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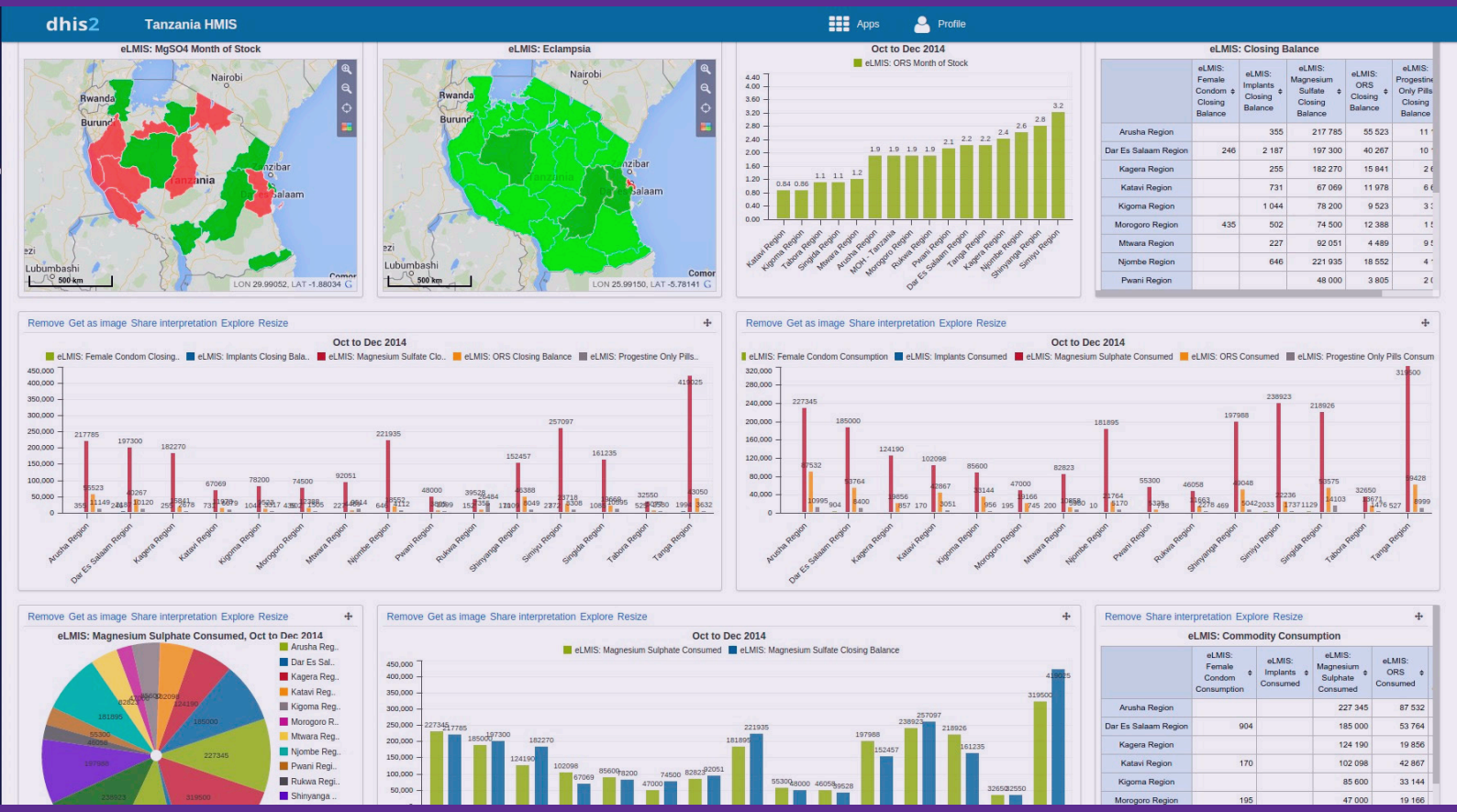

Technology, People, & Processes:

Enabling Successful HMIS/LMIS Integrations

August 31, 2016

WE SUPPORT EVERY WOMAN EVERY CHILD

Acknowledgements

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Table of Contents

Acknolwedgements 2
Executive Summary 4
Introduction 5
Integrated HMIS/LMIS Dashboards 5
Creating an Enabling Environment for Integration 7
Technology & Process 7
Data Integration 7
Updates & Customization 7
Using MOTECH in Senegal 7
Customization in Tanzania 8
Global Applicability 8
Essential Processes 8
People & Process 9
Stakeholder Engagement 9
Human Resources for Analytics 9
Stakeholder Meetings in Tanzania and Senegal 10
Advocating for Process Change in Tanzania 10
Choosing Indicators in Tanzania and Senegal 10
Essential Processes 10
Conclusion 11
Timeline and Budget 11
Future Integrations: A Case for Support 12
Appendix 13
Tanzania Case Study 13
Senegal Case Study 14

Executive Summary

Increasingly, the public health sector in low- and middle-income countries is exploring innovative ways of using data analytics to improve health systems; many are replacing outdated, often paper-based, systems with electronic logistics management information systems (LMIS). As part of this trend, there is growing interest within public health supply chains to incorporate systematic analysis of LMIS data and health management information system (HMIS) data to improve supply chain performance and service delivery. Systematically integrating the data from HMIS and LMIS systems has the potential to facilitate routine communication and data sharing between departmental silos, thereby improving supply chain performance and health service delivery by enhancing data visibility and use in decision-making among health system stakeholders.

In 2014, the Supply Chain Technical Resource Team (TRT) of the UN Commission on Life-Saving Commodities for Women and Children launched integrated HMIS/LMIS Dashboards in Tanzania and Senegal to test the technical feasibility and usefulness of HMIS/LMIS linkages.

Based on the pilots in Tanzania and Senegal, key challenges identified were data mapping and synchronization; software customization and management of system upgrades; and stakeholder engagement and the need for human resources for analytics to organize, interpret and present data in meaningful and useful ways. The integration of HMIS and LMIS systems is not a short or simple process. Successful system integration requires investment in appropriate, well-designed technology as well as in the people and processes that support the technology. Assessing and establishing essential processes at the beginning of the integration saves time, money, and other resources. The following are recommended essential processes to consider when allocating resources for technology and human resources to support integration:

- Create a strategy to build interoperable systems and keep them in sync. Consider initiatives such as creating a national eHealth strategy, creating and maintaining master lists and naming conventions for health facilities, commodities, and other shared lists, and using interoperability layers (such as OpenHIE or MOTECH). Consider sharing and mapping master lists (facilities, commodities, etc.) between LMIS and DHIS2 systems as an interim measure, until a formal interoperability layer can be added.
- Establish a coordination strategy for data integration, including ongoing technology maintenance for software upgrades and addressing other system disruptions and stakeholder communication.
- Launch integration process with a stakeholder meeting, and continue follow-up meetings with key players on a regular schedule, as necessary. Having clear agreement about goals and objectives of the integration from all stakeholders upfront will inform the design and analytics of the dashboard and will help manage expectations.
- Develop a memorandum of understanding (MOU) with well-defined roles and responsibilities for parties involved in maintaining the day-to-day data-sharing interface between LMIS and DHIS2 systems.
- Engage stakeholders with diverse expertise—consider clinical health practitioners, statisticians, logisticians, etc. representing all levels of the health system.
- Engage subject matter experts to understand associations between services, clients, commodities prescribed for typical cases, clinical protocol and practices, substitutable products, wastage and other factors applicable to the country context. Develop a knowledge base and make it available on the dashboard as tips on "how to interpret" indicators presented.

As the opportunities for integration grow across multiple data systems, so does the need for applying long-term integration strategies that take into consideration not only technology, but also the people and processes necessary to sustain them. The integrated dashboards developed in Tanzania and Senegal are a good starting point to understanding the potential of seeing supply chain and service delivery data together, but will require further use and user input to maximize their potential in improving data quality and supporting routine decision-making.

Introduction

As technology and information systems become more ubiquitous and affordable, private sector companies have transformed their use of data analytics toward a systematic use of data for decision-making. The public health sector in low- and middle-income countries has followed suit. Increasingly, these countries are replacing outdated, often paper-based, systems with electronic logistics management information systems (LMIS) and exploring innovative ways of using data analytics to improve health systems.

As part of this trend, there is growing interest within public health supply chains to incorporate systematic analysis of LMIS data and health management information system (HMIS) data to improve supply chain performance and service delivery. In many countries, these data sets are analyzed annually to determine national forecasts of health commodities, but are not routinely compared throughout the year. Adding complexity, LMIS and HMIS datasets are often managed by different departments within ministries of health. As a result of these silos, decision makers do not have easy access to all the data they need to effectively monitor and plan health systems performance.

Both HMIS and LMIS systems are necessary and serve different functions, users, and workflows. While integrating the HMIS and LMIS systems is not necessary, systematically integrating the data from HMIS and LMIS systems has the potential to facilitate routine communication and data sharing between these silos, improving supply chain performance and health service delivery by enhancing data visibility and data use in decision-making among health system stakeholders.

Integrated HMIS/LMIS Dashboards

In 2014, the Supply Chain Technical Resource Team (TRT) of the UN Commission on Life-Saving Commodities for Women and Children outlined potential benefits of linking HMIS and LMIS data in a white paper entitled Considerations for the Integration of HMIS and LMIS. These benefits include:

- **Improving the functionality of the logistics system** by linking, correlating, and analyzing service delivery and disease incidence data with LMIS data
- **Improving service delivery** by making actionable, combined LMIS and HMIS data available to managers
- **Increasing data quality** by allowing for cross-validation of data in both systems to identify and address data errors
- **Reducing the data collection burden** and minimizing collection of duplicate data by eliminating the need to collect the same data points in multiple systems
- **Enhancing communication** between service delivery program managers and supply chain managers

During the writing of this document, the Supply Chain TRT was unable to identify any existing case studies where HMIS and LMIS data were routinely and automatically linked. In order to test the technical feasibility and usefulness of HMIS/LMIS linkages, the Supply Chain TRT launched integrated HMIS/LMIS Dashboards in Tanzania and Senegal.

In both countries, the integrated HMIS/LMIS Dashboards are displayed in the District Health Information System (DHIS2), launching in May 2016 and July 2016 respectively. The choice to display data in DHIS2 rather than the LMIS systems was mainly based on DHIS2's visualization tools that allow users to easily manipulate and display data in the system. In Tanzania, LMIS data are pulled from eLMIS (the Tanzania implementation of OpenLMIS). Because both DHIS2 and eLMIS are deployed nationally, the dashboard provides nationwide data visibility. In Senegal, LMIS data are pulled from CommCare Supply. DHIS2 is deployed in all districts but not all health facilities, while CommCare Supply is used as the LMIS for reproductive health commodities in all 1,400 health facilities. The dashboard was piloted in four districts. See more detailed descriptions of these systems in System Summary text box below.

The pilots of these dashboards reinforce the notion that integration of information systems is a worthwhile investment when considering a long-term strategy to increase use of data for decision-making and supply chain improvement. However, successful integration requires investment in appropriate, well-designed technology as well as investment in the people and processes that support the technology. Lessons learned and considerations from these pilots are presented in the proceeding sections. Each section includes country highlights with examples from Senegal and Tanzania as well as process recommendations and key insights. More detailed case studies for each country are presented in the Appendix.

System Summaries

OpenLMIS is a state-of-the-art, web-enabled, enterprise class electronic LMIS solution that facilitates the requisition and resupply process in low-resource settings for health commodities. OpenLMIS automates the LMIS system at sub-national levels, and is interoperable with different systems at multiple levels including HMIS visualization software, mobile data collection platforms, and warehouse Enterprise Resource Planning (ERP) systems. To learn more, please contact info@openlmis.org or visit www.openlmis.org

CommCare Supply is a mobile logistics management system for low-resource settings and areas of low connectivity. It is designed to support health workers and other mobile agents who manage commodities through improved inventory management, resupply, and delivery. For more information, please contact: supply@dimagi.com or visit www.dimagi.com

DHIS2 is a flexible, web-based open source information system specifically designed to support an HMIS. DHIS2 is typically used as a national HMIS system for routine data management and analysis purposes and includes advanced features like geographic information system (GIS) mapping for high-quality data visualization. For further information, please contact: post@dhis2.org or visit www.dhis2.org

Creating an Enabling Environment for Integration:
Technology, People & Proccesses

Technology & Process

The integration of two or more separate information systems, like an HMIS and LMIS, is likely not a simple, one-time investment. In order for the integration to be sustainable, the underlying technology—and the processes that support it—need to be planned and designed with ongoing support and maintenance for implementation, including considerations for data mapping, system synchronization, software updates, and customization.

Data Integration

Issues with data mapping and system synchronization are inherent to any integration project. In both Tanzania and Senegal, the list of health facilities in DHIS2 had to be mapped to the list of health facilities in the LMIS. If facilities are added or removed, the mapping would need to be updated. This can be an ongoing challenge without a "master" facility list and related processes to maintain synchronization between each system and that master list. Many countries consider these issues even before integration projects begin, starting with standardization initiatives such as creating an eHealth strategy and common standards that all partners and stakeholders must adhere to; creating and maintaining master lists and naming conventions for health facilities, commodities, and other shared lists; and using interoperability layers (such as OpenHIE or MOTECH).

Updates & Customization

Depending on the systems chosen, software updates and feature customization may be necessary for the systems to operate with each other. Project teams should work to obtain all software update schedules and work closely with the teams for all software involved to determine how future updates will affect the dashboard and who will be responsible for ensuring the dashboard is updated as needed.

In addition, stakeholders must determine how much customization would be required for each system used in integration. Customization is helpful in ensuring that the integration meets all the specific requirements of a particular use case. However, customization can be expensive and difficult to maintain. For example, when updating to the newest version of the software, customization may need to be redone in order for the whole integrated system to continue working.

Country Highlights

Using MOTECH in Senegal

In Senegal, integration was done using MOTECH, an open-source platform that can serve as an interoperability layer. MOTECH provides a user-friendly interface to map data from two software systems to each other, where events are defined to automatically trigger MOTECH to pull data from one system and transfer it the other. In this case, MOTECH sends data from the relevant fields in CommCare Supply to DHIS2 each time the facility-level forms in CommCare Supply are updated. Although new facilities will have to be added manually in the future, once they are mapped in MOTECH, the level of effort for integration with a third system is decreased, since MOTECH enables interoperability between multiple systems. For example, to integrate an electronic medical record (EMR) with DHIS2 and CommCare Supply, the facilities from the EMR would only need to be mapped to MOTECH rather than with both systems. The level of effort for mapping facilities in MOTECH can be beneficial for future projects using the same systems.

Customization in Tanzania

One of the benefits of DHIS2 is the ability to create data visualizations and dashboards without additional software development. A DHIS2 user with solid familiarity with the software can edit visualizations through DHIS2's user interface. However, there are some limitations to the types of tables and visualizations that can be easily added to a dashboard on the user's landing page. One requirement for the dashboard in Tanzania was the ability of users to "drill down" on data. If an anomalous spike is identified, the user needs to be able to click on that data point to see the same data presented at lower levels, all the way down to the facility, which can help the user identify whether the spike is due to a national trend or coming from one specific area. Given that DHIS2 initially displays this data only at the user level in the system hierarchy, and that drilling down requires more hands-on manipulation of report elements, the software team used a plugin from highcharts.com to provide users with a simpler way to drill down into specific data points visually. There are now two versions of the elements that make up the Tanzania dashboard in DHIS2: the initial dashboard (without drill down capabilities) and the custom reports (with drill down capability). While this approach ensures that the dashboard meets Tanzania's needs, it creates an added layer of complexity with two versions that require maintenance.

Global Applicability

A major question facing integration projects is whether work done in one country can be utilized in another. Indeed, there are elements of the HMIS/LMIS Dashboards in Tanzania and Senegal that can work across different geographies, but the use cases and requirements will change, as will the data collected through the HMIS and LMIS systems, even for countries using OpenLMIS and DHIS2 or CommCare Supply and DHIS2. Accordingly, indicators will need to be defined and necessary data elements mapped in each individual country. Some technology that enables the integration can be built upon. For example, publishing the application program interfaces (APIs) that were used to share data between systems in individual country implementations can support future integrations. Also, publicly sharing definitions of the indicators and other dashboard elements used in one country can help another country by providing a framework to start discussions with stakeholders about the appropriate key performance indicators for their setting. Since developing strong requirements is a key first step to any software development or integration project, having good models to start from can help a country move their integration work forward more efficiently.

Essential Processes

Integration requires upfront investment to ensure systems are built to be interoperable. This includes data mapping concepts, syncing data collection, determining the integration strategy (i.e. interoperability layer), and system customization as needed. Assessing and establishing these processes during the beginning of the integration saves time, money, and other resources. The integrated HMIS/LMIS Dashboard projects in both Tanzania and Senegal highlight some of these challenges and strategies used to address them.

Key Insights: Technology & Process

1. **Plan for an upfront financial investment to build interoperable systems—data standards; mapping and syncing; customization; and use of interoperability systems (i.e. MOTECH) or other tools**

2. **Establish coordination and ownership strategy, including a system "owner" (individual and/or department); ongoing technology maintenance for software upgrades and other system disruptions; and stakeholder communication**

People & Process

As with any technology project, the people using the technology are as important as the software itself. This includes stakeholder engagement, human resources for analytics, and processes to ensure coordination. Stakeholder engagement will need to cut across programs and disciplines. For example, in an HMIS/LMIS integration there will likely be information technology experts managing the integration in addition to a group of supply chain and health program managers who must define requirements and act on analytics.

Stakeholder Engagement

Developing and managing an HMIS/LMIS integration requires inputs and oversight from a diverse team of people. These critical players, however, often operate silos within a country's health system, at times with no overarching view or owner of the entire system. HMIS systems and LMIS systems are almost always managed by different departments within a ministry of health, or in some cases may even be managed by a parastatal partially outside of the Ministry of Health. Therefore, projects to integrate HMIS and LMIS must begin by engaging stakeholders representing multiple departments such as pharmacy or logistics, health programs (i.e. Department of Maternal and Child Health), monitoring and evaluation, and information technology to clarify responsibilities and ensure collaboration and coordination. Interdepartmental collaboration helps create a full picture of both service delivery and supply chain from multiple perspectives contributed by participants. During the initial meetings, participating stakeholders should:

- Determine data elements and indicators to be included in the integrated HMIS/LMIS Dashboard
- Designate "owner(s)" of the integrated system
- Establish a strategy among stakeholders for ongoing communication

Engaging stakeholders with diverse expertise and function is key for laying the foundation for an integrated HMIS/LMIS Dashboard. In addition to ministries of health, NGOs and other implementing partners, clinical and other medical personnel can also support integration by mapping health commodities to health services while logisticians and pharmacists provide insights on commodity requisition processes and data interpretation.

Human Resources for Analytics

Anytime supply chain analytics are deployed, the first step is to understand and visualize the data, turning that data into actionable information. The next step to determine how to act on the data. This can be a long-term and iterative process, especially when data are complex. As there is a distinct difference between raw data points and actionable information, stakeholder groups and ongoing analysis processes should also include people skilled in data analytics who can organize, interpret and present data facts and figures into meaningful and useful information with context. Those analyzing and/or receiving this information should also be supported and empowered to act accordingly.

This is especially true for Reproductive, Maternal, Neonatal, and Child Health (RMNCH) and other complex commodities. Originally, the project teams in Tanzania and Senegal thought that many indicators presented in the dashboard would comprise of compound indicators: mixing HMIS and LMIS data into a single indicator (i.e. the ratio of condoms consumed from the LMIS to the number of people receiving condoms from the HMIS). While this can be useful for commodities dispensed using a consistent dose for the same condition or service, it is less straightforward for many RMNCH commodities – which makes it hard to set expected thresholds (or potentially indicate problems with data quality). For example, *misoprostol* is used to both prevent and treat postpartum hemorrhage. The dosage given to each patient varies by use (prevention or treatment) and by severity. There exists no consistent ratio or measurable relationship between the number of doses of misoprostol given and the number of cases of postpartum hemorrhage.

Moreover, data completeness and quality of data collected through HMIS, which can be misleading in many occasions, greatly impacts the ability to use this data to drive decision-making. Part of the role of data analytics human resources should be to help work with the teams on data quality issues as they potentially become more visible through system integration and dashboard work.

Country Highlights

Stakeholder Meetings in Tanzania and Senegal

Projects in both Senegal and Tanzania began with interdepartmental stakeholder meetings. In Tanzania, the meeting included multiple departments of the Ministry of Health and Social Welfare (MOHSW, recently renamed Ministry of Health, Community Development, Gender, Elderly and Children, or MOHCDGEC), including the Reproductive and Child Health Section, Health Management Information System Unit, Information and Communication Technology (ICT) Unit, Mvomero District Medical Office, and the National Bureau of Statistics. In addition, representatives from John Snow, Inc. (JSI), who support the eLMIS and supply chain strengthening activities, the University of Dar es Salaam, who support DHIS2, and other implementing partners took part in these meetings.

In Senegal, the project was officially launched with a workshop including representatives from the Ministry of Health (MoH) Department of Planning, Research and Statistics (who manages the DHIS2 unit), Dimagi, HISP West Africa, IntraHealth (who supports the informed push model for RMNCH commodities) the Ministry of Health's Department of Health and Social Services Information Systems the Department of Reproductive, Maternal and Child Health (DRSE) and the USAID mission. During the stakeholder mapping exercise, the MoH DSRSE was identified as a key player and joined the project team.

These meetings were important not only for coordination of the HMIS/LMIS dashboards, but also allowed broader coordination among supply chain and service delivery stakeholders. For example, in Senegal the M&E unit from the DSRSE was very interested in learning about the content of the informed push model indicators in CommCare Supply, since they only had access to DHIS2. Similarly, CommCare Supply users gained insights into the indicators used for RMNCH in DHIS2. The workshop provided a venue for exchange about how to measure RMNCH outcomes more broadly – beyond the scope of the integrated dashboard – and was a rich and valuable experience for all involved.

Advocating for Process Change in Tanzania

In Tanzania, the HMIS/LMIS Dashboards illuminated several ways in which HMIS and LMIS data collection could be harmonized to provide more useful data. For example, HMIS data are collected monthly while LMIS data are collected on a staggered quarterly system that mirrors the commodity distribution schedule. LMIS quarterly data are divided by three to produce a monthly average. These mismatched time periods make data challenging to assess since the comparison is of averages to actuals. The stakeholders discussed the benefits of shifting the LMIS reporting schedule to a monthly system to create more real time visibility, which could be done without having to shift the distribution schedule. While this change has not been enacted, the discussion itself demonstrates the type of critical holistic view that the process of implementing integrated dashboards allows.

Choosing Indicators in Tanzania and Senegal

Despite separate requirements gathering processes, the integration projects in both Tanzania and Senegal ended up with very similar dashboards. In each country, commodities from the LMIS system were mapped to the corresponding service delivery and morbidity data in DHIS2. These data are displayed in graph form side by side. In both countries, stakeholders agreed to monitor data over time which will allow them to identify "normal" thresholds and identify aberrant data that will need further investigation, problem-solving, and action. Having access to these data will allow stakeholders to gain a better understanding of how HMIS and LMIS data can be used together for routine decision-making. Next steps in these projects will be to continue to engage with users as they become more familiar with both datasets and work to find new use cases for the dashboard to improve its ability to aid in both logistics and health services provision.

Essential Processes

As illustrated in the Tanzania and Senegal country highlights, stakeholders and data analysts can only be as effective as their processes allow. In order for data to be used for decision making, agreed upon processes must be in place for stakeholders to review, discuss and act on data. In both countries, defining the relevant stakeholders and conducting workshops to define indicators was a major challenge, and ultimately the success

of this project. These workshops led to fruitful discussions about what indicators would be most useful to each program for decision-making. To achieve useful data analysis and utilization, processes should be put in place to allow these groups of stakeholders to meet routinely to ensure a shared understanding of the interactions between health services provision and logistics. The resulting exchange and learning may highlight other processes that need to change. For example, adjustments to data collection forms and processes may be needed once the team has a better sense of what is available, what is missing, and what may be duplicative among the systems being integrated.

In Senegal, the Informed Push Model (IPM) team learned that DHIS2 captures some of the data points that are also reported in CommCare Supply, and with the integration could be imported automatically rather than entered manually. In Tanzania, several recommendations for updates to data collection forms came out of the stakeholder discussions surrounding requirements for the dashboard. One resulting example is a change to the wording of the HMIS form that more clearly differentiates between whether female condoms or male condoms were provided, rather than capturing only whether an unknown type of condom was provided to a male or female client. A strategy must be put in place to ensure the right people, decision makers and policymakers as well as program managers, are engaged and there is a process to adjust elements of the data collection processes as necessary and communicate said changes to all relevant parties, including service delivery providers working at the last mile.

Key Insights: People & Process

1. **Engage stakeholders with diverse expertise early in the project—consider clinical health practitioners, statisticians, logisticians, etc. representing all levels of the supply chain system**
2. **Launch integration process with a stakeholder meeting, continue follow-up meetings with key players on a regular schedule, as necessary**
3. **Include supply chain analytics human resources who can distinguish between data and information and communicate to stakeholders**
4. **Establish processes for disparate information systems such as DHIS2, OpenLMIS/ eLMIS, CommCare, MOTECH, OpenHIE to work under a unified vision such as a national eHealth strategy and develop a for collaboration and coordination in decision-making and communication between stakeholders at all levels of the system**
5. **Develop processes to streamline and change data collection protocols**

Conclusion

Timeline and Budget

As has been stated, integration is not a short or simple process. In Tanzania, the process took over one year from the initial stakeholder workshop to the eventual launch of the dashboard. Much of that time was spent ensuring all the appropriate people were represented in requirements refinement sessions, working with stakeholders to determine which data would be most useful for the dashboard, and developing and reviewing mock-ups of how data would be displayed in the dashboard. In addition, this time was spent preparing the systems for integration. For example, the manual mapping and matching of the two facility lists in the two systems to link facilities was a time-consuming and tedious task. Issues such as the approach to handling the mismatch in reporting periods for the LMIS and

HMIS also needed to be resolved (i.e quarterly LMIS vs monthly HMIS reporting periods). The process in Senegal lasted just under one year partly because the project team benefited from Tanzania's lessons learned – particularly on dealing with the complexity of defining indicators and analytics. In addition, the integration in Senegal was only in four districts which made mapping of facilities an easier task.

The budget figures provided are high-level estimates that demonstrate the initial costs of integration. These costs include requirements gathering, technical integration, user testing and feedback, training for a limited number of initial users. Costs for global coordination between countries and the Commission as well as documentation of lessons learned are also included. Both the time and money spent are representative of what it takes to get an integration started; in both Senegal and Tanzania the process is just beginning. Future steps include maintaining the systems including upgrades and changes as needed, more in-depth user training, and efforts to interpret and analyze data that can lead to evidence-based decision-making.

Dates of Important Milestones	Tanzania	Senegal
Project Start	March 2015	Sept 2015
Initial User Requirements Gathering Complete	May 2015	Nov 2015
User Acceptance Testing Complete	April 2016	May 2016
Dashboard Launch	May 2016	July 2016

Budget (USD)	Tanzania	Senegal
	$276,000	$232,000

Future Integrations: A Case for Support

The pilots in Tanzania and Senegal have demonstrated the feasibility of routine and automated integration of HMIS and LMIS systems that together make a more comprehensive analysis of service delivery systems possible. The resultant analytics can bring health informatics and supply chain professionals together to look at the public health service system more holistically and to work together to streamline and improve the health care system.

The country pilots also confirmed the enthusiasm from ministries of health for this type of integration, whereby users have enhanced, centralized data visibility from both systems while maintaining the relative strengths of each. In Tanzania, there are already other programs beyond RMNCH that have expressed strong interests in similar integration for the data relevant to their programs. Although more time is needed to understand how to improve the indicators displayed on the dashboard to ensure they are useful to decision makers, this pilot instigated important discussions on how data integration can increase visibility of important trends in medicines use and management. More can be done in close coordination with clinicians, pharmacists and subject matter experts to base the dashboard analytics on standard treatment guidelines (STG) applicable to the medical area and associated clinical product usage. Expert opinions along with analysis of logistics data over historical periods can be used to develop key performance indicators that can alert decision makers on the dashboard for further investigation and interventions.

The dashboard pilots highlighted the importance of putting processes in place that allow for these discussion to happen routinely in order to provide recommendations to policymakers based on a holistic view of the health system.

Refining the dashboards in Senegal and Tanzania, and developing similar tools in other geographies, will be an iterative process. As the opportunities for integration grow across multiple data systems so does the need for applying long-term integration strategies that take into consideration not only technology, but also the people and processes necessary to sustain them. The integrated dashboards developed in Tanzania and Senegal are a good starting point to understanding the potential of seeing supply chain and service delivery data together, but will require further use and user input to maximize their potential in improving data quality and supporting routine decision making.

Appendix

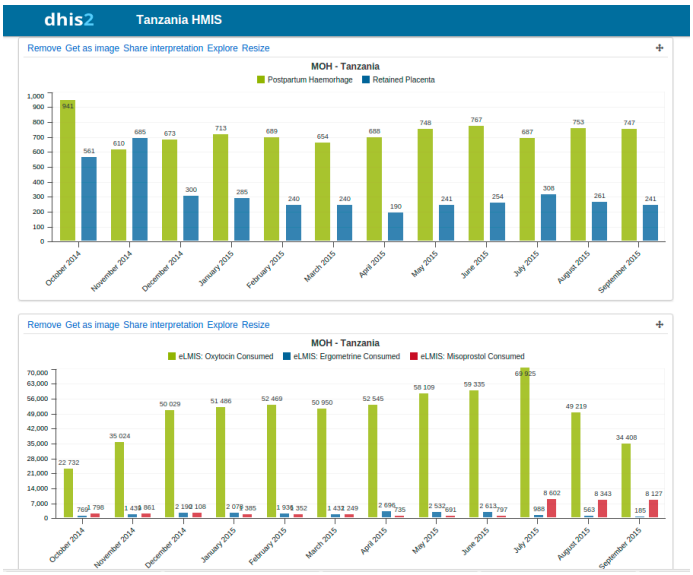
Tanzania Case Study

In Tanzania, DHIS2 and eLMIS are both deployed nationally. For both systems, data are collected on paper at the health facility level and then electronically entered at the district level.

DHIS2 data are typically entered on a monthly basis by the Council Health Management Team (CHMT) led by the District HMIS focal person, in collaboration with other vertical program district coordinators. Once entered, these data are accessed and used by all health management teams from district to national level. In Tanzania, the Computer Science and Engineering Department at University of Dar es Salaam (UDSM) is the software technical lead for DHIS2 and was responsible for the DHIS2 portion of this integration project.

eLMIS data, on the other hand, are typically entered by the District Pharmacist. Health facilities are divided into three groups (Group A, Group B, and Group C), and each group submits a quarterly report and requisition that covers the three months prior to the group's reporting month. The reporting structure is staggered, with approximately one third of the country's facilities reporting each month. For example, Group A reports in January, Group B in February and Group C in March. These data are used to create orders for each health facility that are then sent to Tanzania's Medical Stores Department, who delivers commodities directly to the health facility. Commodities are delivered to a facility every three months. With over 6,000 health facilities the country is too vast for the Medical Stores Department to deliver to every facility in the same distribution cycle, creating a need for three groups with a staggered delivery schedule.

eLMIS data are also used to give logisticians insight into national and regional stock levels, districts or facilities at risk for understock or overstock situations, lab equipment and refrigerator status, among others. John Snow, Inc. (JSI) worked as a contributor to the OpenLMIS initiative to develop and implement eLMIS and is responsible for the eLMIS portion of this integration project and overarching project management of the work in Tanzania.



Results

The dashboard was launched in May of 2016 with the orientation of thirty stakeholders. Those in attendance were reproductive and child health coordinators and HMIS coordinators from the national level, Dar es Salaam regional council and Kinondoni, Ilala and Temeke districts. The launch was also attended by other RMNCH stakeholders and implementation partners.

While refining the indicators, it was decided that the dashboard should display relevant data side by side rather than creating indicators calculated from both data sets. The figure above shows an example of graphs displayed in the dashboard. The first graph shows number of cases of postpartum hemorrhage and retained placenta from DHIS2 while the second graph shows the commodities used to treat those conditions from eLMIS. Seeing these data side-by-side allows the user to understand the relationship between service delivery and consumption and look for abnormal or concerning trends (i.e. a drastic decrease in consumption without a corresponding change in the number of cases diagnosed).

The dashboard has been used continuously by program staff since it's launch, mostly at the national level. Users have provided valuable feedback and requested further training on how to use the dashboard to triangulate service delivery data with logistics data. The launch has also triggered demand to expand the dashboard to include more commodities from the reproductive and child health program, as well as from other programs such as malaria and tuberculosis.

Senegal Case Study

In Senegal, the integrated HMIS/LMIS Dashboard pulls data from CommCare Supply and displays it in DHIS2. As in Tanzania, DHIS2 is deployed nationwide and it is used to track statistics on service delivery. Data are collected on paper forms at health facilities and then electronically entered at the district level. DHIS2 aggregates the data, analyzes it to provide indicators defined at the national level, and visualize data and indicators in a variety of graphics configurable by users, such as bar and line graphs, pie charts and maps.

CommCare Supply is a product developed by Dimagi to help frontline healthcare workers manage commodities. In Senegal, it is used as the LMIS in the Informed Push Model (IPM) project, led by IntraHealth, in 1,400 health facilities. In the Informed Push Model, an assistant logistician and an operator visit facilities with a mobile warehouse to make direct delivery of commodities. The operator uses CommCare Supply to collect data on consumption and stock on hand from the facility's storeroom during the delivery. CommCare Supply then uses that data to determine ideal stock amounts, and the operator and assistant logistician use those data to deliver appropriate quantities of each product. Currently, this system is used for 11 family planning commodities nation-wide, and a pilot is being implemented for 33 essential medicines in two districts. Dimagi has developed the IPM mobile application using the platform CommCare Supply, and is responsible for the CommCare Supply portion of this integration project and overarching project management of the work in Senegal.

In the pilot phase, the HMIS/LMIS integrated dashboard was rolled out in four districts: Sakone, Fatick, Nioro, and Dakar Centre. These districts were selected because DHIS2 and CommCare Supply are well established in all four, which also provided a wider sample. The project team targeted RMNCH supplies, since they are currently managed by CommCare Supply, and since they are of the most interest to the UNCoLSC.

Results

Similar to Tanzania, the Senegal displays data side-by-side rather than creating indicators calculated from both data sets. For each commodity, consumption, stockout and loss rates are displayed from the LMIS next to the corresponding ailments the commodities treat. Some commodities do not have an indicator for consumption rate, either because they are interchangeable with other drugs that treat the same pathologies, such as the antibiotics used in newborn health, or because they are used to treat many pathologies, such as amoxicillin. For these reasons, stakeholders elected not to display consumption rate for these commodities because comparing consumption of these quantities to specific DHIS2 indictors would not allow users to draw any conclusions about rational use of medicines. For post-pilot next steps, key stakeholders will meet to define a roadmap to scale up to all districts and provide ongoing support for the integration system.

Thanks to the contributing partners:

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