Bangladesh's Electronic Management Information System: Using Digital Technology to Link Community Data with Facility Data

Case Study

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Cover: Population data collection in Tangail. Photo: Courtesy of rhis.net.bd

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ABBREVIATIONS

CHIS	community health information systems
eMIS	electronic management information system
FWA	family welfare assistant
HA	health assistant
HIS	health information system
HSS	health systems strengthening
icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
ICT	information communication and technology
M&E	monitoring and evaluation
MIS	management information system
MOHFW	Ministry of Health and Family Welfare
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
USAID	United States Agency for International Development

INTRODUCTION

Strengthening community health information systems (CHIS) entails improving the case management data collection tools used by community health workers and the performance monitoring tools used by their supervisors. By strengthening these tools, the quality of information flowing into the CHIS will improve and be more likely to be used for decision making by wider stakeholder groups. This case study sought to answer the following question:

> *Is there a use case where a country has strengthened its CHIS and linked it to a facility information system using mHealth solutions?*

To answer this question, MEASURE Evaluation used the mHealth for monitoring and evaluation (M&E) and case management landscape analysis developed for Scaling Mobile Community-Based Health Information Systems to select an example for the case study. We looked for examples in which the national government was involved in developing mobile case management tools and integrating the mobile tools with the larger electronic health management information system (MIS).

In Bangladesh, the Ministry of Health and Family Welfare (MOHFW) and its partners—the United States Agency for International Development (USAID), the USAID-funded MEASURE Evaluation, the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), the MaMoni Health Systems Strengthening (HSS) Project, and the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Project—have implemented an electronic MIS (eMIS) in two districts and are scaling it up nationally. This eMIS created an integrated electronic data system in which data collected at the community level are shared across primary healthcare providers and flow up to the national level. This case study looks at how Bangladesh established the eMIS and the initial changes in data management as well as service delivery that have resulted from implementing the system.

BACKGROUND

The community health system in Bangladesh comprises family welfare assistants (FWAs under the Directorate General of Family Planning and health assistants (HAs) under the Directorate General of Health Services and family welfare assistants (FWAs), both of whom provide domiciliary services. The FWAs and HAs serve specified catchment areas. FWAs primarily provide maternal and child health and reproductive health services. HAs are primarily responsible for immunization and treatment of common ailments, such as childhood diarrhea and pneumonia. Static, primary care-level facilities include community clinics, Union Health and Family Welfare Centers, Maternal and Child Health Centers, and the Upazila Health Complex.

Bangladesh started with a paper-based system that consisted of 11 forms for FWAs to complete, including case management tools and reporting forms, and 6 forms for HAs to complete. The paper-based reporting tools were sent to the *upazila* level (subdistrict) to be compiled and entered in an electronic system. In addition to entering the data in the electronic system, *upazila* staff also submitted paper-based forms to the district and national levels.

The paper-based system included a supervision process to ensure that FWAs and HAs were visiting the households and correctly completing the forms, but the time involved made it cumbersome to implement. Union-level supervisors supervised the FWAs and HAs using a structured supervision checklist and prepared their monthly supervision plan in alignment with monthly workplan of the HAs and FWAs. The checklist focused on logistics, quality of service provision, and record keeping. Supervisors were required to visit the households or satellite clinic that the HAs and FWAs supported to verify the data collected and to review the registers and reports. Occasionally *upazila*-level managers supervised HAs and FWAs. Under the paper system, FWAs and HAs did not receive direct feedback on their performance in completing the required forms, although sometimes performance would be discussed during the monthly meeting at the *upazila* or union level.

Under the paper-based system, FWAs, HAs, and supervisors did not regularly use the data they collected to improve quality and coverage of services. The information collected was primarily reported to the higher level, with little feedback provided to the community workers on the quality. FWAs did use the data in the paper tools to determine service provision to their clients, but the registers made this cumbersome. Supervisors at the *upazila* level reviewed FWA and HA performance in reaching their targets for key indicators—women in their care receiving all four ANC services and deliver in a facility— and would discuss any issues in achieving targets during the monthly meetings.

The only way to know whether a client completed a referral was through self-reporting during follow-up visits, which could be occur between two and four months after the initial visit. Facilities to which the clients were referred did not necessarily keep records of referrals, and the reporting mechanisms for referrals were weak.

Decision to Switch to Digital

In the late 2000s, the MOHFW realized a need to reform the country's health information system (HIS). In 2008, the Health Metrics Network assessed the HIS and recommended preparing a comprehensive HIS policy document, creating positions for skilled information technology personnel at the MIS unit,

and developing a culture of information communication and technology (ICT)-based communication and handling data with less dependence on paper (Health Metrics Network & MOHFW, 2009). At the same time, a digital movement was taking place in Bangladesh, which included significant investment in ICT infrastructure and the availability of high-speed Internet and low-cost android phones. These factors, coupled with political will, computer-literate individuals, and a large coverage of mobile networks, helped lead the charge for an eMIS. With all of the digital movement in country, MOHFW started to strengthen its own systems, which entailed building the digital infrastructure in the Ministry from the national to the community level, including hardware procurement and Internet connectivity. To sustain the system, DGFP included the implementation and maintenance of the eMIS in its sector plans and budgets. The combination of these factors led to the rapid movement toward establishing a comprehensive, automated routine HIS.

METHODS

The United States-based MEASURE Evaluation team coordinated with MEASURE Evaluation staff in Bangladesh to develop a list of possible interviewees for the case study. We contacted each person on the list about participating in the case study. Fifteen out of 20 people agreed to participate, including implementing partners and district and union-level government staff for the Directorate General of Family Planning and Directorate General of Health Services (see Appendix 1). MEASURE Evaluation developed two qualitative questionnaires for respondents to complete—one for national-level respondents and one for subnational-level respondents—that were translated into Bangla. Respondents either completed a written questionnaire or provided their responses through a phone interview. We also reviewed documents from the different eMIS modules and the Facebook site created for the rollout of the eMIS.

DESIGNING THE EMIS

With support from USAID partners (MEASUE Evaluation, icddr,b, MaMoni HSS/Save the Children) and SIAPS/Management Sciences for Health), the MOHFW began developing the eMIS in 2015. The ministry wanted an end-to-end electronic system that could capture real-time service delivery data and provide those data to decision makers at all levels of the system in real time to near real time.

To develop the eMIS, all paper-based MIS tools were extensively reviewed, revised, redesigned, pretested, and finalized by the MOHFW and USAID partners. They worked with field-level officials to obtain input on the content of the tools to ensure that the tools correctly captured the data and were easily understood. After the paper-based tools were finalized, a national-level consultative workshop was conducted with all stakeholders supporting the strengthening of the HIS to develop the eMIS modules based on the paper tools. All eMIS module drafts were developed in consultation with their counterparts in the MOHFW. Nine modules were developed for the eMIS:

- Family Welfare Assistant eRegister

- Family Planning Inspectors eSupervision System

- Health Assistants eRegister

- Assistant Health Inspector and Health Inspector eSupervision System

- General Patient eRegister for Union-Level Facilities

- Monitoring and Administrative Tools

- Community Skilled Birth Attendant eRegister

- Family Planning eRegister for Union-level Facilities

- Maternal and Newborn Care eRegister for Union-Level Facilities

In the eMIS development team, the development work was distributed among the implementing partners: icddr,b and MEASURE Evaluation were responsible for developing the community and union-level modules, the MaMoni HSS project was responsible for developing the *upazila*-level facility modules, and SIAPS and Management Sciences for Health were responsible for integrating the logistics management information system (LMIS) with all the eMIS modules. After the modules were developed, they were shared for input with users and their supervisors; national-level managers. The modules were field-tested before the implementation in Habigani and Tangail districts.

In terms of technology used for the eMIS, it was determined that any solution had to be compatible with current solutions used in-country. There was an imperative to maximize the use of the government's existing hardware and future procurement plans. Solutions needed to be open source and interoperable with existing software, such as DHIS 2. The platform also needed to be able to function offline, because some areas of Bangladesh still have little to no Internet coverage. The eMIS implementing team primarily decided on using PostgreSQL for the server database and Java programming language as the application platform for the mobile devices.

Pilot

The eMIS pilot was rolled out in all subdistricts of Habigani and Tangail in conjunction with the paper-based system. A two-day training on the tools and tablets was provided; managers were trained as master trainers, who then trained the FWAs and HAs and supervisors. Central monitoring teams were established and maintained constant contact with the field-level staff and responded quickly to any issues that arose with the eMIS. They also regularly visited the field to supervise the pilot. The central-level eMIS implementation team attended monthly coordination meetings at the *upazila* level with the pilot monitoring staff to troubleshoot any issues and ensure that the pilot was running smoothly. Staff from the Directorate General of Family Planning, MEASURE Evaluation, Save the Children, icddr,b, and USAID regularly visited the field to verify the work and the functioning of the system.

Through the pilot process, the eMIS implementation team observed that rolling out the eMIS in parallel with the paper system increased the workload of the FWAs and HAs, and some of them complained about using both sets of tools. The FWAs and HAs needed to use both systems during the pilot, because the managers wanted to be convinced of the usefulness, functionality, and robustness of the systems before agreeing to fully replace the presumably imperfect paper-based system. In addition, it was also understood that if the tablets did not work properly, the paper tools would provide instant backup. District staff also felt that it was beneficial to have both systems in use during the pilot, because FWAs and HAs were still learning how to use the tablets and the application. Moving forward, both systems will still be rolled out in parallel until the departmental headquarters makes a decision on replacing paper-based registers, which would probably happen gradually or in phases.

Support Systems

In addition the coordination meetings with the eMIS implementation team, a Facebook site was developed to provide support to users. If staff encounter any problems with the system, they can take a photo and post it on the Facebook site. Field staff found that the central implementation team responded quickly to the issues posted on Facebook. Staff also used the Facebook site to learn from others' experiences implementing the system. Technical personnel used the site to post suggestions for field staff on using the system.

Sustainability of the eMIS

Under the fourth Health, Population and Nutrition Sector Program (2017-2022), two operational plans allocate sufficient resources to sustain, expand, and further strengthen the eMIS and M&E activities, including supporting hardware maintenance, replacement, and addition; maintaining and improving Internet and telecommunication connectivity; and continuous training and facilitation of M&E activities. The Sector Program has provisions for expanding the eMIS in 2,500 Union Health and Family Welfare Centers and to14 districts and 2,500 facilities by 2022.

KEY THEMES FROM THE PILOT

The implementation of the eMIS has significantly reduced the workload of HAs and FWAs and errors that were related to transcribing the data to different paper forms. When using the paper-based system, FWAs and HAs would spend one to two days each month compiling the monthly HIS report. With the eMIS, they can press a button and the report is generated instantly. Now that the data are being directly entered in the electronic system at the point of service, there are less transaction errors. Data accuracy is further enhanced through built-in data validation rules, such as setting minimum and maximum values for fields, which will trigger warnings when data fall outside of the range. The system's built-in logic also ensures completeness of data elements in the electronic registers and reports, including the inability to move to the next field unless mandatory data fields are completed.

The unique health identification system (master client index) established in the eMIS through a population registration system has improved quality of care by allowing health workers to track individuals over time and ensure the continuum of care. Through the registration process, all household members are given a health identification card with unique health ID generated from the national system. The unique health ID links the information collected about a client by both FWAs and HAs and is then linked with the facility system. At the facility level, service providers can pull up an individual's information by using the unique health ID and retrieve all stored data from the population and service databases. FWAs and HAs can also retrieve services provided to their clients as well as check on referrals using their tablets with the unique health ID.

Dashboards generated from the data collected on the tablets have helped district and national-level managers plan services to ensure the continuum of care. A manager can pull up services by a particular provider to view data by date. This reduces the need for supervisors to travel to the field to check all aspects of quality of care to determine where improvements are needed. Now supervisors can use the eMIS to support planning by using the mapping function to see service statistics by district, *upazila,* and union. They can review the data each month to evaluate the performance of the FWAs and HAs and see which staff are not hitting their targets. The dashboards have empowered the community workers and supervisors by providing them with access to the information they are generating in the course of their daily work, which allows them to make informed decisions and contributes to transparency of and accountability for their work within the larger health system.

Through the implementation of the eMIS, supervision roles have been broadened because supervisors can see service statistics in real time and provide instant feedback to FWAs and HAs, which makes it easier to monitor activities, especially in hard-to-reach areas. Web-based monitoring and administrative tools produce real-time data that support managers in efficiently monitoring staff performance. The tools have an interactive dashboard with charts, maps, and graphs that display data based on the requirements of managers at different levels of the MOHFW. By using these tools, supervisors can instantly provide feedback to FWAs and HAs and take action as needed, unlike with the paper-system where little to no feedback was provided to the community-based staff.

LESSONS LEARNED

A key lesson learned from the pilot is that transitioning to an electronic system takes a long time but is not difficult. Even those FWAs who were not very computer literate could easily master the use of the tablets. One reason for that could be that the eMIS fits well with their work flow and is based on an already familiar system. The transition also requires political will and the country's readiness in terms of ICT infrastructure. Systematic assessments of the country's existing HIS should be conducted before launching an electronic system to identify gaps in the MIS and obtain baseline information on key technology readiness indicators (e.g., availability of electricity and Internet networks in villages, familiarity of community health workers with mobile phones). The business processes associated with service delivery and reporting need to be understood to develop a robust electronic information system. To achieve this, software programmers need to work closely with health program managers in the design of the system. Some infrastructural weaknesses, such as an unstable power supply or weak penetration of Internet by ensuring that the system has both online and offline options.

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APPENDIX 1. CASE STUDY RESPONDENT ORGANIZATIONS

Sl.	Upazila	Organization
Government staff		
1	Deputy Director Family Planning, Tangail	Directorate General of Family Planning
3	Upazila Family Planning Officer, Mirzapur Tangail	Directorate General of Family Planning
4	Upazila Family Planning Officer, Kalihati, Tangail	Directorate General of Family Planning
5	Upazila Family Planning Officer, Basail, Tangail	Directorate General of Family Planning
6	Upazila Family Planning Officer, Tangail Sadar	Upazila Family Planning Office, Directorate General of Family Planning
7	Upazila Family Planning Officer, Ghatail	Upazila Family Planning Office, Directorate General of Family Planning
8	Upazila Family Planning Officer Ghatail	Upazila Family Planning Office, Directorate General of Family Planning
9	Upazila Family Planning Officer, Modhupur and Dhanbari	Upazila Family Planning Office, Directorate General of Family Planning
10	Upazila Family Planning Officer Bhuapur	Upazila Family Planning Office, Directorate General of Family Planning
11	Upazila Family Planning Officer Nagarpur	Upazila Family Planning Office, Directorate General of Family Planning
12	Upazila Family Planning Officer Delduar	Upazila Family Planning Office, Directorate General of Family Planning
Implementing partners		
13	MEASURE Evaluation	
14	International Centre for Diarrhoeal Disease Research, Bangladesh	
15	Save the Children	