Botswana's Integration of Data Quality Assurance Into Standard Operating Procedures

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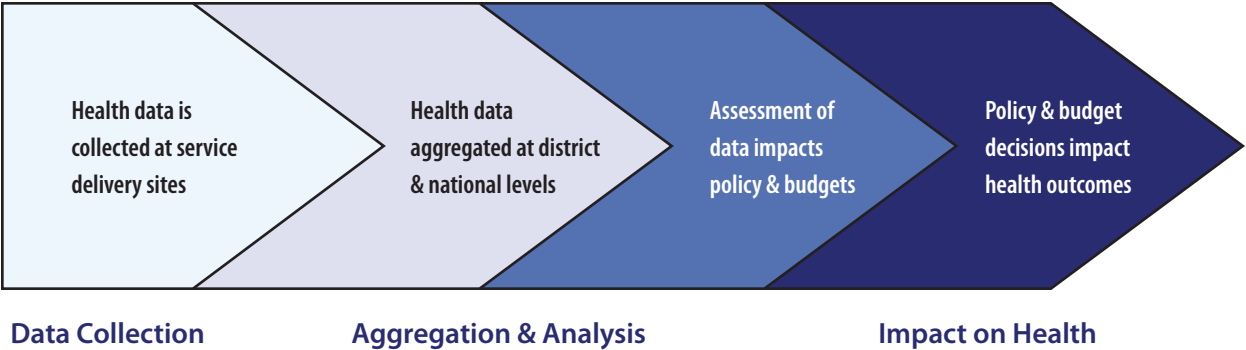
ACRONYMS

B-RDQA   Botswana Routine Data Quality Assessment
DHMT   District Health Management Team
DQA   Data Quality Audit
HIS   Health Information System
M&E   Monitoring and Evaluation
MoH   Ministry of Health
RDQA   Routine Data Quality Assessment
SOP   Standard Operating Procedure
ToT   Training of Trainers

INTRODUCTION

The ability of health system stewards to make strategic decisions is impacted by the quality of their health data. At the national level in Botswana, data ultimately inform budget and policy decisions. At the District Health Management Teams (DHMTs) and service delivery sites, data enable providers and Monitoring and Evaluation (M&E) Officers to understand the broader health activities and priorities in their respective areas. The progression from data collection, to aggregation and analysis, to its impact on health is described in Figure 1.

Figure 1: Data & Health Impact

| Health data is collected at service delivery sites | Health data aggregated at district & national levels | Assessment of data impacts policy & budgets | Policy & budget decisions impact health outcomes |

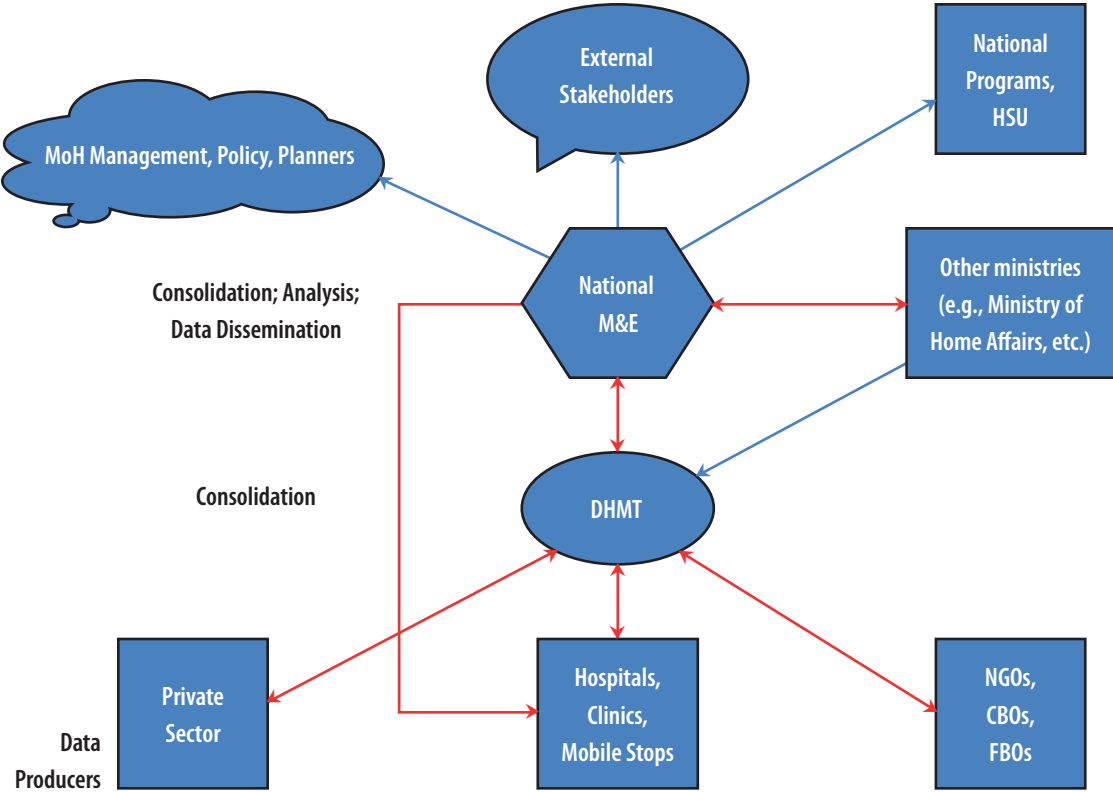**Data Collection** **Aggregation & Analysis** **Impact on Health**

To support improved data quality throughout the health system, the Botswana Ministry of Health (MoH) collaborated with experts from MEASURE Evaluation to develop a national procedure for routine monitoring of data quality and providing specific guidance on developing action plans to address challenges, using a bottom-up approach.

This case study documents the collaborative process between MEASURE Evaluation and the Botswana MoH for writing the standard operating procedures (SOPs) related to data quality, adapting the global Routine Data Quality Assessment (RDQA) tool, and developing and implementing a training curriculum to support the roll out of the new SOPs and tool, highlighting resources required to support the activities and lessons learned for future country adaptations.

BACKGROUND: BOTSWANA DATA FLOW

Botswana health data currently flow through more than 39 different information systems, both electronic and paper-based, that feed into various data management systems. Some data are centralized to a single database, while others are aggregated at various levels through different data management procedures. With the creation of a National M&E Unit inside the Department of Health Policy, Monitoring and Evaluation, the MoH is working to streamline processes and move towards a more efficient data flow. The ideal data flow for the Botswana MoH is illustrated in Figure 2. A key feature of the new information system is that health data will not only flow upstream to higher levels (service delivery to district to national), but also downstream for decision making purposes at all levels of the health system.

Figure 2: Ideal Botswana Health Data Flow

METHODOLOGY

The core objectives of the collaboration between the MoH and MEASURE Evaluation were to:
1. describe the process for ensuring data quality at the service delivery, district, and national levels, and
2. provide guidelines for data quality monitoring procedures.

Botswana chose to adapt the global RDQA tool for routine monitoring of data quality instead of the Data Quality Audit (DQA) protocol, which is designed as a more formal evaluation (audit) of data quality within a programme area. The RDQA approach, on the other hand, provides the flexibility to be used at the discretion of the many stakeholders within the health system. The data quality protocols in Botswana were developed to ensure basic measures would be taken to ensure accuracy, timeliness and completeness of health data throughout the health system. The Botswana adaptation of the RDQA is unique as it provides a national protocol for routine data quality assessment across various levels of the health system, and also across programme areas. Past applications and adaptations of the RDQA have focused exclusively on a single health programme or on integrated programme areas (e.g., water and sanitation, nutrition, family planning and logistics system), but have not been conducted using a single customized national tool applicable to any programme area with source documents.

The RDQA includes two components: system assessment and data verifications. The system assessment is designed to assess the strength of important functional components of an M&E system (e.g., training, data reporting forms and tools, etc.) which will subsequently be discussed in more detail. Data verifications assess the accuracy, completeness, and timeliness of data for up to four indicators in a given programme. Any four indicators can be selected as long as they are all collected on the same source documents (e.g., patient registers).

The RDQA is implemented at the service delivery site, health district, and national levels. The tool is designed to be used by district level staff as part of routine supervisory visits to health facilities, where they collect data on data quality performance indicators using the tool. Once the data are collected, they are extracted from the tool, analyzed, and used to generate recommendations for improvements and an action plan for the facility or district where the tool was applied. These system strengthening measures include specific action items, personnel responsible and a timeline for completion, and are revisited in follow-up visits by the program to ensure they are carried out.

All of the data and recommendations are compiled into a summary report on the findings, and all sites where assessments were conducted receive an individual site briefer with their data and action plan. The data quality SOP directs staff to then add the data and the final reports to the national data repository for easy reference later by program stakeholders.

Ultimately, the adaptation and implementation of the RDQA and associated SOPs will help ensure the quality of health data being transmitted in Botswana, permit the monitoring of those data quality performance indicators over time, and define responsibilities for data quality at each level of the health information system. Through collaboration between MEASURE Evaluation and MoH, the process leveraged the knowledge and familiarity of the Botswana data systems and needs from key stakeholders, both internal and external to the ministry, and the data quality expertise from MEASURE Evaluation staff.

The development of the protocols and curriculum was conducted in collaboration with the MoH over the course of one year as shown below:

- **January:** established the scope of work and objectives
- **February through March:** developed the Botswana Routine Data Quality Assessment (B-RDQA) tool and drafted the SOPs
- **April:** pretested the B-RDQA tool and reviewed the draft SOPs
- **May:** finalized the B-RDQA tool and revised the SOPs
- **June:** finalized the SOPs
- **July through October:** developed the data quality curriculum
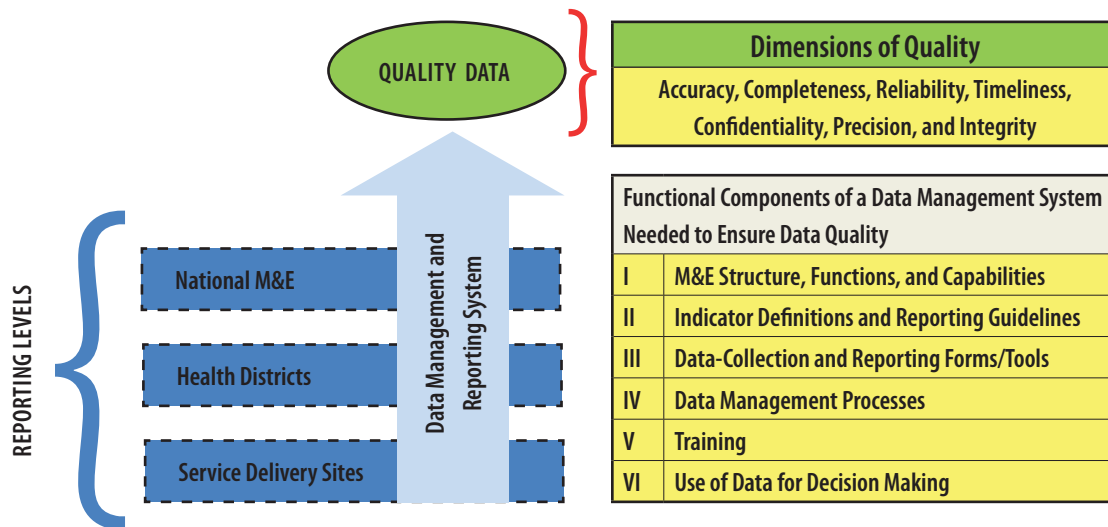- **November:** conducted the first data quality training workshop

Key deliverables in the process included two SOPs, a customized Excel tool, a user manual for the tool, and a complete data quality curriculum. A detailed description of each deliverable is included in Table 1 below, and additional information about the process for developing each of the deliverables is included in subsequent sections.

Table 1: Key Data Quality Deliverables

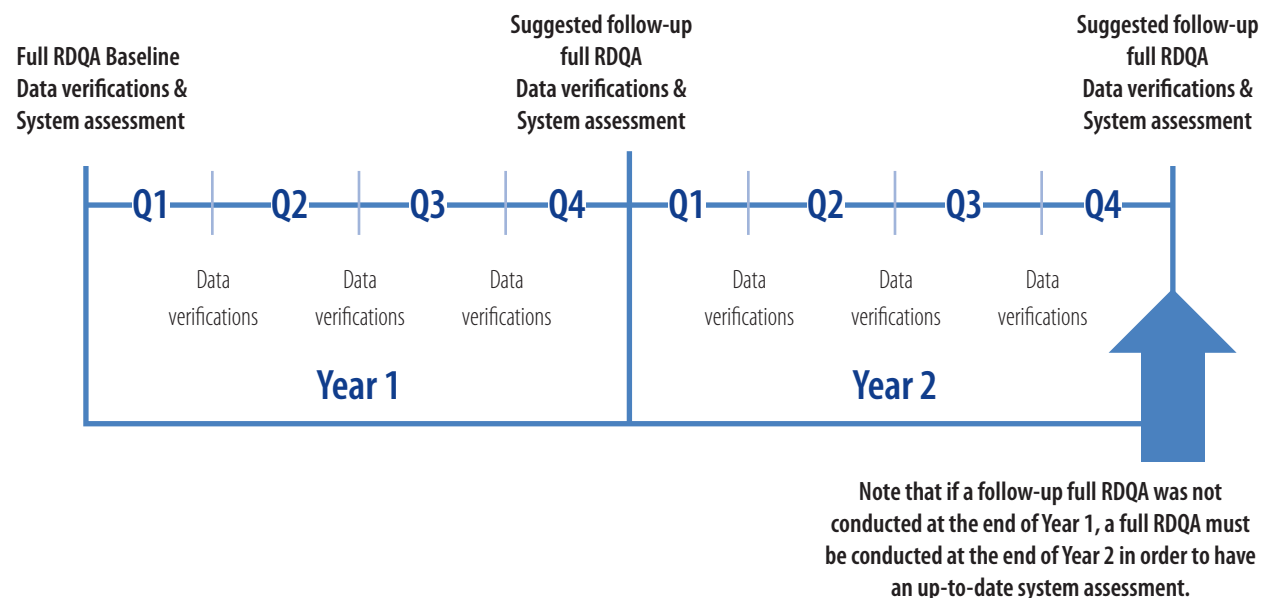| DELIVERABLE	DESCRIPTION
Data Quality SOP	General, high level protocol for ensuring data quality at the service delivery, district, and national levels. It includes guidelines for data management procedures to ensure accuracy, completeness and timeliness of health data being transmitted in Botswana; ensures consistency in indicator definitions; and defines responsibilities for data quality at each level of the health information system.
Routine Data Quality Assessment SOP	Protocol for the implementation of RDQAs as a monitoring tool to routinely assess the quality of data at the service delivery, district, and national levels. It includes instructions on when assessments should be conducted; who is responsible for conducting assessments; and how data from assessments should be reviewed and used to inform action plans to improve data quality.
B-RDQA Tool	The global RDQA Excel tool customized to reflect Botswana's local needs, such as reporting structure and key functional areas.
B-RDQA Tool User Manual	Detailed guidance on the implementation and results dissemination for the B-RDQA Tool when conducting an RDQA for up to four indicators within any health programme.
Data Quality Curriculum	Curriculum for use in MoH trainings on data quality, including presentations, exercises, and a full participant's guide. The curriculum covers the content of the two SOPs and the use of the B-RDQA tool for routine data quality assessments.

A global conceptual framework for data quality was adapted to reflect the Botswana data flow and priorities within the country's M&E system. Specific changes were made to ensure that the language used for the reporting levels reflected the Botswana data flow from service delivery sites (e.g., health facilities) to health districts (e.g., DHMTs) to the National M&E Unit. The dimensions of data quality remained consistent with the original framework. The functional components to ensure data quality, however, were revised to reflect the language and local context within Botswana, as well as extract training as a separate component. Furthermore, a sixth functional component, use of data for decision making, was added at the request of the MoH. An additional set of questions was included in the System Assessment sections of the B-RDQA tool to capture this new functional component.

Figure 3: Botswana Conceptual Framework for Data Quality

QUALITY DATA

Dimensions of Quality
Accuracy, Completeness, Reliability, Timeliness, Confidentiality, Precision, and Integrity

REPORTING LEVELS
- National M&E
- Health Districts
- Service Delivery Sites

Data Management and Reporting System

	Functional Components of a Data Management System Needed to Ensure Data Quality
I	M&E Structure, Functions, and Capabilities
II	Indicator Definitions and Reporting Guidelines
III	Data-Collection and Reporting Forms/Tools
IV	Data Management Processes
V	Training
VI	Use of Data for Decision Making

Together, MEASURE Evaluation and the MoH also determined a timeline for conducting data quality assessments (Figure 4). This timeline indicates that a full RDQA, including a system assessment and data verifications, should be conducted annually to track trends and progress in the various functional areas, and data verifications alone should be conducted on a quarterly basis. Additional details about the timing of reports related to each assessment were included in the protocols.
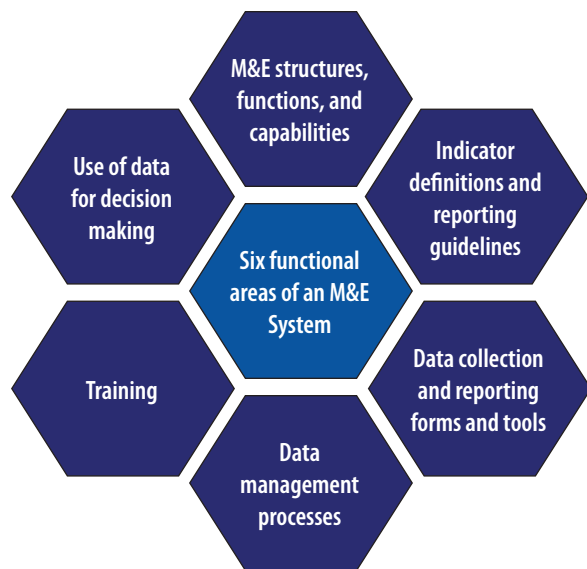
Figure 4: Timeline for implementation of RDQA

Full RDQA Baseline
Data verifications & System assessment

Suggested follow-up full RDQA
Data verifications & System assessment

Suggested follow-up full RDQA
Data verifications & System assessment

Q1 — Q2 — Q3 — Q4 — Q1 — Q2 — Q3 — Q4

Data verifications   Data verifications   Data verifications   Data verifications   Data verifications   Data verifications

Year 1   **Year 2**

Note that if a follow-up full RDQA was not conducted at the end of Year 1, a full RDQA must be conducted at the end of Year 2 in order to have an up-to-date system assessment.

ADAPTATION OF THE B-RDQA TOOL

The B-RDQA Tool is an Excel tool with multiple worksheets for a user to complete to verify data at various levels of the health system and conduct a system assessment to evaluate the key functional components of the M&E system. The adaptation of the tool included a customization workshop in April 2012, where specific recommendations were made on content changes to reflect the needs of the MoH. One of the significant additions to the tool was the addition of the "use of data for decision making" functional area in the system assessment component of the tool, as noted in the earlier discussion of the data quality framework adaptation. The importance of this component was reinforced in subsequent consultative workshops and at the November 2012 training, where district M&E Officers identified the use of data for decision making as a key challenge.

Figure 5: Functional Areas of the M&E System

Following the customization workshop, the B-RDQA tool was pretested in the field at all three levels of the health system to ensure that the questions were meaningful and the tool was easy to use. Since the data were not going to be analyzed, the pretest sites were selected for accessibility, i.e., convenient location, and availability of staff to assist in the pretest. The site visits took a half day and were scheduled in the morning, followed by a meeting in the afternoon for the teams to share their experiences and provide feedback on the tool.

MEASURE Evaluation staff acted as team leaders for each of the three teams, while the other members were selected from participants of the customization workshop. The national team, consisting of staff from the National M&E Division, pretested the tool at the national level with the Family Planning and Reproductive Health Programme. The district team, consisting of two programme M&E Officers, pretested the tool at a nearby DHMT. Lastly, the facility team, consisting of two district M&E Officers, pretested the tool at two facilities in Gaborone.

STANDARD OPERATING PROCEDURES

The SOPs for data quality and RDQA and the B-RDQA Tool User Manual were drafted for review while the final B-RDQA Tool was being customized. Originally, the team envisioned one comprehensive SOP and user guide. To make the documents more user-friendly, the SOP was divided into two SOPs and a user manual.

The data quality SOP was written as a high level document on the various dimensions and considerations of data quality, intended for senior MoH officials, policymakers, and other MoH personnel or contractors engaging in health information activities for the MoH. The RDQA SOP was written as a general protocol for conducting an RDQA, including responsibilities by level, intended for any MoH or district official responsible for initiating, managing or conducting routine assessments. The B-RDQA Tool User Manual was written specifically for those staff implementing the B-RDQA tool and conducting assessments in the field.

Draft SOPs and a draft user manual were reviewed and discussed with stakeholders at consultative workshops in June 2012. Both Ministry and external stakeholders participated in the consultations. Day one of the consultations included national and international representatives from the Ministry of Health, Centers for Disease Control and Prevention/Botswana, UNICEF, and other organizations. Attendees on the second day were from various organizations within the MoH, including district health officers. The input from the district health officers was particularly valuable, as it pointed to modules within the SOPs and the user manual that needed additional description or language to communicate protocols clearly.

Following the consultative workshops, MEASURE Evaluation staff made a presentation about the SOPs and the B-RDQA Tool to the MoH Management Team and provided copies of the SOPs for their review. While comments were minimal, the support of the Management Team was important for continuing the momentum behind the implementation of these protocols. The documents were finalized based on the recommendations from the workshops and meetings with the MoH team members. Final documents were printed in-country for distribution by the MoH.

DATA QUALITY CURRICULUM & TRAINING

A complete curriculum was developed by MEASURE Evaluation to train national and district M&E Officers on how to implement and use the SOPs and the B-RDQA Tool. MEASURE Evaluation led the curriculum design and development because of their depth of experience in developing various curricula and their multi-country experience in implementing the RDQA. The curriculum outlines a two and a half day training and comprises a balance of presentations and hands-on exercises that give attendees first-hand experience using the tool, interpreting outputs, and developing action plans. As the modules, presentations, and exercises for the curriculum were developed, they were shared with the team members at the MoH for their review and approval.

One of the most challenging exercises to develop was the sample data verification exercise, as the exercise required selecting a sample programme and procuring data collection forms and aggregated reports, as appropriate, from the national, district, and service delivery levels. In the end, blank data collection forms for the mental health program (selected for its reasonable number of patients in each reporting period) were supplied by the MoH and MEASURE Evaluation created sample data to be used for the exercise. Care was taken in the development of sample data and aggregated reports to ensure they were realistic and imperfect, which required more time than expected. The final exercise was one of the best received by training participants though, and gave a real-world experience of conducting data verifications.

The initial training of 22 M&E Officers was conducted in November 2012 by three MEASURE Evaluation staff. A training of trainers (ToT) workshop is planned for March or April 2013. The target participants for the ToT will be staff who attended the initial training and may have already begun the process of implementing the SOPs and conducting RDQAs using the customized tool.

> **"A very good training that came at the right time, providing skills that are sustainable and very easy to use…Bringing out very valuable results to improving health information systems, important to system improvement and decisions making."**

Overall feedback on the first training was very positive, indicating that the SOPs and RDQA process would be useful for use both at the district and national levels as a routine monitoring tool for improving data quality.

Evaluations included valuable feedback on how the protocols would be useful in their work. One trainee wrote, "This training makes our DQA knowledge clear & improved; developed skills that we expected for over a decade." Another, who identified as a district health officer, said, "This [process] will really reduce work burden…very exciting, can't wait to implement. This was one of the best trainings which will really address our district data quality problems."

RESOURCE REQUIREMENTS

Time & cost: The process of developing the SOPs, customized tool, training materials, and conducting the first training took approximately one year. The total cost, primarily in staff time and travel for in-country consultation workshops and training, was approximately US$300,000, funded by the United States Government through MEASURE Evaluation. The expenditures were broken down approximately as 65% staff time, 30% travel expenses for field visits, and 5% materials and printing costs. The MoH was responsible for funding the in-country workshops, including venue, per diems, and transportation costs. Printing of the first set of SOPs and user manual, as well as the training materials for the first training workshop, were included in MEASURE Evaluation's budget. The MoH supported some of the logistics for the consultative workshops and trainings which proved beneficial with respect to them taking ownership of the process.

In retrospect, it would have been beneficial for the MEASURE team to engage more around compiling lists of invitees for the various events and crafting the invitation messages, to ensure participants arrived prepared with the proper equipment and information (e.g., distributing and reading SOPs in advance, bringing laptops to training).

Staff: At the MoH, the newly formed Department for Health Policy, Monitoring, and Evaluation (DHPME) initiated the activities with MEASURE Evaluation. A Principal Health Officer was a key champion for the process, supported by the Chief Health Officer and an M&E Advisor. The MEASURE Evaluation team that worked with the MoH included three Senior M&E Advisors and two M&E Associates.

Travel: A total of four trips were made to work in-country with the MoH and other stakeholders including:
1. January 2012—Planning visit to develop the scope of work.
2. April 2012—B-RDQA Tool customization workshop and pretesting.
3. June 2012—Consultative workshops to finalize SOPs and user manual.
4. November 2012—Training for M&E officers, at the invitation of the MoH.

The collaboration between MEASURE and the MoH highlighted the importance of doing work plans together with in country partners and the need for routine adjustments, and consequently budgets, as time and expectations change. Any changes in activities and timelines need the buy-in of the local partner. For example, the time allocated to conduct the curriculum preparation of a comprehensive two and a half day training was more labor intensive than anticipated, resulting in the need to find the appropriate funds to cover the additional time. In addition, the experience highlighted the importance of setting and holding to various deadlines for deliverables to ensure that the team across the two countries is working collaboratively to move the activities forward.

KEYS TO SUCCESS

Country ownership: The development and implementation of protocols for improving data quality was initiated by the MoH, who approached MEASURE Evaluation for technical assistance to adapt global tools to the Botswana context. The country-led foundation of this process has been essential in connecting with the correct stakeholders to give input and insight.

The MoH invited various stakeholders to the customization workshop in April 2012 and to the consultative workshops in June 2012, identifying who should be present to comment on both the tool adaptation and drafts of the SOPs and user manual. MEASURE Evaluation staff facilitated these workshops and discussions, through the lens of their past work with health information systems and data quality assessments in various countries around the world.

Champions: Also key to the entire process was having a strong champion for data quality activities at the MoH. Without a strong technical voice supporting the investment in protocols to improve data quality, it would have been challenging to find the momentum to support the development and implementation of the protocols.

Decentralization: Finally, the protocols decentralize the process of planning targeted activities to improve data quality, allowing service delivery sites and district-level officials to take ownership of data quality in a systematic and structured way. Service delivery sites and districts develop their own recommendations and action items, putting the power in local hands.

RECOMMENDATIONS FOR FUTURE COUNTRY ADAPTATIONS

Looking forward, the Botswana country adaptation experience provides an excellent framework for other countries interested in adapting these global data quality tools to their own context. Having conducted this adaptation in Botswana, the customization approach has been tested and streamlined, and select deliverables (e.g., data quality training curriculum) could be adapted to other country contexts rather than working from scratch to develop new materials. Other countries interested in conducting a similar adaptation will benefit from the pioneering work initiated by the Botswana MoH.

Collaboration between a team of data quality experts from MEASURE Evaluation and a team at the MoH was essential to the success of this activity. MEASURE Evaluation staff brought years of experience conducting RDQAs in various countries and a deep understanding of the process—particularly essential in developing and conducting the data quality training—while MoH staff understood the Botswana data flow, ongoing changes in MoH structure and policy, appropriate stakeholders to contribute to the design of the SOPs, and the key challenges to data quality in their country. As the MoH was in a transition period, moving M&E activities from the programme units (e.g., family planning, HIV) to a central National M&E Unit, this expertise was particularly valuable. Moving forward, we would recommend this collaborative approach for future adaptations.

As this was the first time MEASURE Evaluation has worked to adapt the data quality assessment protocols for a national context, there were also a number of lessons learned. The division of the large SOP into two smaller SOPs and a very detailed user manual made the information more accessible, and provided the appropriate level of detail to various staff involved in data quality assurance throughout the health system. For example, a district health officer implementing the RDQA could use the User Manual for detailed guidance on using the tool and conducting a site visit, while a senior official at the MoH could refer to the high level data quality SOP to understand the fundamentals of the MoH approach to data quality assurance.

A minimum of a one year time frame is necessary to conduct the various field visits, draft documents, customize a training curriculum, and conduct the trainings. While an ambitious nine month timeline was first proposed, it became apparent as activities were executed that working over the duration of a year is more appropriate for this activity.

Finally, as noted in the curriculum development section, the data verification exercise was particularly challenging to customize to the Botswana system as dummy data had to be created from scratch by the MEASURE Evaluation team. For future adaptations, it would be more straightforward to use actual patient registers with names and identifying information removed, and the related aggregated reports. Using actual registers with real data further improves the real-world feel of the exercise.

CONCLUSIONS

With growing interest and investment in health system strengthening measures, the Botswana adaptation of global data quality tools operationalizes a system for health information system improvements that could be adopted by other countries facing data quality challenges. A challenge, moving forward in Botswana, will be the need for continued implementation support from the MoH. The sustainability of these protocols and the use of the customized tool will rely on continued support—both technical and financial—to train staff and encourage use of the B-RDQA Tool for monitoring data quality. If implemented routinely over the next year and beyond, results of regular system assessments and routine data verification exercises could be analyzed to evaluate the impact of the SOPs and use of the RDQA process.