoperability	• Standards and guidelines • HIS core services • Interoperability (data exchange)
Data quality and use	• Data quality assurance and data management • Data availability and data use processes and products

The SOCI tool kit will be piloted in late 2018. Below, we illustrate the five stages of continuous improvement toward a strong HIS using three HIS components that are illustrative of the full SOCI: **HIS strategic plan, HIS workforce capacity and development, and information communications technologies (ICT) operations and maintenance.** In the SOCI tool kit, all 13 HIS components and 39 subcomponents are fully described for each stage (see Appendix A for a list of these). This document will be updated with country examples as the SOCI tool kit is implemented.

► Emerging/ Ad Hoc

In an emerging or ad hoc HIS, stakeholders have limited experience and understanding of HIS issues and activities. Formal processes are also limited or emerging and undocumented. In some cases, the functional capabilities of the HIS may be in place for specific projects, but not at the national level. An emerging or ad hoc HIS shows these characteristics of the three chosen components:

- **HIS strategic plan:** Stakeholders are aware of the need for an HIS strategic plan and policies to govern the HIS, but planning is in the early stages and focuses on small or short-term projects.
- **HIS workforce capacity and development:** HIS competencies, roles, and responsibilities are neither defined nor documented and training programs for the HIS workforce are ad hoc and do not follow a standardized curriculum. Adequate HIS staff exist only in some locations, typically in large cities.
- **ICT operations and maintenance:** Information on electricity access and reliability is limited and network and internet connectivity exist mainly at the national level. Basic support for ICT equipment installation and maintenance exists but is not standardized or HIS-specific. The national HIS has few computers or other hardware to support it.

► Repeatable

In a repeatable HIS, stakeholders recognize the need for standard processes and automated functional capabilities. Basic HIS processes are in place, based on previous activities or existing policies, and there are efforts to document processes. For the three components taken as illustrative of the full SOCI, a repeatable HIS is distinguished by the following:

- **HIS strategic plan:** Strategic plans are current and are developed by subject matter experts but are not vetted with all key stakeholders and may not include all relevant HIS activities.
- **HIS workforce capacity and development:** The government has documented some HIS workforce competencies and used them to develop roles and responsibilities for staff in some facilities. Processes to identify relevant courses for staff exist in limited settings, and at least some HIS-relevant academic courses are available.
- **ICT operations and maintenance:** Adequate network and internet connectivity are in place to meet the basic needs of the HIS in relevant offices at all levels. Stakeholders recognize the need to standardize ICT infrastructure processes but have not yet done so. Fewer than half of central and subnational health offices have adequate hardware.

► Defined

In a defined HIS, approved, documented processes and guidelines exist. Stakeholders share knowledge and collaborate on HIS activities and innovative methods and tools are implemented and used to expand HIS functional capabilities. For the three components illustrative of the full SOCI, a defined HIS includes the following processes, capacities, and infrastructure:

- **HIS strategic plan:** An established strategic planning process involves key stakeholders. The HIS strategic plan is current and includes standards, supportive legislation, appropriate technical and service delivery aspects, and the financial and human resources to deliver them. Standard processes for evaluating HIS activities are defined.
- **HIS workforce capacity and development:** A national HIS organization chart with clear description of staff duties and responsibilities exists and is aligned with the HIS strategic plan and used to develop, implement, and manage activities. The government has standardized HIS training programs with clear and measurable learning outcomes. HIS workforce numbers are sufficient to meet needs at the national level, but not at subnational levels.
- **ICT operations and maintenance:** At least half of central and subnational offices have adequate hardware, designated staff have capacity to support ICT equipment installation and maintenance, and standard operating procedures (SOPs) detail the protocols for routine network and hardware maintenance. A national plan for network management and clear procedures govern procedures to follow in case of network failure.

► Managed

In a managed HIS, activities are implemented using established processes. HIS requirements and goals are developed and processes detail measures for ensuring requirements are met and goals are achieved. For the three components illustrative of the full SOCI, a managed HIS includes the following:

- **HIS strategic plan:** A budgeted HIS strategy is aligned with the national health sector plan/strategy and M&E plan and ongoing M&E ensures alignment of HIS activities with the HIS strategy and desired impact on service delivery.
- **HIS workforce capacity and development:** HIS training programs align with workforce competencies and HIS implementation plans. The government conducts capability assessments and analyses regularly to explore opportunities for improvement and supports refresher trainings and alternative modes of training, including distance learning.
- **ICT operations and maintenance:** Most of the ministry of health's national and subnational offices have adequate hardware. Most national offices and about half of subnational offices have strong and reliable network connection. ICT operations and maintenance are included in the HIS or health sector strategic plan. Staff implement SOPs consistently, and a backup plan exists for data recovery.

► Optimized

In an optimized HIS, best practices are applied and the system is capable of learning and adapting. An optimized HIS uses experiences and feedback to correct problems and continuously improve processes and capabilities. Future challenges are anticipated and a plan is in place to address them through innovation and new technology. For the three components illustrative of the full SOCI, an optimized HIS is characterized by the following:

- **HIS strategic plan:** HIS strategic planning is responsive to changing health priorities reflected in the health sector strategic plan. Results of evaluations are used for continuous improvement of M&E systems, processes, and alignment with the HIS strategy.
- **HIS workforce capacity and development:** HIS workforce competencies and training curricula are reviewed regularly, to ensure continuous improvement. The training approach is innovative, proactive, and student-centric.
- **ICT operations and maintenance:** Almost all of the health ministry's national and subnational offices have a reliable network connection. HIS ICT equipment and maintenance and user support are integrated in an HIS strategic plan that includes financing and technical support for continuous improvement of ICT infrastructure.

The SOCI tool kit can be used by stakeholders to identify both the overall stage of their HIS and the status of their HIS within specific HIS domains and components. In addition to knowing the status of their HIS, stakeholders need to be able to identify future HIS goals and map a path to improvement. The HIS SOCI tool includes a roadmap-planning exercise to meet this need.

Conclusion

The five stages of progression to a strong HIS described here are based on our learning to date and are described in full in the HIS SOCI tool kit. MEASURE Evaluation is meeting country demands for a tool that HIS stakeholders can use to identify the stage of their HIS and chart a path forward. We will implement the HIS SOCI with stakeholders and will update this document as more data on HIS stages is available.

References

Carvalho, J. V., Rocha, Á., & Abreu, A. (2016). Maturity models of healthcare information systems and technologies: A literature review. Journal of Medical Systems [Internet], 40(6):1–10. Retrieved from http://dx.doi.org/10.1007/s10916-016-0486-5

MEASURE Evaluation. (2017a). Strengthening health information systems in low- and middle-income countries: A model to frame what we know and what we need to learn (tr-17-156). Chapel Hill, NC, USA: MEASURE Evaluation, University of North Carolina. Retrieved from https://www.measureevaluation.org/resources/publications/tr-17-156.

MEASURE Evaluation. (2017b). Health information system performance monitoring tool — a source of evidence to help national authorities prioritize HIS-strengthening interventions. Chapel Hill, NC, USA: MEASURE Evaluation, University of North Carolina. Retrieved from https://www.measureevaluation.org/resources/publications/fs-17-213

MEASURE Evaluation. (2017c). Health information systems interoperability maturity toolkit. Chapel Hill, NC, USA: MEASURE Evaluation, University of North Carolina. Retrieved from https://www.measureevaluation.org/resources/tools/health-information-systems-interoperability-toolkit

MEASURE Evaluation. (2018). What are the characteristics of a strong health information system? Chapel Hill, NC, USA: MEASURE Evaluation. Retrieved from https://www.measureevaluation.org/resources/publications/fs-18-294

World Health Organization (WHO). (2018). Joint external evaluation tool: International Health Regulations (2005), second edition. Geneva, Switzerland: WHO. Retrieved from https: extranet.who.int/sph/joint-external-evaluation-tool-2nd-edition

Appendix A. Stages of Continuous Improvement HIS Core Domains, Components and Subcomponents

HIS Core Domains	HIS Components	HIS Subcomponents
HIS Leadership and governance	HIS strategic plan or HIS strategy	HIS strategic plan
		M&E plan
	Policy, legal, and regulatory framework and compliance	Existence of HIS policies and legislations
		Policy compliance enforcement
	HIS leadership and governance organizational structures and functions	HIS leadership and coordination
		HIS organizational structure and functions
HIS Management and workforce	HIS workforce capacity and development	HIS competencies (knowledge, skills, and abilities)
		HIS training and education (includes continuous professional development)
		Human resources policy
	Financial management	HIS financing plan
		Resource mobilization
HIS ICT infrastructure	Operations and maintenance	Reliable power/electricity
		ICT business infrastructure support
		Hardware
	Communication network (LAN and WAN)	Networks and internet connectivity
	Business continuity	Business continuity processes and policies
HIS standards and interoperability	Standards and guidelines	HIS standard guidelines
		Data set definitions (clinical and indicator)
		Data and exchange standards
	HIS core services	Master facility list
		Indicator registry
		Terminology management
		Unique person identity management
		Enterprise architecture
	Interoperability (data exchange)	Person data exchange
		Aggregate data exchange
		Commodity management data exchange
		Data exchange security

HIS data quality and use	Data quality assurance	Data quality assurance and quality control
		Data management
	Data use	Data use availability strategy
		Information/data availability
		Data use competencies
		User/stakeholder engagement
		Data synthesis and communication
		Reporting and analytics features
		Data use impact
		Data collection alignment with workflow
		Decision support (clinical or other)

This publication was produced with the support of the United States Agency for International Development (USAID) under the terms of MEASURE Evaluation cooperative agreement AID-OAA-L-14-00004. MEASURE Evaluation is implemented by the Carolina Population Center, University of North Carolina at Chapel Hill in partnership with ICF International; John Snow, Inc.; Management Sciences for Health; Palladium; and Tulane University. Views expressed are not necessarily those of USAID or the United States government. FS-18-309.