

What are the factors and conditions of HIS performance progress?

Introduction

A national health information system (HIS) encompasses all sources of health data that a country needs to plan and implement its national health strategy. Examples of 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 (MEASURE Evaluation, 2017a). A strong HIS is essential for a country to meet its health goals.

A strong HIS should be **well-defined, comprehensive, functional, adaptable and resilient, and scalable** (MEASURE Evaluation, 2018a). 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. 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 if we are to plan for and allocate resources and evaluate the effectiveness of health interventions.

This document presents factors and conditions that allow

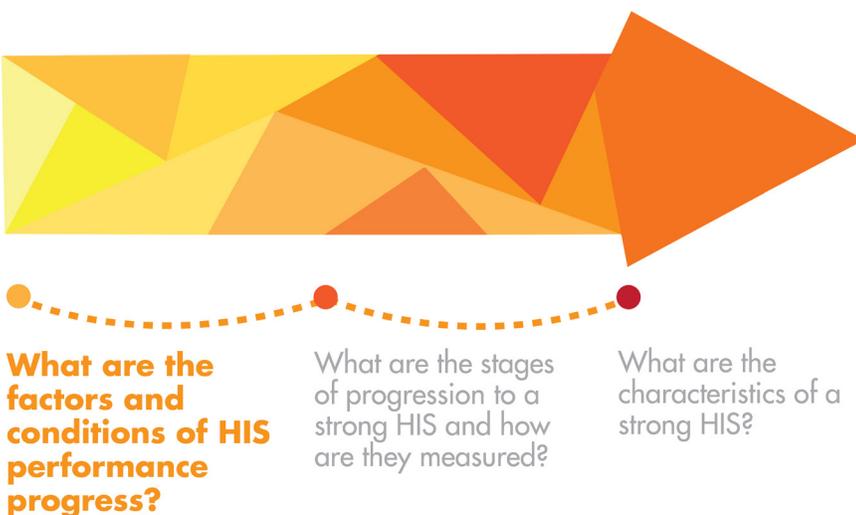
an HIS and the interventions that act on it to work toward improved performance, defined as data quality and data use. This discussion outlines factors and conditions that favor a system's improvement. Here are some examples:

- Human resources and capacity are sufficient.
- Leaders are engaged and management is constructive.
- Interventions are integrated and mutually reinforcing.
- Processes are standardized.
- Approaches are flexible and adaptable.
- Feedback systems exist for course corrections.
- User perceptions are positive.

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's work is to help countries improve HIS management, governance, and performance. In July 2014, USAID asked MEASURE Evaluation to implement activities that would build an evidence base documenting which investments in HIS are effective and useful. To do this, we developed an HIS Learning Agenda (LA), to explore what works to strengthen HIS. The Learning Agenda seeks

Figure 1. MEASURE Evaluation HIS Learning Agenda



to answer three questions (Figure 1).

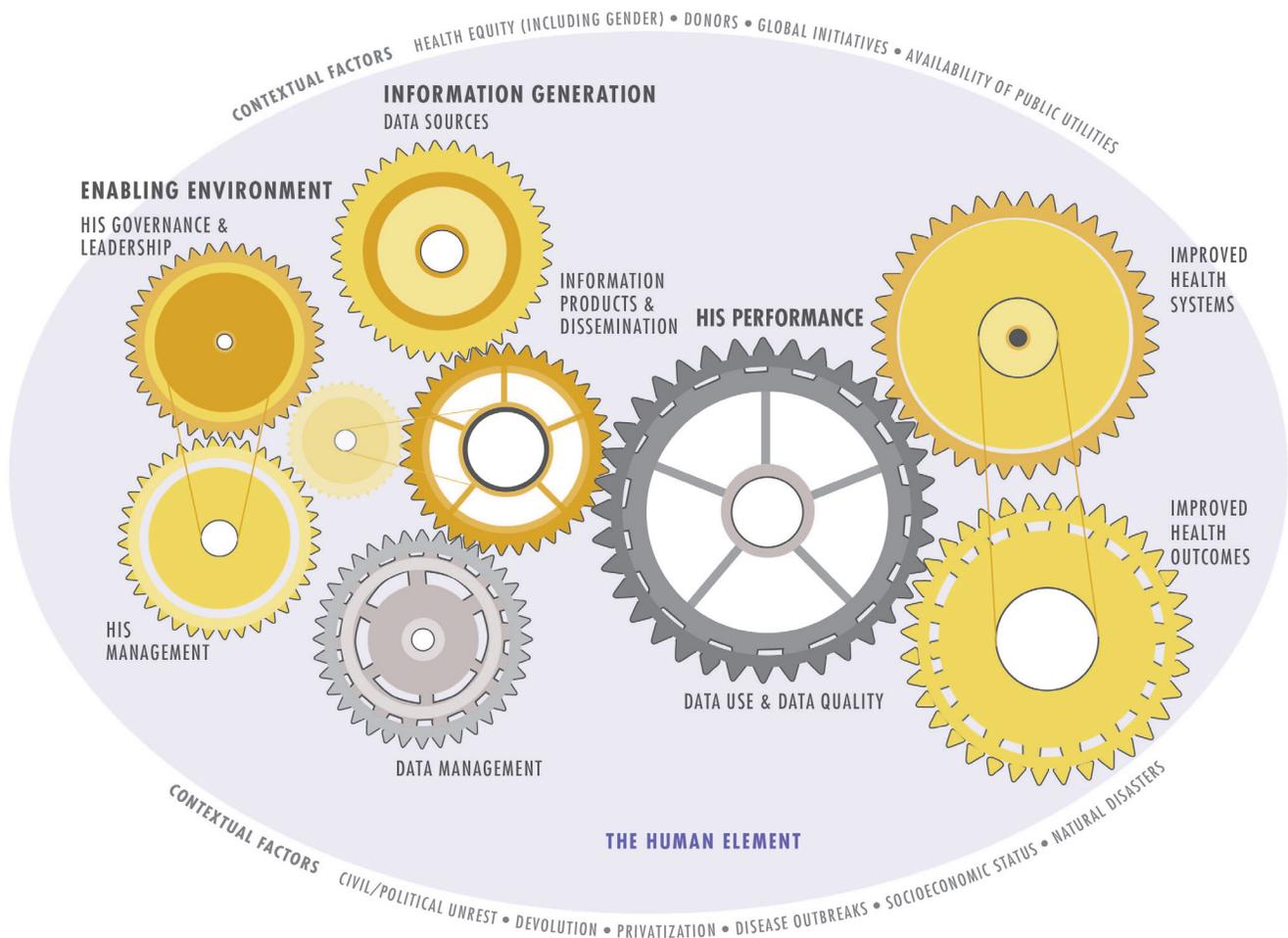
1. **What are the factors and conditions of HIS performance progress?** The answer describes the underlying structures that create a favorable environment for interventions to improve HIS performance. HIS performance includes the dimensions of data quality (accuracy, reliability, precision, completeness, timeliness, integrity, and confidentiality) and the continuous or systematic and institutionalized use of information for decision making.
2. **What are the stages of progress to a strong HIS and how are they are measured?** The answer to this question describes the process, people, and institutional and system (technology/infrastructure) components that compose an HIS and presents stages of progress across five levels of improvement.

3. **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 inform health-sector decision making and, ultimately, enable a country to meet its health goals.

This paper seeks to answer the first question.

Although MEASURE Evaluation is learning from all of its HIS activities, the project is paying special attention to those that build the evidence base on HIS strengthening. One of the first activities under the LA was the development of the HIS Strengthening Model (HISSM) (Figure 2). The model illustrates the relationship among HIS components and shows that a systems approach to strengthening activities can lead to improvement in performance, management, data, data use, and, therefore, health outcomes. The development of this model is one of several MEASURE Evaluation activities and products that are contributing to the LA, as

Figure 2. HIS Strengthening Model



Source: MEASURE Evaluation. (2017). Health Information System (HIS) Strengthening Model. Chapel Hill, NC, USA: MEASURE Evaluation, University of North Carolina. Retrieved from <https://www.measureevaluation.org/his-strengthening-resource-center/his-strengthening-model>

Activities and Products Contributing to the Learning Agenda

1. **An HIS Assessment Tools Database.** This searchable database contains several tools for assessing aspects of HIS. Information is provided on the purpose and prescribed use of each tool 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>
 2. **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/>
 3. **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/publications/hl-17-03b>
 4. **HIS country profile pages.** Part of the HIS Strengthening Resource Center (HISSRC), the country profiles provide practical resources and learning for countries and organizations working to strengthen their HIS. The country profiles include national health strategies, 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>
 5. **HIS interventions.** 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>
6. **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>
 7. **Conceptualizing and Measuring Data Use: A Review of Assessments and Tools.** This review expands on the 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>.
 8. **Studies:** Four MEASURE Evaluation studies in Côte d'Ivoire, eSwatini (formerly, Swaziland), Kenya, and Madagascar are documenting the factors and conditions and interventions for improving HIS performance. These studies examine interventions across the HISSM, covering improvements in staff capacity, conducting monitoring and evaluation, and interventions to help reach global goals to combat HIV/AIDS. The Côte d'Ivoire and Madagascar studies are ongoing. The eSwatini and Kenya studies are linked at <https://www.measureevaluation.org/his-strengthening-resource-center/his-strengthening-resource-center/his-performance-progress>

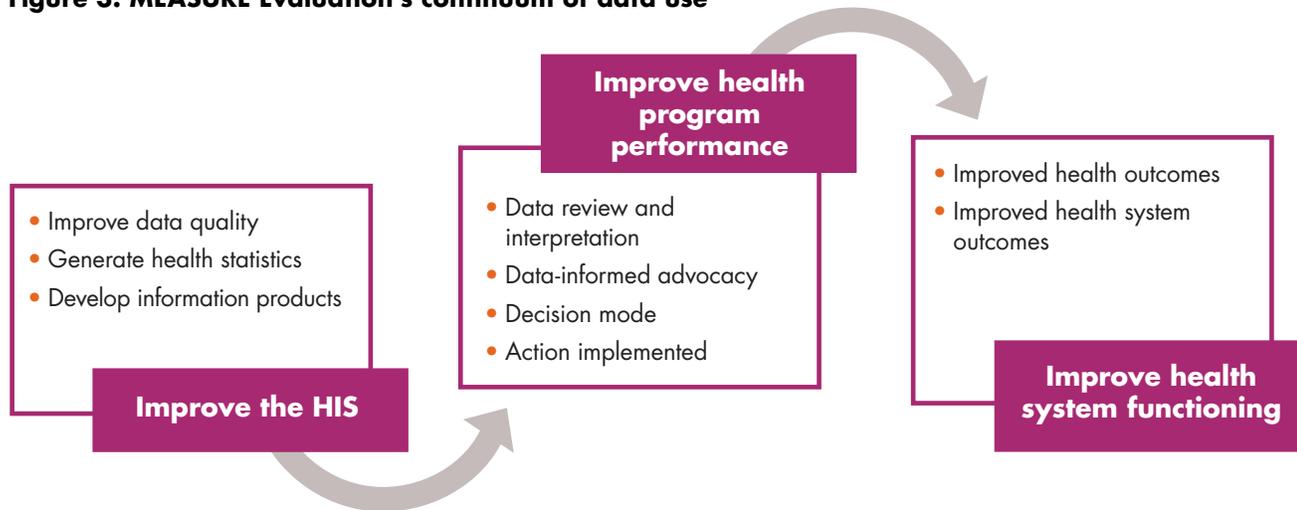
described in the box on page 3.

What is HIS performance?

To understand the factors and conditions of HIS performance progress, we first must define HIS performance. The ability of low- and middle-income countries (LMICs) to monitor and measure their progress toward sustainable, health-related development goals and to meet health sector decision-making needs at all levels depends on the ability of national HIS to capture, store, manage, share, and use both individual- and population-level health data. Therefore, **HIS performance is defined by data quality and data use.**

Data quality means data are relevant, complete, timely, and

accurate. Data use "...is the analysis, synthesis, interpretation, and review of data as part of decision-making processes, regardless of the source of data" (Nutley & Reynolds, 2013). MEASURE Evaluation conceptualizes data use as a continuum (Figure 3). At one end of the continuum is the use of data to assess and improve data quality, produce health statistics, and develop information products. Then, data use is concerned with programs, where data are used to identify a program's problems and implement solutions. Ultimately, data use improves the health system and health outcomes.

Figure 3. MEASURE Evaluation's continuum of data use

Source: MEASURE Evaluation, 2018b

Role of Factors and Conditions in HIS and Health Systems

Because health information is contained within a system, many components are interconnected and interrelated, sometimes in a nonlinear fashion. Moreover, an HIS exists and interacts within a larger health system, whose factors and conditions can affect HIS performance. Interventions designed to improve HIS performance may alter underlying system structures and conditions and may be facilitated or impeded by those changes. All these interacting factors and conditions influence system sustainability, by creating favorable conditions for interventions.

Methods

We drew on MEASURE Evaluation studies and reports for which results were available to identify which factors and conditions are positively associated with HIS performance progress. Those sources are cited here, augmented with evidence from the published literature. In addition, a group of MEASURE Evaluation HIS experts were consulted to provide input on the definitions of factors and conditions and the identification of those factors and conditions.

Results

The evidence supports the following factors and conditions for all components of an HIS associated with HIS performance progress:

- **Solutions are local and aligned** with health ministry information systems and national priorities (MEASURE

Role of Factors and Conditions in HIS Performance Progress

We define factors and conditions **as the underlying structures that create the environment in which HIS interventions are implemented, and that influence HIS performance** (i.e., measured by data quality and data use).

- For a list of common HIS interventions, go to <https://www.measureevaluation.org/his-strengthening-resource-center/his-interventions/common-set-of-his-interventions>
- And for more details about interventions in Bangladesh, Botswana, Burundi, Côte d'Ivoire, the Democratic Republic of the Congo, Guinea, Madagascar, Mali, Nigeria, Senegal, and eSwatini, go to <https://www.measureevaluation.org/his-strengthening-resource-center/his-interventions/his-interventions-by-country>

We hypothesize that these interventions will create an HIS that is well-defined, comprehensive, functional, and resilient and scalable.

Evaluation, 2018d; Mutale et al., 2013; Moucheraud, Schwitters, Boudreaux, et al., 2017).

Mutale and colleagues studied the African Health Initiative, funded by the Doris Duke Charitable Foundation, that supported the Population Health and Implementation Training (PHIT) partnership in five countries. Researchers found, across all five countries, that the likelihood of improvements to be sustained rose when interventions were aligned with national priorities and were cognizant of the importance of health ministry information systems. For example, in Mozambique—where the health

system was decentralized—successful interventions were targeted to strengthen data quality and data use within the existing information system and supported decision making at the district level.

- **Leaders are engaged and serve as change agents** and there is a general **political will** to change (MEASURE Evaluation, 2018d; Mutale 2013; MEASURE Evaluation, 2017b; Fritz, Tilahun, & Dugas, 2015).

MEASURE Evaluation's USAID-funded associate awards in Kenya, Tanzania, and South Africa offered an opportunity to study how robust investments in HIS strengthening interventions affected data use. Across the three countries, we found that improved HIS performance positively correlated with countries where leaders acted as change agents through their support of and demand for data use in decisions. For example, in Kenya, leaders and other senior managers who prioritized participation in data review meetings fostered a climate where data quality was taken seriously and perceived as valuable. This environment resulted in increased accountability for the programs reviewed at those meetings (MEASURE Evaluation, 2018e).

- **Interventions are complementary and mutually reinforcing.** Implementation of multiple HIS strengthening activities are more effective than isolated, stand-alone ones (MEASURE Evaluation, 2018d; Moucheraud, Schwitters, Boudreaux, et al., 2017; Mohamadali & Aziz, 2017).

This MEASURE Evaluation study also found that complementary interventions were more effective than stand-alone interventions. For example, capacity-building activities, activities to engage data users and data producers, and work to improve data quality and availability resulted in synergies to improve overall data use (MEASURE Evaluation, 2018e).

- **Processes are standardized and institutionalized** (MEASURE Evaluation, 2017b).

As an HIS progresses in its ability to meet a country's health goals, it moves from a stage where processes are ad hoc and uncoordinated to a stage where processes are documented, standardized, and shaped by common guidelines. Ultimately, those processes are revised and adapted based on evidence and feedback. For example, data quality assurance and quality control processes can be standardized at a national level and overseen by a national coordinating body. Institutionalizing those processes might mean that governing bodies regularly meet and provide remediation for problems identified. Standardization and institutionalization results in

more consistent procedures for data processing, analysis, and use—and, ultimately, better data quality.

- **Approaches are flexible and adaptable**, and testing, implementation, and improvement is **iterative** (Mutale, et al., 2013).

The five PHIT partnerships tailored approaches to each of five countries, but all groups used a flexible, iterative approach to designing and refining tools and feedback systems to improve data quality and use. For example, the project in Tanzania was designed to improve community-level primary healthcare through community health agents (CHAs). Tools developed to record information did not give the CHAs enough information about client care. A special booklet was created to fill that gap and feedback and problem-solving were addressed through supervision visits and regular review meetings.

- **Feedback systems are regular and routine.** Assessments, data review meetings, supervision, stakeholder meetings, and mentoring are conducted regularly as part of routine practice and are used to inform interventions (MEASURE Evaluation, 2018d; Odek, 2018; Millar, forthcoming; Mutale, et al., 2013).

Odek conducted a study in Tanzania to examine the factors in and barriers to the effectiveness of data quality assessment (DQA) activities. DQAs had occurred annually in HIV programs since 2008, and in the national monitoring and evaluation unit, intermediate (regional) reporting level, and service delivery points. DQAs led to an action plan to correct issues. The study found that frequent supportive supervision, support from other service coordinators, regular data review meetings, and regular feedback to the health facility on data quality were important factors that facilitated implementation of the action plan and maintained and improved data quality.

- **System attributes and user perceptions about the systems are positive** (MEASURE Evaluation, 2018d; Odek, 2018; Fritz, Tilahun, & Dugas, 2015; Moucheraud, Schwitters, Boudreaux, et al., 2017; Mohamadali & Aziz, 2018).

Moucheraud and colleagues conducted a qualitative study in three countries among stakeholders involved in projects that aimed to strengthen HIV care, by setting up electronic HIS. They aimed to look at factors associated with potential sustainability and found that the likelihood of sustainability may be enhanced when users have positive attitudes toward

the HIS and see tangible benefits from it—for example, that the system reduces workload and reporting and is robust, secure, intuitive, and convenient.

- **Sufficient human resources and capacity** and good project management exist (Odek, 2018; Fritz, Tilahun, & Dugas, 2015).

Fritz and colleagues conducted a literature review to identify the success criteria for implementing electronic medical records projects in LMICs. After proper function, the most important success criterion was that the organization had an adequate number of skilled staff and good project management.

- **System maturity may increase the momentum of subsequent improvements** in system capability and functionality (MEASURE Evaluation, 2018d; MEASURE Evaluation, 2017b).

MEASURE Evaluation found that in Kenya, where DHIS 2 had been in use for a while, users were more able to cite instances of data use than were users in Tanzania and South Africa, where DHIS 2 was more recently installed. They concluded that longer exposure to and more experience with and training in DHIS 2 were beneficial for users and that the maturity of a system may increase the momentum of improvement in the performance of an HIS.

Contextual Factors

The contextual factors listed here are taken from the HISSM. Contextual factors can positively or negatively influence the effectiveness of HIS strengthening interventions and can affect HIS performance progress, though perhaps less directly than the factors cited above.

- **Health equity and gender** is about fairness among people, regardless of gender. HIS performance progress is facilitated when leadership, governance, and management practices support integrating gender in data sources, information products and dissemination, and data management. When gender-related data are available and appropriately analyzed, they can be used to address underlying inequities (MEASURE Evaluation, 2018c).
- While international **donors** have invested millions of dollars to strengthen HIS in LMICs, they have their own priorities and agendas that may or may not align with those of countries. Donor initiatives can distort national priorities and lead to multiple and parallel coordinating bodies (Biesma, Brugha, Harmer, et al., 2009). A country national health plan with goals and objectives for the HIS can help steer donor support to country-defined priorities (Cibulskis & Hiawalyer, 2002). Donor initiatives are credited with facilitating scale-up of service delivery and stakeholder participation (Biesma, Brugha, Harmer, et al., 2009). Diversified funding less reliant on donors is associated with more-sustainable HIS (Moucheraud, et al., 2017).
- Similarly, **global initiatives**—such as the Health Data Collaborative and Sustainable Development Goals—can play an important role in galvanizing donors, aligning partner priorities, and marshalling collective action to create new knowledge (Jha, Kickbusch, Taylor, et al., 2016), but are only as effective as there is support for that role.
- **Public utilities**, particularly electricity and Internet connection, can have a direct impact on whether HIS interventions can function. For the most part, positive trends in computing and infrastructure will make it easier to improve HIS (Moucheraud, et al., 2017).
- **Civil and political unrest** and **disasters** can interfere with people's safety and access to such public services as police and water, compromise the availability of trained providers and equipped health facilities, and limit people's movement. Civil war is associated with long-term increased risk of death and disability from infectious diseases, injuries, and accidents (Ghobarah, Huth, & Russett, 2004). Moreover, these effects spill over to neighboring countries.
- **Devolution** and **privatization** of decision making mean systems must be adapted or created. Devolution transfers power from the national level to lower levels, so that districts or counties are responsible for policies, systems, funding allocation, human resources, and integrated information (MEASURE Evaluation, 2017). Privatization is a strategy to promote efficiency of resources, but how that may affect health outcomes in LMICs is not well understood (Austin, DeSciociolo, & Samuelsen, 2016).
- **Disease outbreaks**, such as Ebola in West Africa and Zika, have several effects on health and HIS. Outbreaks can challenge a country's HIS, reveal political and policy weaknesses, and expose noncompliance with health laws. Emergency responses to disease outbreaks can divert resources from other public health needs. Many disease surveillance systems lack sensitivity

and specificity to detect outbreaks. These bad effects can be mitigated with staff incentive structures and communication and coordination among stakeholders with potential to improve disease reporting and response systems (Tekola, Myers, Lubroth, et al., 2017).

- People of lower **socioeconomic status** generally have poorer health outcomes and are less likely to use healthcare (Gwatkin, Rutstein, Johnson, et al., 2007). A country's socioeconomic status may affect its ability to invest in HIS strengthening interventions.

Discussion

Factors and conditions interact with and are affected by the HIS, by interventions to improve the HIS, and by the larger health system. Because HIS strengthening has not traditionally been the subject of rigorous testing and study, the evidence about what factors and conditions are associated with stronger HIS performance is limited. We focused on identifying those factors and conditions that the literature associates with HIS performance progress. Our findings of factors and conditions of HIS performance progress are present in other discussion topics regarding well-functioning systems, including solutions that are locally designed and owned, mutually reinforcing interventions, and flexible and adaptable approaches. Stakeholders intent on improving HIS should foster known positive factors and conditions in their HIS strengthening approaches.

Contextual factors exist in the environment of an HIS and a health system and can influence the effectiveness of HIS interventions. Contextual factors are also important to consider when planning and implementing HIS interventions.

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