WORKING PAPER

Feasibility of Integrating Social Service and Community Health Data in DHIS 2

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CONTENTS

ABBREVIATIONS

ANC	antenatal care
CHW	community health worker
EMR	electronic medical record
HIS	health information system(s)
HMIS	health management information system(s)
ICT	information and communications technology
M&E	monitoring and evaluation
MIS	management information system
MOH	Ministry of Health
MOU	memorandum of understanding
OVC	orphans and vulnerable children
RHIS	routine health information system(s)
USAID	United States Agency for International Development

BACKGROUND

Governments require information about the health and social service needs of their populations to enable effective policymaking and resource allocation. Most governments have set up health information systems (HIS) to track critical health indicators, and these data are often captured in the district health information system software known as DHIS 2.[1] However, these systems are not often linked to the data systems used by social and community services, where people often access care. As a result, the systems are fragmented and unable to provide holistic information for decision making on health and social services.

Community health workers (CHWs) and parasocial workers frequently collect information on pregnancy, births, and deaths; immunization of children; referrals for antenatal care (ANC); health screening and status; school attendance; household economic status; nutritional status; and potential adverse situations. Collection of this information is essential for local government, health facilities, and social workers to understand potential health and social welfare problems in the community, identify trends, set community priorities, and monitor progress of beneficiaries and programs. A community information system that aligns with the district-level government system on the DHIS 2 platform can help capture and synthesize this information for use in community decision making.

But a blended information system poses its own challenges, because the data structure and information flow often differ between the social services and health sectors, and information is collected and managed in different ways—definitions do not align, tools are not standardized, technology may not be compatible, and reporting frequency and data quality vary among entities—making the data difficult to harmonize. Furthermore, the government agencies that manage and invest in their own systems may not support integrating theirs with others.

In many countries, governments choose to scale up parallel systems to track social and community services outside the health sector. The multiple systems that result mean these countries run the risk of duplicating the efforts of health workers at the community and facility levels; there can be challenges in coordination and access to data; and there also is a risk of double-counting individuals. Most agree that health program managers need to know about social services, and social service managers need to know about health services. Unfortunately, we have few examples of systems that can integrate data from both sources and that also can identify gaps in services and staffing to coordinate and address needs across programs.

Could DHIS 2 offer the answer? While DHIS 2 has its origins in the health sector, it is becoming a routine aggregated data management software in other sectors, as well. Some DHIS 2 applications are including community-level health and social service data. This presents an opportunity to examine whether DHIS 2 can integrate community health and social service data with facility-based data.

OBJECTIVE

This paper investigates the feasibility of using DHIS 2 to manage and share social service and community health data among ministries, district management teams, and related programs to support decision making for community-based social services.

[1] The University of Oslo developed DHIS 2 as a routine HIS platform for global use. DHIS 2 is a free and open source health management information system used to manage, analyze, and report health facility-level aggregated data. It is being deployed in more than 47 countries in four continents.

PURPOSE

This paper aims to provide information to donors and country programs on criteria for the successful integration in DHIS 2 of facility-based health data with data from community-based health programs and social services.

METHODS

To prepare this paper, the author conducted a literature review and interviews with experts in public health informatics and health and social service monitoring and evaluation (M&E).

Literature Review

The review of literature on integration of community health and social service data in DHIS 2 and other routine health information systems (RHIS) was conducted using PubMed and Google Scholar and a search of specific journals, including the *Journal of Health Informatics in Developing Countries* and the *Internal Journal of Medical Informatics*. Reviews were also conducted of publications on DHIS 2, *Principles for Digital Development*, and OpenHIE websites. Only seven documents were found to address integration of community health and social service data in DHIS 2 or health management information systems (HMIS), which is not surprising, given that such integration is a relatively new area of inquiry. Of those seven, only one was sufficiently useful to warrant a citation in this report but all are listed in the References section. Search terms were one or a combination of the following: DHIS 2; community-based information systems; community-based health information systems; routine health information systems; social welfare information systems; social service data; child-sensitive data; community health-data integration; and interoperability.

Key Informant Interviews

Key informant interviews were conducted with a convenience sample of stakeholders selected because of their experience with or knowledge of DHIS 2 and integrating community health data or social service data in DHIS 2. The initial sample was drawn from MEASURE Evaluation and Palladium staff, who then recommended interviews with additional people who work for other projects and organizations, because of their knowledge of DHIS 2. Interviews were conducted over Skype from January 28–April 14, 2016, with 12 representatives of nongovernmental organizations, multinational organizations, and donors, all of whom have backgrounds in information and communications technology (ICT) or business analysis and M&E.

The key informants interviewed had a wide range of experience with district health information systems, having worked with them in Bangladesh, Ghana, Kenya, Liberia, Mali, Nigeria, Senegal, Sierra Leone, South Africa, South Sudan, Swaziland, Tanzania, Uganda, and Zambia (using DHIS 1—the first iteration of the software) and in India, Malawi, Mozambique, and Namibia (using DHIS 2 software). Two respondents had also supported national systems in Ethiopia and Guatemala that use other HIS platforms.

We asked respondents open-ended questions from an interview guide that was developed with input from MEASURE Evaluation staff. The interviewer inquired about their experience or knowledge of integrating community health and social service data in DHIS 1 and 2, any lessons they learned from the experience, and compatibility issues they encountered between the data sets and data security. Respondents were also asked for their thoughts on what governance, infrastructure, and human resources should be put in place to integrate the systems. Each interview took 30 to 45 minutes; notes were transcribed using Microsoft Word. We analyzed notes for common themes about successes, challenges, and recommendations for integrating the two streams of data in DHIS 2.

FINDINGS

What we learned from the literature review and key informant interviews is grouped by four topics, reflecting the questions guiding the assessment: (1) using DHIS 2 as a platform for managing nonhealth/social service and community health data; (2) experiences integrating these data streams in DHIS 1 and 2 platforms; (3) recommendations for implementation; and 4) whether the systems should be integrated or if it is enough that they be interoperable.

1. Use of DHIS 2 to Manage Nonhealth/Social Service and Community Health Data

According to those interviewed, the main use of DHIS 2 is to manage health data that facilities or communities report to the district level, where they are aggregated (some data may be aggregated at the facility level, in larger facilities). They noted that a key feature of DHIS 2 is its promotion of data use through data visualization functions, including graphs, pivot tables, maps, and dashboards.

Regarding social services data, key informants were aware of only two countries (Tanzania and Uganda) where some social service data (on orphans and vulnerable children [OVC] were incorporated in DHIS 2. The system in Guatemala includes national-level aggregate social-service data from the 17 ministries that support social services, such as health, education, social development, agriculture, and finance. As for community health data, all other countries were integrating some amount of community health data in DHIS 2.

DHIS 2 developers are trying to expand the functionality of the platform to include options for collecting client-level data through a "tracker" tool, which would simplify data aggregation, by reducing paper tools (https://www.dhis2.org/overview, April 2016). To date, client-level data have been collected only for small-scale pilots. According to respondents, DHIS 2 does not have the functionality to truly expand into client-level data and was not originally designed to replace an electronic medical record (EMR) or case management tool. Four of those interviewed said that the current DHIS 2 platform cannot handle the volume of data required for integrating a client-level community health and/or social service system. They noted that Nigeria's district health information system had incorporated client-level data and running queries took hours. One of the interviewees said that DHIS 2 could be the user interface to enter client-level data, but that you would need a more robust back-end system (the server and database) to handle the larger volume of data that would result. According to one respondent, limited encryption and access control will limit the ability of DHIS 2 to be used for sensitive data, and this might be something that the DHIS 2 community could improve.

2. Experiences Integrating Different Program/Data Streams in DHIS 2 Platforms

2.1. Leadership and Coordination

Respondents mentioned that countries that have integrated social welfare or community health data in DHIS 2-based systems (or some other social-service management information system) had political buy-in for the integrated system and a given ministry mandated to lead the process. To legitimize the new system, respondents recommended memoranda of understanding (MOUs) signed by high-ranking officials in the ministries or departments responsible. They also felt it was important to have a national ICT/eHealth policy in place that supports integration, to provide a policy basis for the ministries to work together. In Tanzania, the Department of Social Welfare sent a formal letter to the Minister of Health to initiate the process that would allow them to coordinate with the team responsible for DHIS 2 and begin discussions around the integration. In Zambia, three databases were collecting health data, and the permanent secretary for the Ministry of Health (MOH) signed off on integrating them, allowing the team to begin discussions with database developers about integration. In Guatemala, the legislature decreed that the Ministry of Social Development would be responsible for creating and coordinating a social service information system—a

decision that was the main driver behind that country's success in coordinating 17 ministerial information systems. (Even so, it took two years after the decree for the ministries to agree on the terms of the MOUs.)

All respondents said it would be a challenge to coordinate the ministries that would need to be involved in developing an integrated DHIS 2-based system, because the ministries are responsible for different parts of the system and have different priorities. The MOH can set the policy for health data at the national level, but it may be a ministry of social welfare/development or community development that sets policy for social welfare/service data. Then, at the subnational level, a ministry of local government may be responsible for policy and staffing. In terms of ICT, one interviewee mentioned that in one country, a ministry of ICT/informatics plans ICT infrastructure for all government systems. Respondents felt that all ministries, depending on the country context, should be part of the process to develop an integrated system. This, they thought, could be a challenge, as all of them have varying needs for information, timelines, and agendas. Four respondents mentioned that it might be best to coordinate the development of an integrated system outside of the MOH, through the president's or prime minister's office, or another ministry responsible for facilitating activities across ministries.

Interviewees also noted a need for coordination and leadership at the subnational level, saying that parallel reporting structures and data systems have been developed at this level and would need to be coordinated to have an integrated system. One interviewee noted that administrators of these vertical programs often hesitate to give up their systems, which represent a significant investment and which deliver the information they need for program reporting and decision making. Another respondent noted that countries are trying to move away from parallel systems by using the DHIS 2 platform, but integrating in the system all facility-based program data, let alone community-based program data, is a slow process. As an example, one interviewee cited Kenya, which has made great strides to integrate community health and facility data in DHIS 2, but parallel systems remain, because stakeholders have different data needs and not all stakeholders feel data should be in one system. Interviewees thought that districts need to take on a leadership role to create clear guidance, awareness of the process, and capacity building for stakeholders within the district to increase the possibility of a successful implementation of an integrated system.

2.2. Steering Committees and Technical Working Groups

All people interviewed thought that partnerships would be important for integrating existing systems. Stakeholders should convene to discuss how the systems will be integrated and agree on a vision regarding integration's value to them and their work. Interviewees mentioned that governments are establishing steering committees or technical working groups to oversee the development and implementation of blended health and social service information systems. In Tanzania, an eHealth steering committee, overseen by the MOH permanent secretary, manages the implementation of DHIS 2 integration. In Namibia, a technical working group advises the MOH's HMIS department on strategy and proposals for integration.

2.3. Data Needs

Interviewees said that historically, information systems have been developed with a top-down approach, focusing on the information needs of those at the national level. Each level within the system has discrete information needs and these should be taken into consideration, or ownership and use of an integrated system will be limited. For example, CHWs need client data to make decisions about case management; facilities require aggregate data on key health indicators for management, planning, and reporting. Interviewees said that stakeholders developing an integrated DHIS 2 platform need to determine what level of data should be incorporated, along with a minimum data set of well-defined essential indicators that meet the information needs of the users.

2.4. Data Alignment

Fully integrating community health or social welfare data with facility data will require significant work to align these data sources (Guenther, et. al, 2014). As mentioned above, data definitions often vary among ministries and programs, so harmonizing indicators and definitions will be important. In Uganda, the MOH and the Ministry of Gender, Labour and Social Development do not define vulnerable children the same way (see the box), yet both report data to the national program for OVC. In Namibia, community health programs and facilities define ANC differently, yet both report data to the district health information system, which leads to problems aggregating those data. In Kenya, the USAID-funded MEASURE Evaluation PIMA project works with community and facility programs on data definitions to improve data alignment. In countries where the United Nations Children's Fund supports integrated community case-management (iCCM) data, the agency is disaggregating community and facility data stored in DHIS 2-based systems, to enable users to see what information and contributions specifically come from the community.

Example of Disparity in Defined Indicators

In Uganda, the MOH defines vulnerable children as those with unusual or exaggerated susceptibility to sickness or physical, biological, or behavioral disorders. Vulnerable children are all children in situations where family, community, environment, or biological factors expose them to greater than usual risk of diseases.

In contrast, the Uganda Ministry of Gender, Labour and Social Development defines vulnerable children as those who are orphans, disabled, out of school, or chronically ill.

Many interviewees mentioned that data from the community level have issues of quality and timeliness. Facilities and community-based programs do not necessarily report at the same time, and if community data are late or not reported with the same frequency as facility data, data sets can be incomplete.

2.5. Data Collection Tools and Reporting

Interviewees mentioned that facility-based programs often have harmonized standard reporting tools that can be entered in an integrated system easily, whereas community-based health and social service program tools are not consistently standardized, which makes them difficult to integrate. Interviewees mentioned that even without standardized paper tools, community-based programs are rapidly investing in and moving toward mobile solutions for reporting, which also are not standardized but which, nevertheless, contribute data directly to DHIS 2-based systems. One person we interviewed knew of successes in integrating data sets when community-based programs first had engaged with districts to refine tools and map the DHIS 2 indicators to the programs' information needs.

Stakeholders within a system also need to know what data are being captured and by whom, and how they are being captured or entered. One interviewee mentioned an instance in which an immunization campaign had double-counted, because facility staff and CHWs were collecting the same information for the same population and uploading it into the system. Several mentioned that most countries that collect community health data in DHIS 2-based systems only combine a small number of variables from the community data with the facility data, making it hard to determine the community health information's impact on the system. Most interviewees noted that general practice is for community-based organizations to submit paper-based forms to the district to be entered in DHIS 2, or for CHWs to submit paper forms to a facility, which in turn submits data from the forms as part of its reports to the district.

2.6. Infrastructure to Support DHIS 2

DHIS 2 is a web-based system and all interviewees noted the need for connectivity, which is not available at all subnational levels. And even though 3G mobile phone connectivity is becoming widespread, functioning mobile devices, computers, and tablets for data entry, analysis, and use, along with technological support for these devices, are still needed. Several interviewees stated that many health ministries and larger health facilities have the necessary infrastructure to link to DHIS 2 but that many smaller facilities and social welfare ministries do not unless donors give them support for this.

2.7. Access and Security

Authority over access to information is another issue. Interviewees said more security around sensitive data needs to be in place. Countries should convene stakeholder groups comprising representatives of the key program areas to discuss security, confidentiality, and access to information in the system. Interviewees thought that before information systems are integrated, it should be determined who needs access to client-level data for service delivery and who needs only aggregate data for decision making. Security and access are of special concern in the domain of disaggregated client-level data or vital statistics. Interviewees said that user interfaces could be designed based on the data needs of specific users. Unique logins could help ensure the security of the data in the system's back end, both for sensitive and nonsensitive data, along with other built-in security mechanisms. One interviewee said that developers should ensure that systems conform to country security and privacy laws, especially for data shared across ministries.

2.8 Interoperability versus Integration

Interviewees said that a clearly defined purpose for an integrated database may reveal that interoperability is a better solution than integration, especially for social welfare data that involve more than one ministry. DHIS 2 could be used as a data warehouse, with each ministry maintaining its own database linked to the software. Some thought that having a unified system puts too much dependence on one system, creates issues of ownership, and limits innovation. If a government should decide to develop interoperable systems, they recommended that it should limit the number of software platforms linked to the systems to avoid complicating matters.

CONCLUSIONS

Overall, respondents felt that DHIS 2 is a good platform for housing and reporting aggregate community health or social service data and has strong analytics and visualization. Based on the literature and stakeholder interviews, it would be feasible to integrate social service or community health data with facility-based data in DHIS 2, because DHIS 2 is essentially a database platform that can be adapted for different purposes easily. That said, some prerequisites emerged for the development of a system that can be trusted to collect reliable data for decision making. These are detailed below.

Prerequisites for Successful Integration of Community Health and Social Service Data in DHIS 2

1. **Strengthen political will**. The government needs to be committed to developing the interoperable or integrated system and invest time and resources to ensure sustainability. There also needs to be a lead agency, preferably outside of the MOH if more than one ministry is involved, mandated by the government to spearhead the process for concept, design, and implementation. Also, champions within the government should be identified, because they will be essential to move forward— especially to align ministries on the terms included in the MOUs.

2. **Develop strong governance structures**. MOUs need to be developed and signed by ministries and/or departments whose systems will be integrated or made interoperable. Once MOUs are signed, national steering committees that include community and social services stakeholders should be put in place to make decisions about what indicators need to be captured in DHIS 2, their definitions, what data should be captured at each level, who captures and reports the data, how frequently they are reported, if the system should be integrated or interoperable, what security measures need to be included, and who has access to what data. These decisions can be governed by standard operating procedures, developed in concert with all system stakeholders.

   An ICT technical working group also is essential to outline the technical components of the system, establish the technological infrastructure, monitor compliance, and establish strategies and standards to integrate or extract data for the ministries. The working group should assess the current informatics environment in health and social services and develop an eHealth/social services strategy that will establish a governance mechanism for coordination and control of the system. It also should provide guidelines for developing and investing in the system.

3. **Develop standard tools for community-based health and social-service data collection and reporting**. Once the steering committee harmonizes the indicators and indicator definitions to be captured by the electronic system, standard tools should be developed to collect the data necessary to report on the indicators across community-based programs to ensure they are collecting the same information. By standardizing tools, programs can ensure that they are collecting the same data in the same way. The tools—whether paper-based or electronic—should be compatible with DHIS 2 and developed so that community and facility data can be distinguished but with the same classification system and indicator definitions. Data collection tools for community-based and facility-based data also should be aligned, because many local organizations collect community-level data using different tools and with varying degrees of quality (Guenther, et al., 2014).

4. **Improve DHIS 2 user interface**. Countries should work with the University of Oslo to make the user interface more user-friendly and intuitive with workflows for community-based program staff. This would entail speaking with the data collectors, data entry staff, and end users to understand their computer literacy and opinion on how data should flow into the database. It also would require speaking with community-based organizations to

understand their information needs and the types of reports and dashboards they want the system to generate for decision making.

5. **Strengthen ICT and M&E capacity**. Both ICT and M&E capacity at the national and subnational levels needs to be developed to successfully implement and use DHIS 2 for reporting and decision making. Capacity entails building skills and also ensuring that ICT and M&E positions are staffed at each level. Skills needed to successfully implement DHIS 2 include, but are not limited to, governance, database programming, network administration, data administration, and computing. Individual and organizational M&E capacity will be needed in indicator development and harmonization, articulation of information needs for decision making, reporting and data quality, data analysis and interpretation, and data use.

6. **Improve the quality of data in the system**. Because the quality of data coming from community-based programs is often considered to be lower than that of facility data, data quality checks should be in place. This can range from quality control checks built into the electronic system or regular data quality assessments conducted on the data entered in the system.

7. **Promote data use**. Leadership should promote the use of the system data for decision making at all levels to increase accountability and improve data quality. To promote use, the steering committee should understand who uses the data and for what purpose to ensure that DHIS 2 can produce relevant reports and/or graphics.

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