Prospective Study of Health Information Systems (HIS) Strengthening in Madagascar:

Integration of Routine Health Information Systems and Epidemiologic Surveillance with a Focus on Malaria

Background

Madagascar's Ministry of Public Health (MPH), supported by the United States Agency for International Development (USAID) and other international donors, is working to improve the country's health information systems (HIS). The MPH and partners have developed an electronic health management information system—a Microsoft Access database called *Gestion du Système d'Information Sanitaire* (GESIS)—to strengthen and facilitate reporting of health information at national and district levels. Existing disease surveillance systems are the integrated disease surveillance and response (IDSR) system (*Surveillance Intégrée de la Maladie et la Riposte* [SIMR]) and the Pasteur Institute's fever surveillance system. Other vertical programs have developed parallel information systems to meet their specific information needs. The Madagascar National HIS Strengthening Strategic Plan (2013—2017) aimed to reduce reporting redundancies at district, regional, and national levels by eliminating vertical reporting systems and integrating them in health management information systems (HMIS).

USAID/Madagascar supported the USAID-funded MEASURE Evaluation project to strengthen the country's routine health information systems (RHIS) and integrated surveillance. In November 2016, we began technical assistance to strengthen Madagascar's RHIS and malaria surveillance systems based on assessment results and to build capacity in the MPH to manage HIS through the placement of resident advisors. These activities included establishing a data quality assurance system; strengthening the RHIS through updated policies, improved real-time access to health data, and improved capacity; and providing support to strengthen malaria monitoring and evaluation and surveillance.

Soon after we began, the MPH, in collaboration with MEASURE Evaluation, convened a workshop in February 2017 in Antsirabe, bringing together stakeholders and drafting a nine-strategy implementation plan called the Road Map for the Sub-Committee on Health Information Systems.[1] The MEASURE Evaluation study team used the Road Map as a key document to help us understand the activities that were planned to achieve the Road Map's stated goal: "an efficient, unique and integrated health information system."

In addition to the USAID-funded activities described above and as part of MEASURE Evaluation's Learning Agenda (a collaborative and adaptive approach to documenting and applying results for health information system [HIS] strengthening), we conducted a study in Madagascar of the effects on HIS performance of all recent efforts by MEASURE Evaluation and also other stakeholders to strengthen the HIS. This study aimed to provide evidence to the MPH, USAID, and the broader community working on HIS on how to integrate key elements of the HIS effectively. This brief reports our study's findings.

[1] Madagascar Ministry of Public Health (MPH). (2017). *Draft feuille de route du sous-comité du système d'information sanitaire.* Antsirabe, Madagascar: MOH.

Research Questions

The general question was whether the various HIS interventions resulted in changes in HIS performance outcomes, particularly malaria surveillance systems. These sub-questions guided documentation and data gathering for the study:

- What is the process to integrate the routine health information and surveillance systems, including capacity building?
- What are the factors that affect integration of the data systems and that affect data analysis and use?
- What are the intended and unintended consequences of integration?
- What is the effect of integration on providers' use of their time, data quality (completeness and timeliness), data use, and quality of care (such as available malaria commodities, adherence to screening algorithms, and staffing)?
- Does the intervention improve the ability to assess/ monitor how the system is performing?

Methods

This study used a process tracing, case-based approach[2] to describe the causal chain between the intervention activities and their relationships with HIS performance outcomes—specifically, malaria surveillance systems. The connections in the causal chain were evaluated against newly generated evidence through primary data collection from focus group discussions (FGDs).

Process Tracing

Process tracing in a global development implementation context involves establishing a hypothesized causal chain linking an intervention to its intended outcome, outlining the steps in between, hypothesizing about the causal links from one step to another, and then testing those hypotheses through document review and primary data collection. In this case, we applied a "theory testing" approach, meaning that the theory was already established that a specific intervention—implementing the activities outlined in the Road Map—would lead to the intended outcome, which we defined as "an efficient, unique and integrated health information system" based on the Road Map. The causal mechanism was developed using FGD data to inform the theoretical steps, or components, linking the intervention to the intended outcome. For each link between components, hypotheses were developed, including at least one "core" hypothesis to explain how one component causes another, and one "alternative" hypothesis, generally representing an opposing explanation. In some cases, more than one core or alternative hypothesis was proposed, and sometimes one or more "bonus" hypotheses. (A bonus hypothesis would represent an additional causal link explanation generally independent of proposed core or alternate hypotheses.)

Primary and secondary data constitute evidence that, if strong enough, contributes either to confirming or disconfirming one or more hypotheses by satisfying one of four possible "tests"[3]. These tests judge the evidence against two qualitative criteria: certainty and uniqueness. While we usually cannot be absolutely certain that a causal mechanism is true, we can be certain that some mechanisms are not. Certainty refers to the ability of some tests to rule out causal mechanisms. Uniqueness refers to the confirmatory power of tests. Unique evidence is a set of observations that would extremely unlikely under other causal mechanism (Befani & Mayne, 2014). The four tests are as follows:

1. **Straw-in-the-wind** (most common; low uniqueness and low certainty): Applied to evidence that is neither necessary nor sufficient to accept a hypothesis, but when considered with other evidence may strengthen the confirmation of a hypothesis; these are the weakest tests
2. **Hoop** (high certainty): Applied to evidence that is deemed necessary to confirm a hypothesis, but is not sufficient on its own; alternatively, it can contribute to disconfirmation of a hypothesis if the test fails
3. **Smoking gun** (less common; high uniqueness): Applied to evidence considered to be sufficient to confirm the hypothesis, but not necessary; it therefore does not disconfirm alternate hypotheses
4. **Doubly decisive** (rare; high certainty and high uniqueness): Applied to evidence considered to be both necessary and sufficient to confirm the hypothesis, to the extent that it eliminates all other competing hypotheses; these are the strongest tests

Ultimately, conclusions generally also depend on the evaluator's knowledge of the context and interpretation of the data.

[2] For more information on process tracing: http://betterevaluation.org/evaluation-options/processtracing.

[3] For more information on process tracing tests, consult Punton & Welles, 2015.

Causal Mechanism

The evaluation team developed the causal mechanism illustrated at the end of this document through exploring the HIS Road Map and studying FGD transcripts from the initial data-gathering visit in February 2018.

Data Collection

The evaluation team spoke to key stakeholders involved in the process of developing the Road Map for the Sub-Committee for Health Information Systems; reviewed key documents, including the Road Map document, project documents from technical and financial partners, such as quarterly reports, and other documents from the MPH, such as the updated 2018–2022 Strategic Plan for Health Information Systems Strengthening; and designed FGD interview guides to generate qualitative data.

As part of the document review, the team developed a Field Tracking Tool to establish an implementation timeline documenting activities as they were accomplished, to align with information collected through qualitative interviews and FGDs.

During four in-country visits, the team gathered qualitative data through the following mechanisms:

- **Scoping visit** (September 2017): To conduct key informant interviews to understand stakeholders' questions and obtain their buy-in, identify local partners; identify potential comparison groups for study design purposes; identify data sources, etc.
- **FGD workshop** (February 2018): To better understand the HIS context in Madagascar and inform stakeholder mapping and model building through a systematic data collection process to document the nature of the interventions, institutions and stakeholders, context and behaviors, and other factors (e.g., human resources, finances, political will, geography, etc.) that influence implementation of interventions. The team gathered data from nine FGDs with a total of 76 respondents.
- **Process-tracing interview guide pilot testing** (November 2018): To validate the HIS causal mechanism developed to illustrate the process outlined in the HIS Road Map (February 2018) and explain causal links between implementing the Road Map and achieving an efficient, unique, and integrated HIS. The evaluation team conducted two FGDs with a total of 13 respondents to pilot-test the interview guide developed to gather primary data on components of the causal mechanism.
- **Process tracing FGD workshop** (July 2019): To test the theory described in the causal mechanism by gathering data from key stakeholders in directorship and technical positions in Madagascar. We tested hypotheses designed to confirm or disconfirm the causal links between each of the six components of the causal mechanism. The team gathered data from seven FGDs with a total of 42 respondents.

All but two of the FGDs were divided into director-level or technical-level respondents. (The FGDs in November 2018 to pilot-test the interview guide involved both groups of respondents. Because we did not track their comments by respondent type, where they are quoted below, we cite them simply as "Pilot.") All interviews were conducted in a mix of French and Malagasy, recorded, transcribed into French, and then translated into English.

Data Analysis

A coding key was developed, assigning color codes to each hypothesis across the six causal mechanism components. FGD data, including those from pilot FGDs, were coded by systematically applying the codes to the interview transcripts manually. The coded data were then mapped to the relevant hypotheses and evaluated to determine what type of evidence they provided and therefore what type of test they satisfied. Based on this mapping, the data were interpreted to confirm or disconfirm each hypothesis.

Limitations

The study used a method that has not been widely adopted in global health or HIS scenarios. The method is typically applied to a past event with a clear outcome, but in this case, it was applied to an evolving series of intervention activities. The study team attempted to apply the implementation for as long a period as possible, stretching the three data gathering trips across 17 months, so that as much of the Road Map implementation as possible would have taken place according to the timeline established in the Road Map document. However, the study was limited to the overall MEASURE Evaluation project timeline. As a result, the findings pertaining to Components 5 and 6 in the causal mechanism, closest in time and process to the intended outcome, could be strengthened in future data gathering efforts. This assessment was purely qualitative and did not include a quantitative component. This may be something to consider for future, similar assessments.

Additionally, the pilot-testing FGD workshops (November 2018) may not have gathered the intended audience as

respondents. The team planned one of these workshops for director-level respondents and another for technical-level respondents, expecting to pilot-test the process-tracing, hypothesis-testing interview guide with stakeholders who had knowledge of the HIS Road Map development process, and who ideally had not only participated in the February 2017 workshop in Antsirabe at which the Road Map was drafted, but who also had subsequent knowledge of the implementation process. The reality is that unless an event is high-profile, with buy-in at the highest levels, key informants may send delegates, and this is what we observed. Director-level participants did not turn out as we had hoped, and even for technicians, the knowledge of the Road Map implementation process was not as thorough as we anticipated. This FGD experience contrasts with that of the February 2018 and July 2019 workshops. In each case, the Secretary General for Health supported the workshop, bolstering attendance by the intended key invited respondents.

Findings

Data provided multiple pieces of evidence on which to base confirmation or rejection of most hypotheses. More evidence was generated for Components 1–3 than for Components 4–6. The findings supported confirmation of the hypotheses represented in Table 1, which are termed "causal links."

Table 1. Causal mechanism in six components with accepted causal links

Intervention: Implementation of the Road Map for the HIS Sub-Committee **Outcome:** An efficient, unique, and integrated health information system*	
Component 1: Design and implement procedures and mechanisms for institutional strengthening of HIS.	
Causal link to 2:	The stakeholder workshop for the implementation of the HIS sub-committee galvanized efforts to put in place procedures and mechanisms for institutional strengthening of HIS.
Component 2: Lead the process for development, updating, and launch of tools, guides, training plans, supervision plans, data quality assurance system.	
Causal link to 3:	The technical working groups (TWGs) know their tasks and now that they are organized, they are carrying out their scope, which includes leading the process for developing, updating, and launching relevant materials.
Component 3: Develop and implement plans to enhance competence of officers responsible for management and use of data and use of information at all levels	
Causal link to 4:	Availability of tools and guides improves in part the competence of the officers through trainings and helps them master the tools.
Component 4: Increasingly engage officers in data demand and use.	
Causal link to 5:	Development of these programs to improve officer competence permits them to make decisions on a factual basis. AND Ongoing supportive supervision is an essential activity to reinforce officer capacity building for data demand and use.
Component 5: Implement strategies to create a culture of data use for decision making.	
Causal link to 6:	Stakeholders in leadership positions—especially MPH, with implementing partner (IP) support—see that the groundwork has been laid and the time is right to push forward strategies to promote a culture of data use.
Component 6: Craft and shape use of a communication platform, including availability of dashboards, bulletins, and regular data sharing meetings.	
Causal link to Outcome:	GOM and IPs are no longer proprietary with their data but see the value of sharing, so they initiate dissemination elements.

* Specific objectives:

- Ensure the permanent availability of necessary resources.
- Make available a harmonized and coordinated HIS for the production of high-quality data at all levels.

Component 1: Design and implement procedures and mechanisms for institutional strengthening of HIS

Causal link to 2: The stakeholder workshop for the implementation of the HIS sub-committee galvanized efforts to put in place procedures and mechanisms for institutional strengthening of HIS.

Most of the evidence supporting this causal link satisfied hoop tests, with some additional support from straw-in-the-wind tests, and several strong quotes constituting smoking gun tests. Overall, the evidence strongly supported accepting the hypothesis that the stakeholder workshop held in Antsirabe in February 2017, which resulted in drafting the HIS Road Map document, substantially influenced subsequent HIS strengthening activities. Respondents drew clear connections between this workshop and HIS strengthening:

> *So, there is a relationship between the Antsirabe workshop and institutional HIS strengthening. Because of the workshop, all that could be implemented, as well as the schedule for implementing the Road Map.* —Technician

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> *Yes, it really stimulated efforts in this direction. . . It strengthened the health information system, that's when it all started. . . From collection to transmission, utilization to decision making. Everything had to start from the procedural standards.*
>
> —Technician

Additionally, respondents indicated that without the workshop and the resulting HIS Road Map, HIS strengthening efforts would have been unlikely to roll out, or to have rolled out in a thorough and coordinated manner. Stakeholders can be confident that everyone is following the same strategic plan and procedures.

> *The workshop really was necessary! Because there were no standards or procedures, it's as if everything was done blindly. It was necessary, and it is good to always refer to these documents because these things have been developed, with these 2018–2022 strategic plans and information system to make sure everything is based on them …. Without them, we would have been working blindly and there would have been no harmonization of the health information system and. . .* —Technician

> *The connection may be that it was that workshop that helped determine the direction of the HIS in Madagascar. We did a lot of programming during that workshop. Setting up institutional strengthening, and setting up all those mechanisms… The procedures manual for the health information system in Madagascar. In other words, that was the foundation for everything that was done.* —Pilot

It is worth noting that there was some evidence to support the alternative hypothesis, that the GOM and in-country stakeholders were implementing HIS strengthening efforts prior to the Antsirabe workshop and Road Map development. However, the evidence does not overwhelm the conclusion that the workshop played a strong role in stimulating progress to an appreciable extent.

Component 2: Lead the process for development, updating, and launch of tools, guides, training plans, supervision plans, and a DQA system.

Causal link to 3: The TWGs know their tasks and now that they are organized, they are carrying out their scope, which includes leading the process for developing, updating, and launching relevant materials.

Most of the evidence for this causal link satisfied only hoop or straw-in-the-wind tests. Overall, however, evidence points to its confirmation. Several respondents indicated that without established TWGs, the necessary work to develop, update, and launch key HIS strengthening documents would not have happened. The TWGs completed the technical work as a coordinated body of stakeholders and organized validation processes.

> *If there hadn't been a TWG, there wouldn't have been any of these documents. That's what we were saying, that the information system didn't have any movement from 2000 through 2015.* —Technician

> *A tool doesn't just appear out of nowhere, without a group creating it. A tool isn't designed by a single individual. This is precisely what a working group does.* —Technician

> *I wouldn't want to guess what would have happened if the TWG didn't exist. In fact, when there are activities to be done, all ministry directorates were consulted and all partners were involved. So I think that we have achieved something we should keep at all costs: complete involvement. That way, the people who were there from the beginning know the whole process perfectly well, and those who join along the way can follow along and gradually take ownership.* —Director

Respondents had a clear understanding of the TWG roles and pointed to specific tasks and accomplishments under their aegis, from developing and updating key data quality

documents to the next steps, including dissemination and training.

> *To my knowledge, the tools have been updated. And I think there is a TWG specially dedicated to that.*
> —Director

> *Within the HIS subcommittee… there was a data quality TWG responsible for the development of tools. The way that was adopted to do this are the workshops and weekly meetings. It seems like it was even once a week at the time. All that was done at the weekly meetings was develop the document. The document was developed little by little for each point. There was an outline to follow that was completed. An outline of the dimensions of data quality, what data quality dimensions need to be verified? What indicators are to be verified in it? There was also the development of the process, for example, upon verification of data quality, what indicators to choose, etc. And these documents were developed at all levels.*
> —Technician

> *These documents, it was after the TWG that there was an improvement in data quality. There was a training done. There were some trainings, and what was seen is that improvement in the quality of the data really requires some work. And these documents have now been distributed and are already being used.*
> —Technician

While the FGD evidence supports confirming the core causal link, key informant evidence also indicates that although TWGs under the HIS sub-committee were outlined at the workshop in Antsirabe in February 2017, the GOM was still working through the process of officially accepting documentation to establish the TWGs and their respective terms of reference in July 2019. However, they have been meeting ad hoc as needed since before September 2018. There is also some FGD evidence supporting the hypothesis that the necessary HIS strengthening work would have taken place without establishing TWGs, but overall the evidence more strongly supports confirmation of the causal link stated above.

Component 3: Develop and implement plans to enhance the competence of officers responsible for management, use of data, and use of information at all levels.

Causal link to 4: Availability of tools and guides improves in part the competence of the officers through trainings and helps them master the tools.

Evidence was less strong for this component than for the first two. It was strongest for the alternative hypothesis, which is listed here as the causal link, rather than the core. No smoking gun test was satisfied, but collected hoop and straw-in-the-wind tests point to confirming this causal link. Respondents mentioned that HIS-related trainings have happened, and point to health officers' mastery of tools and data quality improvement as a result.

> *…when an individual is trained, he will acquire knowledge, so he will provide a better quality of data. When the data are better, the information is better, which helps decision makers make good decisions.*
> — Technician

> *In any case, it is from the base that decisions are made, from the data. This has been put into practice at all levels. Plus, the way of checking data quality has also been put into practice, meaning "how to ensure that the data are good, what to do when they aren't, who should be notified, and where the data you have collected go." So all this has been done at all levels.*
> —Technician

> *You can't say… that it changed overnight... but it's getting better and better…. It gets better. Every time we do a supervision, a visit, we realize that this is well done; this has changed.*
> —Technician

All FGDs included respondent discussion on data quality, demonstrating a clear understanding of the desired trajectory from training to developing data skills to producing high-quality data. They acknowledged the process of learning new software and tools and its role in enhancing data demand and use.

Component 4: Increasingly engage officers in data demand and use.

Causal link to 5: Development of these programs to improve officer competence permits them to make decisions on a factual basis.

AND

Ongoing supportive supervision is an essential activity of reinforcing officer capacity building for data demand and use.

One core and one bonus hypothesis were accepted as causal links. The evidence for these links is weakened by the fact that almost none passes a smoking gun test. Nonetheless, the team confirms that both HIS strengthening programs and supportive supervision contribute to health officer data demand and use.

For the first causal link, "development of these programs to improve officer competence permits them to make decisions on a factual basis," hoop tests prove both that HIS strengthening and data use programs have been developed, and that health officers are making decisions based on data.

> *We talked about how to proceed, for example, the issue of dashboards, which dashboard will be used at the CSB level, which dashboard is needed at the district level, which dashboard is needed at the regional level, which dashboard is needed at the central level. That is, we had to show the relevant and essential indicators in these dashboards in the health system.… We really taught them that it is the data that provide the information for decision-making at all levels, and that decisions aren't only made at the central level.* —Technician

> *These are my goals, will I achieve them? I look at what I'm doing to find out if I can reach them and then think about what I need to do to get there. . . that is, I need to do this and that. Maybe I have to tell my supervisor that I need something, that there are not enough medicines.* —Technician

> *And there really are doctors who have that skill and know how to use the data, and it's easier for them, too, to answer. . . to find solutions to solve the problem.* —Technician

> *The impact of these skill-building programs on decision making, obviously when you are skilled, the results of your work will be better. It's much easier to make clear, proper decisions. That's the consequence.* —Director

The evidence closest to passing a smoking gun test is the following, which shows training leading to data use for decision making, with the caveat that it is not a universal trend.

> *But for those who receive the training, that depends on the health workers, whether or not they apply it. Some use it at the basic health centers. So when you go there to do supervision, there are displays or dashboards that show the number of children, or women who gave birth. . . and especially concerning vaccines, they do that. So that's at a basic health center level, but some also do it as you go up to the district level. . . Sometimes some don't do it, but most do, anyway.* —Director

For the second causal link, which layers on the component of supportive supervision, evidence satisfies hoop tests for one or more of the following: (1) demonstrating that supportive supervision is happening; (2) demonstrating that supportive supervision is reinforcing health officer capacity; or (3) demonstrating that officer capacity for data demand and use is increasing. (Evidence deemed straw-in-the-wind strengthens the conclusion that the hypothesis can be confirmed.)

> *But since data come from the base, we've really noticed that their quality improves after there has been supportive supervision. It's really necessary because that's when we can correct issues of not following standards. That way, the quality of the data they send improves. So there are fewer errors and gap.* —Pilot

> *There is a connection with supportive supervision because the incentives, from what #4 said earlier, that the data are received, here is what is right and what is wrong. And we're also going to tell them that in the long term, these data will be used to make decisions because you told us these things. But what happens is that people just do it, they don't know it has an impact. This supportive supervision can also be used to teach them things. "For this thing you do, something isn't quite right, but for us to achieve this goal, we must correct these data like this, because there is a goal to achieve."* —Director

The strongest evidence comes from a technical-level respondent, who confirms:

> *Yes, it* [supportive supervision] *has a major impact; it leads to improvements. Because after supportive supervision, management tools are used, too. The people trained will have better analysis skills. Everything is aligned to improve the quality of the information.* —Technician

A related theme that emerged but did not specifically fit into the proposed causal links was the feedback loop, which was linked to worker motivation. Throughout the FGDs, respondents discussed the necessity and positive effect of feedback about data quality on health workers and their performance, not only with regard to data quality, but in terms of subsequent program performance. Feedback from those higher up the data chain was not the only motivator mentioned. One respondent described a health worker who had wanted to move posts, but had been stuck for years, resulting in a "why should I care" attitude (director).

Component 5: Implement strategies to create a culture of data use for decision making.

Causal link to 6: Stakeholders in leadership positions (especially GOM, with IP support) see that the groundwork has been laid and the time is right to push strategies forward that promote a culture of data use.

While evidence thinned over the course of the FGDs, there was still enough support to confirm one of the proposed core causal links between Components 5 and 6. The following pieces of evidence pass smoking gun tests, showing that leadership has been key in promoting a culture of data use:

> *What I would like to talk about is the model that the Minister and the SG* [Secretary General for Health] *are showing us, which highlights the culture of data use. They very much insist on the regular use of data, and not only when it's convenient for those in charge. This is an example that should be repeated. And the model of the upper level of the hierarchy is reflected in all the levels. If those at the top don't care about this data use, no one will give it any importance.* —Director

> FACILITATOR: . . . *do decision makers promote such strategies to develop a culture of data demand and use?*
>
> PARTICIPANT: *If we all listened carefully to the SG's opening remarks earlier, this is clearly the case!* —Technician

These are supported by other evidence satisfying either a hoop or straw-in-the-wind test:

> *In fact, this culture of data use is already being spread. . . everyone uses the data they have at their own level, all from the lowest level, from the basic health centers to the top. Everyone uses data, like, "If I have this here, what will I do with it?". . . we've really gotten everyone used to this, so everyone contributes to it, whether it's the Ministry or the TFPs* [technical and financial partners]. —Technician

> *One part of the strategies decision makers use to approach data use is the demand for a dashboard, which is often found with health statistics. The demand for a type of dashboard for a given situation, that we send them periodically. Second, management has to back the newsletters that are published. These are also part of a strategy to promote a culture of data use.* —Pilot

However, there was some evidence to support the hypothesis that this evolution of a culture of data use is taking place somewhat geographically disparately, indicating there is still work to be done:

> *But we see and feel that this is still not enough and that this* [culture of data use] *must be strengthened at different levels, of all kinds. It exists, but we can see that it needs to be strengthened.* —Technician

> *As far as I know it, [*a strategy to encourage a culture of data use] *isn't really widespread, you know. . . because while it's true that. . . ,for example, the district head, they know it exists. But we have to follow up to find out if this data use is being put into practice.* —Director

Component 6: Craft and shape use of a communication platform, including availability of dashboards, bulletins, and regular data sharing meetings.

Causal link to outcome: MPH and IPs are no longer proprietary with their data but see the value of sharing, so they initiate dissemination elements.

Evidence for this causal link was perhaps weakest. Nonetheless, data from several respondents satisfied hoop tests, describing various modes of dissemination and indicating regular stakeholder use of them.

> *Dissemination of information is included in the overall feedback, bulletins, or an annual report.* —Director

> *One part of the strategies decision makers use to approach data use is the demand for a dashboard, which is often found with health statistics. The demand for a type of dashboard for a given situation, that we send them periodically. Second, management has to back the newsletters that are published. These are also part of a strategy to promote a culture of data use.* —Pilot

> *Take the HIS, DHIS2, for example; that's a type of platform. After data were lost or not used, we set up the platform with the sole goal of increasing utilization of these data. And as a result, we all use a new platform.* —Pilot

Additional evidence is gleaned from the Field Tracking Tool, which is aligned with the activities listed in the HIS Road Map and populated primarily with achievements available through MEASURE Evaluation quarterly reports. These data clarify the processes of developing and issuing monthly bulletins, bringing the annual health statistics reports up to a current status, and developing the GESIS web portal. The portal was designed to allow all MPH departments to access health data from 2015–2017 imported from the GESIS database.

Conclusions

The evaluation team confirmed one potential causal pathway from the proposed hypotheses, linking the intervention to the outcome, using data from project documents and FGDs with director-level and technical-level stakeholders in Malagasy HIS. The process began with the intervention of implementing the Road Map for the HIS Sub-committee for Health Information Systems, and while the end of the path has not been reached, the outcome of an efficient, unique, and integrated HIS is well within reach.

Key contributors to moving the process forward are:

- Leadership at the highest levels of government
- Structure to guide the path, such as development of the Road Map for the Sub-committee for Health Information Systems
- Stakeholder buy-in for an HIS strengthening strategy
- Coordination across stakeholders, from the GOM to health regions, districts, and facilities, to technical and financial partners
- Supportive supervision, particularly for health officers in peripheral health facilities
- Investment in standardizing tools and software and providing training

Recommendations for Other Contexts Based on Madagascar's Experience

One purpose of implementing a process tracing approach is to generate in-case evidence that could potentially be generalized to other, like scenarios. While we cannot definitively state that this exact approach would work in any other country seeking a template for a harmonized and integrated HIS, many aspects of Madagascar's approach should be considered:

Technical/Infrastructure Inputs:

- Designing an online interface that allows stakeholders access to relevant data in as close to real time as possible
- Prioritizing allocation of resources for data collection infrastructure, such as standardizing tools, implementing a system such as DHIS2, providing appropriate computer hardware, and supporting electricity and Internet where needed

Government-Stakeholder Communication:

- Ensuring that technical and financial partners are consulting with the government and designing plans aligned with the current strategic plan
- Designing official communications from the government to stakeholders in the health system to codify key decisions, such as establishing TWGs or outlining an official shift to a new data collection system
- Working with partners that can help advocate technical and financial support for specific activities

Supportive Supervision:

- Prioritizing supportive supervision and feedback on submitted data to complement training, improve data quality, and enhance data demand and use

Recommendations for Madagascar

Additional areas for potential improvement or streamlining emerging from the evidence in Madagascar are the following.

Dissemination of Key Policy and Implementation Materials

Not all respondents were up to date on the evolution of the Road Map implementation. This concern took several forms, from not having heard any follow-up since the workshop in Antsirabe, to concerns about dissemination of updated standardized data collection tools, to uncertainty as to whether TWGs were established and functional. It is worth considering how to ensure that information is adequately communicated.

Human Resources

Trainings have rolled out for DHIS2, and supportive supervision was highlighted by respondents as a key influence on improving data quality and augmenting data use. It is clear that when health officers are invested in improved health outcomes, they are invested in the work it takes to achieve those improvements. Understanding health officer concerns and determining where those concerns align with feasible improvements could contribute to a plan to further enhance health worker engagement on data demand and use. Considering how to address the inevitable problem of trained professionals moving on to be replaced by professionals who have not had the same training opportunities is crucial.

Madagascar Learning Agenda: Macro–Level Causal Mechanism for HIS Integration								
	Intervention	**1**	**2**	**3**	**4**	**5**	**6**	**Outcome**
Component	Implementation of the Road Map for the HIS Sub-committee	Design and implement procedures and mechanisms for institutional strengthening of HIS	Lead the process for development, updating, and launch of tools, guides, training plans, supervision plans, DQA system	Develop and implement plans to enhance competence of officers responsible for management and use of data and use of information at all levels	Increasingly engage officers in data demand and use	Implement strategies to create a culture of data use for decision making	Craft and shape use of a communication platform, including availability of dashboards, bulletins, regular data sharing meetings, etc.	An efficient, unique and integrated HIS*
Assumptions	Workshop took place, Road Map written			IT equipment, software, and DHIS2 warehouse are available (Strategy 2, Strategy 8)				
Related strategy (see list below)		**Strategy 1**	**Strategy 3,4**	**Strategy 5**	**Strategy 6**	**Strategy 6**	**Strategy 7**	
Actor		**GOM leadership and MEASURE Evaluation [national]**	GOM and stakeholders (IPs) [national]	GOM, IPs at technical / implementation level [regional, district]	GOM, IPs [national down to facility?] and newly competent data managers and health care workers (data users and data producers)	GOM, IPs	GOM, IPs	
Data source(s)			FGDs, activity documentation	FGDs, activity documentation	FGDs, activity documentation	FGDs, activity documentation	FGDs, activity documentation	FGDs, activity documentation

* Specific objectives:

- Ensure the permanent availability of necessary resources.
- Make available a harmonized and coordinated HIS for the production of high-quality data at all levels.

HIS Road Map Strategies

Strategy 1.	Institutional strengthening of HIS (governance: structure, standards and procedures, strategic documents/HIS)
Strategy 2.	Establishment of an effective information technology (IT) platform for HIS support (availability of IT equipment, performance of IT tools/software)
Strategy 3.	Development or updating of tools or guides for the management and use of information (management tools, management manual, training plan, supervision plan)
Strategy 4.	Development of a data quality assurance system (monitoring and evaluation, supervision, verification, quality control, validation and transfer, retro-information)
Strategy 5.	Enhanced competence of officers responsible for management and use of data and use of information at all levels
Strategy 6.	Creation of a culture of data use for decision making
Strategy 7.	Creation of a platform for sharing and disseminating information (Internet, periodic bulletins, periodic reviews) with easy access by all users
Strategy 8.	Implementation of the DHIS2 software at the central level for data warehouses, fed periodically by the various official databases
Strategy 9.	Mobilization of resources and sustainability

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