HEALTH LOGISTICS IN TANZANIA

A Decade of Supply Chain Accomplishments

2005-2016

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SCMS

The Supply Chain Management System (SCMS) was established to enable the unprecedented scale-up of HIV/AIDS prevention, care and treatment programs in the developing world. SCMS procures and distributes essential medicines and health supplies, works to strengthen existing supply chains in the field, and facilitates collaboration and the exchange of information among key donors and other service providers. SCMS is an international team of 16 organizations funded by the US President's Emergency Plan for AIDS Relief (PEPFAR). The project is managed by the US Agency for International Development.

This document was made possible through support provided by the US Agency for International Development, under the terms of contract number GPO-I-00-05-00032-00. The opinions expressed herein are those of the author(s) and do not necessarily reflect the views of the US Agency for International Development or the US government.

USAID | DELIVER PROJECT, Task Order 4

The USAID | DELIVER PROJECT, Task Order 4, is funded by the U.S. Agency for International Development (USAID) under contract number GPO-I-00-06-00007-00, order number AID-OAA-TO-10-00064, beginning September 30, 2010. Task Order 4 is implemented by John Snow, Inc., in collaboration with PATH; Crown Agents USA, Inc.; Eastern and Southern African Management Institute; FHI 360; Avenir Health for Development, LLC; LLamasoft, Inc.; The Manoff Group, Inc.; Imperial Health Sciences (IHS); PRISMA; and VillageReach. The project improves essential health commodity supply chains by strengthening logistics management information systems, streamlining distribution systems, identifying financial resources for procurement and supply chain operation, and enhancing forecasting and procurement planning. The project encourages policymakers and donors to support logistics as a critical factor in the overall success of their healthcare mandates.

USAID | DELIVER PROJECT, Task Order 7

This document was prepared by staff of the USAID | DELIVER PROJECT, Task Order 7, which is funded by the U.S. Agency for International Development (USAID) under contract number GPO-I-00-06-0007-00, order number AID-OAA-TO-11-00012, beginning on March 28, 2011. Task Order 7 is implemented by John Snow, Inc., in collaboration with 3i Infotech, Inc.; Crown Agents USA, Inc.; FHI 360; Foundation for Innovative New Diagnostics; Logenix International, LLC; The Manoff Group, Inc.; MEBS Global Reach, LC; PATH; Imperial Health Sciences (IHS); Population Services International; Social Sectors Development Strategies, Inc.; UPS Supply Chain Solutions, Inc.; and VillageReach. Task Order 7 supports USAID's goal of reducing the malaria burden in sub-Saharan Africa by procuring and delivering safe, effective, and high-quality malaria commodities; by providing technical assistance and on-the-ground logistics expertise to strengthen in-country supply systems and build capacity for managing commodities; and by improving the global supply and long-term availability of malaria commodities.

Recommended Citation

Supply Chain Management System; USAID | DELIVER PROJECT , Task Order 4; USAID | DELIVER PROJECT Task Order 7. 2016. Health Logistics in Tanzania: Timeline of Accomplishments for Supply Chain Interventions. Arlington VA: Supply Chain Management System; USAID | DELIVER PROJECT, Task Order 4; USAID | DELIVER PROJECT, Task Order 7.

Abstract

This report describes key investments of USAID-funded logistics projects, managed by John Snow, Inc. (JSI) and the Partnership for Supply Chain Management (PFSCM), in Tanzania. From 2005-2016, USAID, in partnership with JSI, PFSCM, and others, worked with the government of Tanzania to improve access to medicines and medical supplies for the population of Tanzania by strengthening the public health supply chain.

Cover photo: Health facility worker managing commodities in a store.

All photos in this document are credited to the USAID | DELIVER PROJECT, unless otherwise stated.

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The authors' views expressed in this publication do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.

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ACRONYMS

ACT Artemisinin-based combination therapies

ADR adverse drug reaction

ART antiretroviral therapy

ARV antiretroviral

BRN Big Results Now

CHMT Council Health Management Team

CIDA Canadian International Development Agency

CTC care and treatment centers

DANIDA Danish International Development Agency

DED District Executive Director

DFID Department for International Development

DMO district medical officers

EDP Essential Drug Program

eLMIS electronic Logistics Management Information System

ERP Enterprise Resource Planning

EUV end-use verification

GFATM Global Fund for AIDS, Tuberculosis, and Malaria

GOT Government of Tanzania

HIV Human Immunodeficiency Virus

IHAS Institute of Health and Allied Sciences

ILS Integrated Logistics System

IP implementing partner

IST in-service training

LMU Logistics Management Unit

MIS management information system

MOF Ministry of Finance

MOHCDGEC Ministry of Health, Community Development, Gender, Elderly, and Children

MSD Medical Stores Department

MUHAS Muhimbili University of Health and Allied Sciences

NEMC National Environmental Management Council

NPAP National Pharmaceutical Sector Action Plan

OI opportunistic infection

OJT on-the-job training

PO-RALG President's Office-Regional Administration and Local Government

PMTCT prevention of mother-to-child transmission

PSS Pharmaceutical Services Section

PST pre-service training

PVM Prime Vendor Model

QA quality assurance

RBF Results Based Financing

RH reproductive health

RHMT Regional Health Management Team

R&R report and requisition

SBU Strategic Business Unit

SCM supply chain management

SCMA Supply Chain Monitoring Advisor

SCMS Supply Chain Management System

SOPs standard operating procedures

STI sexually transmitted infection

TB Tuberculosis

TBL Tuberculosis and Leprosy

TFDA Tanzania Food and Drug Authority

ToT training of trainers

TWG technical working group

VIMS Vaccine Information Management System

VMMC voluntary medical male circumcision

WHO World Health Organization

WIB Warehouse-in-a-Box

ACKNOWLEDGEMENTS

The Supply Chain Management System (SCMS) and USAID | DELIVER PROJECT would like to express our gratitude to health commodity supply chain stakeholders for their support and collaboration in the successful implementation of supply chain interventions for a strengthened logistics system for the past ten years. We acknowledge the high degree of commitment and support from all our partners in the different levels of governance of health commodity security.

We express special appreciation to the management and staff of the Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) for identifying strategic supply chain areas that require technical assistance, helping to maximize the impact of proposed interventions in the public health sector and improving health outcomes for patients at the health facility. Our sincere gratitude is extended to the leadership of the Chief Pharmacist's office and other institutions under the Ministry: the Tanzania Food and Drugs Authority (TFDA), Medical Stores Department (MSD), National Health Insurance Fund (NHIF), Muhimbili University of Health and Allied Sciences (MUHAS), and Pharmacy Council.

We would like to mention the involvement of complementing ministries beyond the MOHCDGEC, whose participation in engaging pharmacists and health care workers within their jurisdiction resulted in a conducive environment for implementing activities at all levels of the supply chain. Special thanks is extended to the Ministry of Finance and the President's Office Regional Administrative and Local Government for administrative support and technical direction.

The extensive work in advocacy, capacity building, and distribution of lifesaving commodities to health facilities by implementing partners throughout the country has further solidified partner engagement and enabled continuation of best practices introduced by the projects. Special thanks to all the health care workers in Tanzania who have diligently worked to improve commodity availability at the last mile. Their devotion has been exemplary.

Our legacy as detailed in this report has been supported by funding from the United States Government through the United States Agency for International Development (USAID), President's Emergency Plan for AIDS Relief (PEPFAR), and President's Malaria Initiative (PMI). Additional funding supporting SCMS and USAID | DELIVER PROJECT's initiatives from the World Bank, Global Fund for AIDS, Tuberculosis and Malaria (GFATM), Department for International Development (DFID), Canadian International Development Agency (CIDA), and Danish International Development Agency (DANIDA) has enabled the successful implementation of interventions led by the two projects.

This report is a dedication to all who have worked tirelessly to ensure that every Tanzanian has the opportunity to live a healthy, productive life.

EXECUTIVE SUMMARY

Over the last decade, investments made by the Government of Tanzania (GOT) through the Ministry of Health, Community Development, Gender, Elderly, and Children (MOHCDGEC), United States Agency for International Development (USAID), and other donors and partners toward strengthening the public health supply chains in Tanzania has had a positive impact on the health and well-being of Tanzanians.

Funded by USAID, PEPFAR, and PMI, both the USAID | DELIVER PROJECT and Supply Chain Management System (SCMS), working in concert with the MOHCDGEC, have made significant contributions in making supply chains more effective and efficient. These accomplishments demonstrate the impact of collaboration and the efforts put forth by the MOHCDGEC to achieve these goals.

Some of the highlights for strengthening public health supply chains include:

Systems Strengthening

End-Use Verification data, an instrumental performance management tool for system monitoring, shows stockout rates for artemisinin-based combination therapies (ACTs) on the day of the visit have decreased from 24 percent in 2012 to 3 percent in December 2015.

Management Information System (MIS)

Implementation of electronic logistics management information system (eLMIS), a web based application for managing logistics data created a sustainable MIS solution. Reporting rates from January – March 2016 were 93 percent for the Integrated Logistics System (ILS) and 95 and 92 percent for the antiretroviral (ARV) and Lab logistics systems, respectively.

Quality Assurance

Facilitated greater use of and sensitization to the pharmacovigilance system, resulting in a 76 percent improvement in adverse drug reaction (ADR) reporting rate. The renovated lab at Muhimbili University of Health and Allied Sciences has enhanced capacity building in research and development for Tanzania and the broader East Africa region.

Warehousing and Distribution

Optimal design of the Warehouse-in-a-Box (WiB) has nearly tripled the total number of pallet positions at Medical Stores Department (MSD). Optimized distribution routes improved access to life saving health commodities and led to a 10 percent reduction in distribution costs.

Procurement

As of 2015, procured a total of $276 million worth of health commodities: $205 million of antiretroviral therapy (ART), rapid test kit, and other HIV commodities; over $51 million of anti-malarial commodities; and over $20 million of family planning and reproductive health commodities.

Quantification

Built local capacity and significantly increased the level of country ownership in management of the quantification process. Achieved 78 percent forecast accuracy rates for family planning in 2014, 94 percent accuracy rate for ARVs, and 95 percent for anti-malarials in 2015.

Policy

Collaborated with donors and other stakeholders to formalize supply chain and pharmaceutical priorities in the National Pharmaceutical Section Action Plan (NPAP), valued at $42,939,536.

Capacity building

Trained over 18,000 health care workers representing all levels of the supply chain on various supply chain interventions.

Waste Management

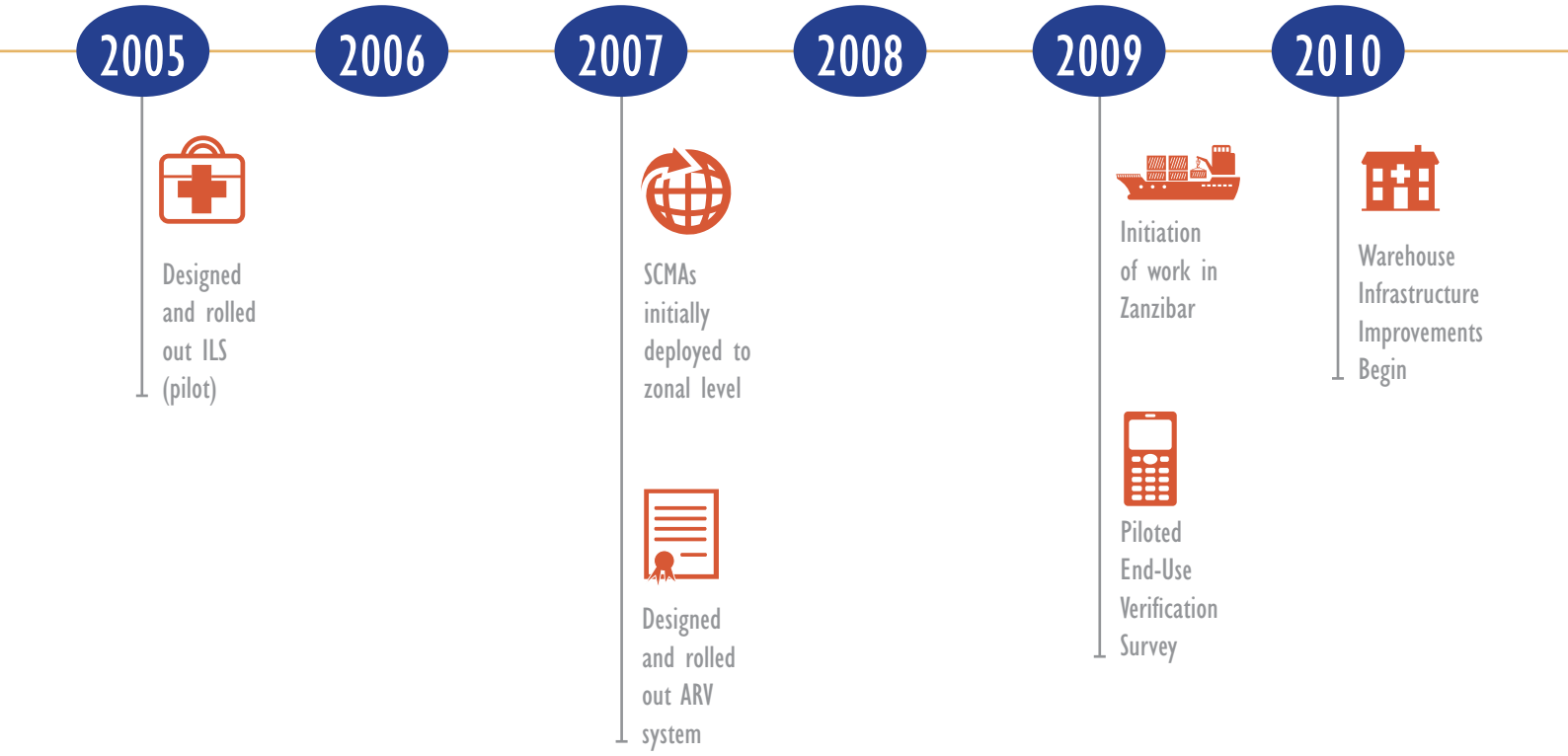
Trained a total of 548 health care workers and stock verifiers in 24 regions on pharmaceutical waste disposal guidelines.

Logistics Management Unit (LMU)

Institutionalized supply chain management with 73 LMU staff hired and placed within the MOHCDGEC.

These achievements across the two projects' technical areas have generated high impact and positive health outcomes for the Tanzanian health sector. Each program area contributes to the critical work of strengthening supply chains, building capacity, and ensuring commodity security. Equipped with a vision for sustainability, innovation, and collaboration; SCMS and the USAID | DELIVER PROJECT's work has produced systems and processes for high-performing supply chains leading to greater availability of life-saving health commodities.

THE PUBLIC HEALTH SUPPLY CHAIN MANAGEMENT PATH IN TANZANIA



Since its inception, a total of **43 SCMAs** in the nine MSD zones have provided mentoring, supportive supervision, and on-the-job training (OJT) to health care workers for the management of the ARV logistics system.

At present, 40% of **LMU staff** is paid by the MOHCDGEC.

2011

- Launched Prime Vendor Model

2012

- Implemented Epicor at MSD

2013

- SCM PST curricula integrated at Muhimbili
- Strategic Review of Tanzania and Zanzibar Supply Chains

2014

- Quantification ownership
- Developed toolkit for best practices in governance and commodity management
- LMU developed and fully staffed

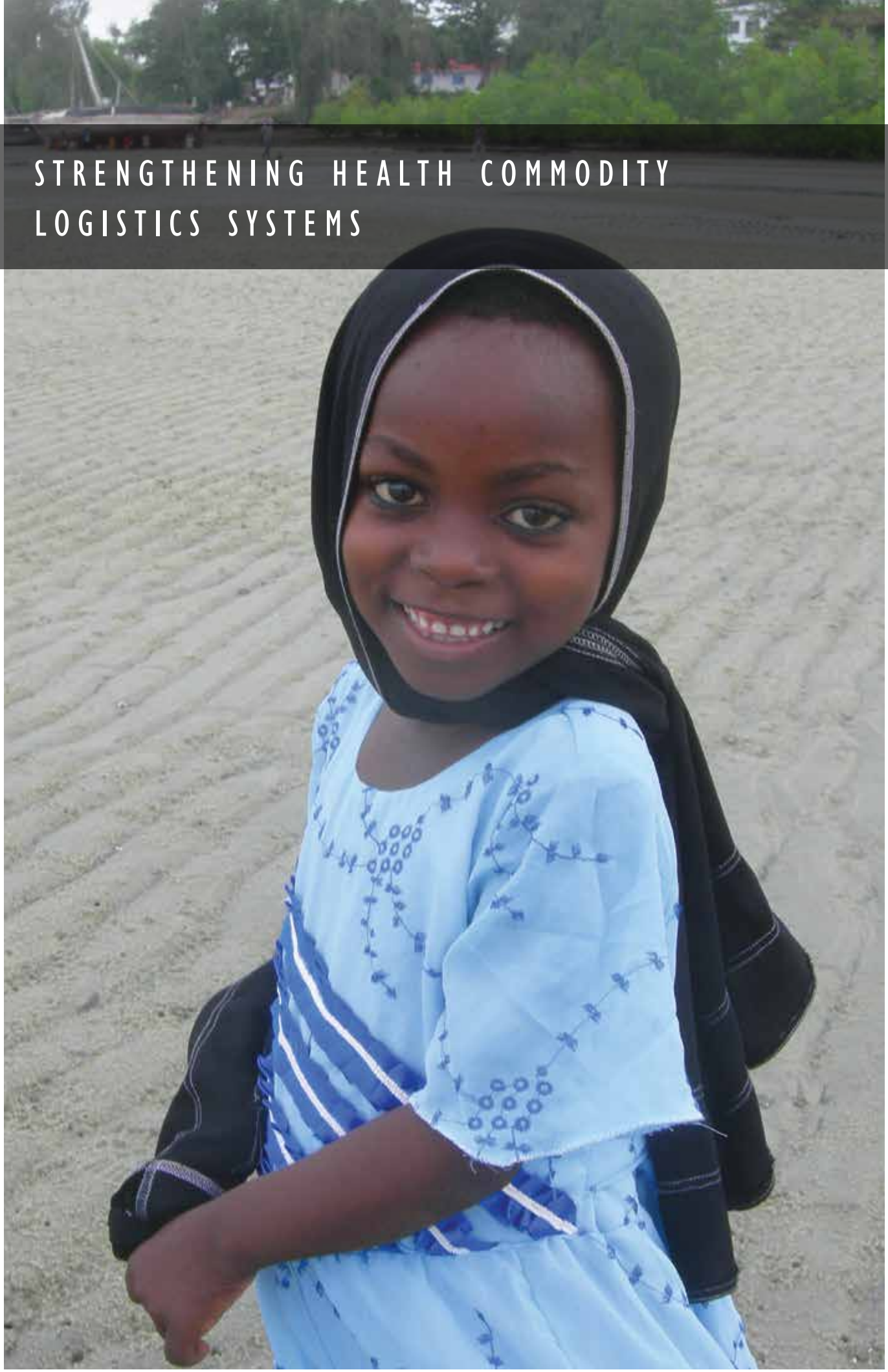
2015

- eLMIS rolled out to all districts
- Muhimbili Lab Renovated

In March 2012, the projects held a two day workshop with MOHCDGEC, MSD, and other stakeholders to outline the **functions** of the LMU that would be embedded within the structure of the MOHCDGEC below.

From January 2014 through March 2015 LMU staff handled 1,774 facility to facility **redistributions**.

STRENGTHENING HEALTH COMMODITY LOGISTICS SYSTEMS



System strengthening efforts have provided a systematic approach to improving commodity logistics systems to meet the needs of the clients and providing data to allow managers to make informed decisions related to planning and budget management

- Designed and implemented supply chains that are more agile and responsive to the changing needs of clients serving over 800,000 patients on ART.
- Integrated the management of five supply chains to minimize duplication of efforts, ensure product availability, and instill more effective management of financial and human resources.
- Strengthened supply chain processes to promote coordination at all levels, reducing stockouts of artemisinin-based combination therapies (ACTs) to under three percent.

Prior to 2004, public health commodity supply chains in Tanzania had significant variations and challenges in ordering and reporting of health commodities. This resulted in multiple ordering systems, insufficient inventory control parameters, parallel supply chains, duplication of efforts, bureaucracy in ordering, and over-extension of limited resources.

Staff preparing for End-Use Verification survey.

Introduction of the Integrated Logistics System

In response to these challenges, the USAID | DELIVER PROJECT provided technical assistance to the MOHCDGEC between 2005 and 2012 to strengthen Tanzania's health logistics system. In 2005, the ILS — which merged the management of commodities for the Essential Drug Program (EDP), malaria, reproductive and child health, sexually transmitted infections (STIs), and family planning into a single ordering and reporting system — was piloted in Dodoma and Iringa regions. The final stages of ILS roll-out were completed in 2009.

Despite the ILS's integrated supervisory, reporting, and distribution functions, some challenges still existed, including non-adherence to quarterly reporting and ordering schedules, errors in completing the report and requisition (R&R) forms, and delays in receiving commodities from the MSD. In March 2012, the MOHCDGEC, in collaboration with the USAID | DELIVER PROJECT and SCMS, decided to make some adjustments to the ILS, shifting supervisory roles from health facility staff to the district pharmacist and expanding the scope to include laboratory reagents and consumables managed at health facilities. Some revisions were also made to the ILS management tools to make them easier to use, complete, and provide adequate logistics data.

Group discussing optimization of the TB and leprosy logistics system.

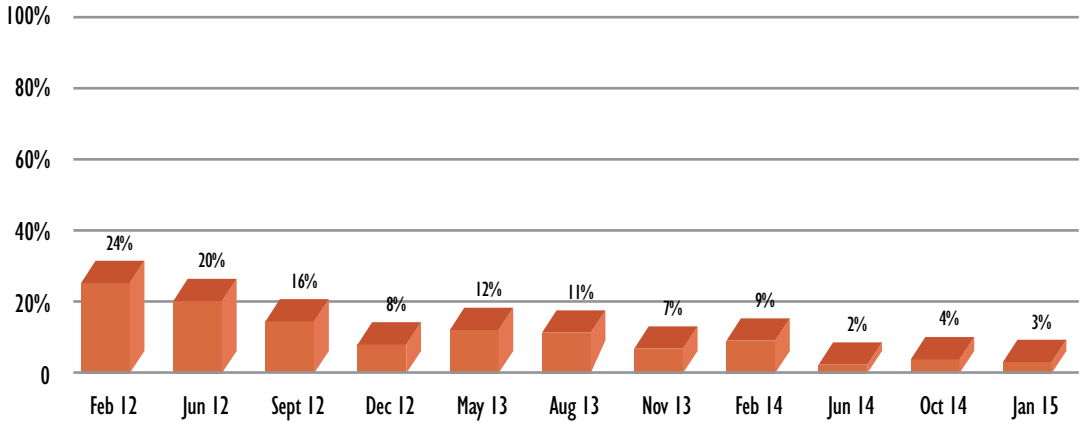
System Strengthening Efforts Improve Data Visibility

Since the implementation of these improvements to the ILS and other system strengthening interventions, such as the eLMIS, an electronic management system used to collect, organize and manage logistics data, and the LMU, a coordinating body that provides supply chain management oversight, data accuracy and visibility at the different supply chain levels have significantly improved, facilitating informed decision making by stakeholders.

The malaria program, for example, has seen a steady decline in stockout rates of all ACTs on the day of visit through the quarterly EUV surveys. Stockouts dropped from 24 percent in February 2012 to 3 percent in January 2015.[1] Reporting rates have also significantly improved, from 56 percent in February 2012 to almost 90 percent in January 2015[2]. According to the Chief Pharmacist, Mr. Henry Irunde, "if you have good supplies of drugs, for example, for treatment of malaria, it can be related to having an improved system. Having good supply system for medicines contributes to saving lives, and our systems have contributed to some extent to saving lives."

According to the Chief Pharmacist, Mr. Henry Irunde, "if you have good supplies of drugs, for example, for treatment of malaria, it can be related to having an improved system."

Percentage of Facilities Stocked Out of all ACTs on Day of Visit



ARV Logistics System Adapts to the Changing Environment

In 2009, SCMS, in collaboration with the MOHCDGEC, fully rolled out the ARV logistics system, modeled after the ILS, which provided a coordinated ordering and distribution system. The system was implemented at about 200 sites in 2007, supporting about 136,700 patients on treatment; it is now implemented at more than 1,500 facilities nationally, supporting over 800,000 patients. Since 2011, reporting rates have been maintained above 80 percent.[3]

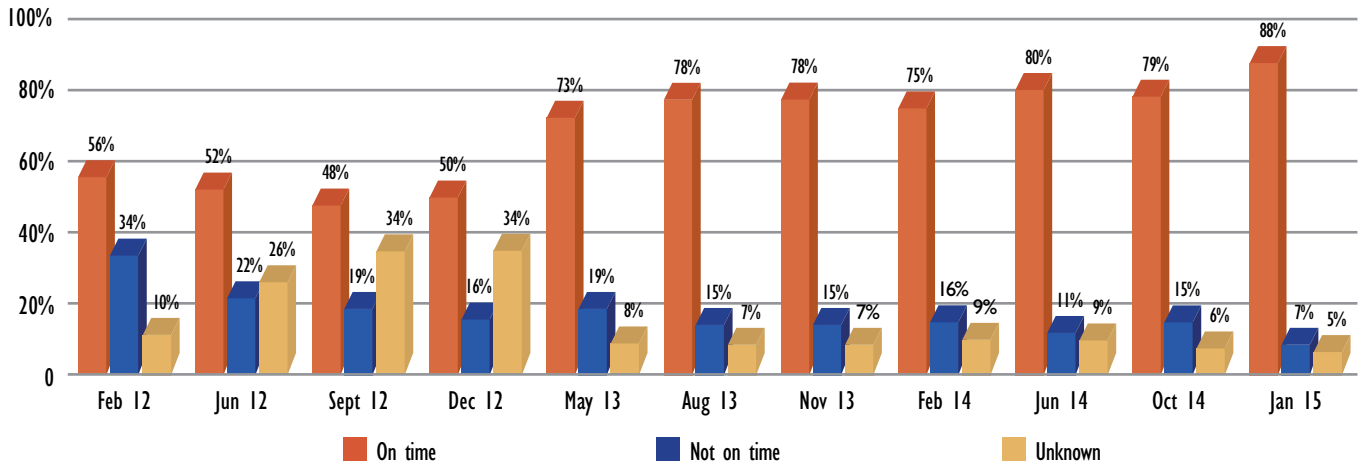
SCMS has remained responsive to the changing landscape of HIV & AIDS care and treatment services. In 2013, the World Health Organization (WHO) introduced prevention of mother-to-child transmission (PMTCT) Option B+, which recommends providing lifelong antiretroviral treatment (ART) to pregnant and breastfeeding women living with HIV. In implementing this change, SCMS

[1] The end-use verification (EUV) collects data on malaria commodity availability and the diagnosis and treatment of malaria through a routine, facility-based monitoring survey, implemented in PMI focus countries. Sample size is approximately 200 health facilities per quarter and is not considered nationally representative.

[2] EUV data

[3] SCMS Performance Management Plan, April - June, 2013.

Integrated Logistics System Reporting Rates



included a PMTCT Option B+ component in health facility ordering forms and the standard operating procedures (SOPs), resulting in the scale-up of Option B+ services for HIV test kits and ARVs, from the initial 1,200 health facilities in 2013 to more than 4,500 by the end of 2014. In Tanzania, there has been a marked drop in mother to child transmission rates from 30 percent in 2009 to 9 percent in 2014."[4]

Optimization of the Tuberculosis (TB) and Leprosy Program

Following the TB and leprosy (TBL) system assessment, the National TB and Leprosy Program (NTLP) and SCMS completed a redesign of the TBL system in 2012 to optimize logistics system performance. Certain components of the optimized TBL system tap into aspects of the ILS and ARV systems, such as use of MSD for storage and distribution and of MSD documentation, use of standardized transaction forms and ledgers, and engagement of district-level staff in commodity management. However, unlike other systems, TBL uses a pull system up to District stores and a push system to Direct Observed Treatment centers due to patients changing phase and the fact that they are managed only by sites that have patients on a specific TBL drug regimen, SCMS designed the TBL system as a separate system, which still benefited from the ILS and ARV system, by leveraging existing reporting tools, supportive supervision frameworks, and commodity management principles.

Summary

Public health logistics systems in Tanzania continue to support local and global changes in service provision. This type of systematic implementation of coordinated logistics systems with established inventory management systems has led to streamlined reporting, ordering, and distribution processes; better enabled and engaged human resources; and improved visibility into data for decision making. These interventions have also created agility in the supply chains, making them responsive to the changing demands of clients.

Public health logistics systems in Tanzania continue to support local and global changes in service provision.

[4] Joint United Nations Programme on HIV/AIDS 2015 Progress Report on the Global Plan towards the elimination of new HIV infections among children and keeping their mothers alive

STRENGTHENING QUANTIFICATION

Institutionalized quantification processes within the MOHCDGEC programs and supported GOT and USAID efforts to quantify program health commodity requirements.

- Strengthened quantification capacity within the MOHCDGEC.
- Increased the level of country ownership for conducting quantification, from fully SCMS and USAID | DELIVER PROJECT supported at the start of the projects to an activity with MOHCDGEC ownership for many stages of the process.
- Achieved 78 percent forecast accuracy rate for family planning commodities in 2014, 94 percent forecast accuracy for antiretroviral commodities in 2015 and 95 percent for anti-malarials in 2015.[1]
- Institutionalized quantification as one of the key technical areas within the LMU.

Prior to 2006, quantification processes for public health commodities were inconsistent across program areas. The MOHCDGEC performed annual quantification exercises for reproductive health (RH) and ARV commodities, but the efforts, and resulting supply plan quality, suffered due to the lack of a standardized process including tools, methodology, data availability and quality, and human capacity.

Over the years, the USAID | DELIVER PROJECT and SCMS have provided technical assistance to the MOHCDGEC in forecasting and supply planning. MOHCDGEC programs have progressively assumed more responsibility for the annual quantification exercises in addition to routine supply planning and monitoring.

Quantification workshop participants review forecast requirements.

Building Capacity in Quantification

Due to limited MOHCDGEC capacity in quantification, early efforts were primarily led by the two projects. Over time, the projects introduced capacity building into the quantification exercises, training 36 MOHCDGEC staff to serve as the GOT's technical leads for quantification of public health commodities.

[1] Forecast accuracy rate is calculated using Median Absolute Percent Error - $100 \times |A_t - F_t| \div A_t$, where A^t indicates the actual quantity of a contraceptive distributed at time t and F_t indicates the forecast of A_t.

As of late 2015 GOT counterparts spearheaded ARV quantification, reaching a country ownership level of 72 percent.

In 2012, the projects began measuring the level of country ownership in quantification as an indicator. At that time, the MOHCDGEC had assumed ownership for 50 percent of the quantification process. Since then, the MOHCDGEC has continued to assume greater responsibility for various stages within the activity. As of late 2015 GOT counterparts spearheaded ARV quantification, reaching a country ownership level of 72 percent, with leadership in initiating the quantification exercise; data collection for forecast and supply planning; data validation and analysis; documentation of inputs, assumptions, and outputs; and coordination of sourcing for planned shipments.

Implementing Quantification Tools and Methodology

As quantification exercises grew and strengthened, MOHCDGEC staff and project advisors increasingly adopted strong technical methodology and use of software tools, including Quantimed and PipeLine, to assist with forecasting and supply planning. Methodologies expanded from the use of demographic data to include use of consumption and service data where most technically appropriate. Advisors from the two projects built MOHCDGEC staff capacity to understand the nuance and intricacies involved with using data from multiple forecasting methodologies data source and methodology for a quantification exercise.

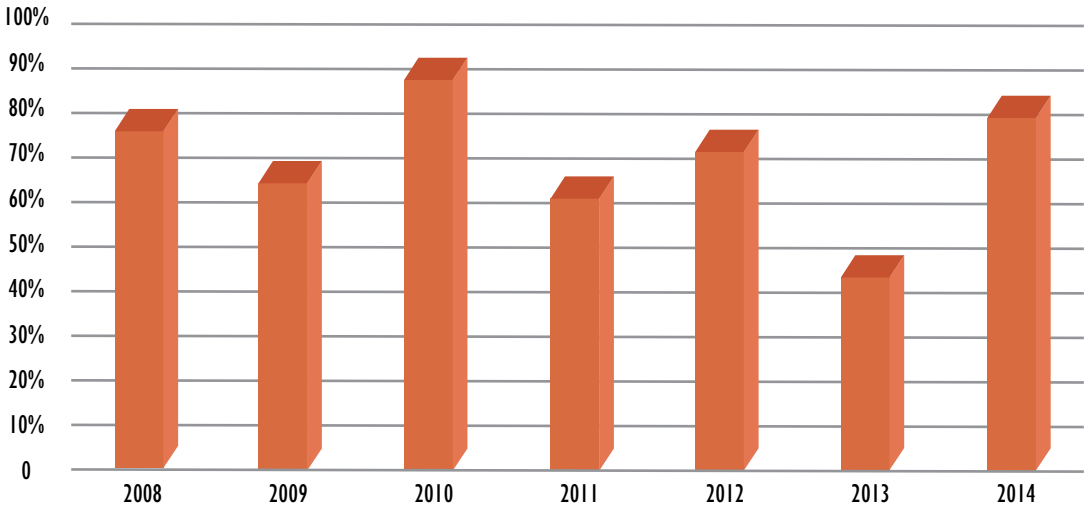
Healthcare workers reviewing store records and data.

In addition to annual quantification exercises and updates, the USAID | DELIVER PROJECT and SCMS have worked with MOHCDGEC programs on routine supply planning, using PipeLine software to keep track of stock levels, commodity movement, and program needs. In collaboration with the MOHCDGEC logistics officer, staff from the two projects update the PipeLine databases on a routine basis—quarterly for RH and malaria commodities and monthly for ARVs—to respond to consumption trends.

Improved Data Boosts Forecast Accuracy

Along with increased human capacity and use of a standardized methodology and software tools, the availability of quality consumption data from the LMIS that the projects put in place helped improve forecast accuracy rates for family planning commodities to 78 percent. Similarly, the ARV forecast accuracy rate increased from 80 percent in 2014 to 94 percent in 2015 due to continued SCMS efforts to promote logistics data availability and local capacity.

Family Planning Forecast Accuracy Rate



With the creation of the LMU and the elevation of the Pharmaceutical Services Section to a Unit level, demand planning responsibilities for the public health sector have been prioritized and institutionalized as one of the key functions of the LMU.

Introducing Laboratory Quantification

Prior to 2009, no systematic or data-driven national quantification exercise for laboratory supplies had taken place. To provide data-based supply planning, SCMS began conducting laboratory quantification exercises with service data obtained from the zonal stores and health facilities that use laboratory commodities. About 300 health facilities and stores are now providing service data for laboratory commodities following the implementation of the laboratory logistics system. As laboratory products are introduced into the eLMIS, data quality and availability will make laboratory quantifications more accurate.

Institutionalizing Demand Planning

With the creation of the LMU and the elevation of the Pharmaceutical Services Section (PSS) to a Unit level, demand planning responsibilities for the public health sector have been prioritized and institutionalized as one of the key functions of the LMU. With support from the two projects, the MOHCDGEC successfully designed and implemented the LMU to serve as the core GOT body with responsibility over core supply chain management functional areas and activities. As one of the key supply chain functional areas, the LMU will take increasing responsibility for conducting annual quantifications in collaboration with MOHCDGEC programs, and will also conduct bi-annual reviews of commodity forecasts and quarterly reviews of supply plans.

Quantification workshop for HIV and lab commodities.

STRENGTHENING PROCUREMENT PROCESSES

Fostered an environment of robust procurement planning and strengthened public-private partnership in procurement through the establishment of the Prime Vendor Model (PVM).

- Built partner understanding of procurement processes and commodity lead times to improve planning for commodity needs.
- Created public-private partnership with local pharmaceutical vendors to fill gaps in commodity needs for 45 opportunistic infection drugs.
- Achieved annual throughput of $240.5 million in 2013 for HIV, reproductive health, and anti-malarial commodities.
- Procured over $205 million worth of ARV, rapid test kit, and other HIV commodities; over $51 million of anti-malarial commodities; and over $20 million of family planning and reproductive health commodities.

In 2006, at the start of the USAID | DELIVER PROJECT and SCMS in Tanzania, the MOHCDGEC procured reproductive health, malaria, and HIV/AIDS commodities through the MSD for public health facilities. Procurement lead times were long and were not aligned with program expectations for commodity availability, making program and supply planning difficult and causing stockouts despite good PROCUREMENT operations. Frequent changes in treatment regimens for HIV/AIDS and malaria complicated procurement planning further, and MSD's procurement operations lacked the necessary FLEXIBILITY to readily adapt to changing environments.

A healthcare worker at the MSD verifying commodities.

In conjunction with the MOHCDGEC, the USAID | DELIVER PROJECT and SCMS worked to educate stakeholders on realistic EXPECTATIONS for procurement lead times for health commodities. The projects' approach to procurement incorporates an appreciation of the lengthy lead times for products and emphasizes the importance of procurement planning and monitoring. In-country stakeholders now have a better understanding of the procurement process and are better equipped to plan for contingencies, such as problems with global commodity availability, product registration delays, and quality issues.

A newly renovated store in Kondoa

Over the life of the projects, the USAID | DELIVER PROJECT and SCMS have procured hundreds of millions of dollars of public health COMMODITIES for the MOHCDGEC, including contraceptives, long-lasting insecticide-treated nets, malaria rapid diagnostic tests, ARVs, male circumcision commodities, and many others.

Despite improvements in larger scale procurement operations, including planning for realistic procurement lead times, PEPFAR-funded implementing partners (IPs) found that they still had challenges in procuring MEDICINES to treat opportunistic infections (OIs). The local pharmaceutical market could not meet USAID quality standards to allow procurement through those companies, leaving the care and treatment centers (CTCs) that rely on commodities from the IPs with stockouts and clients without their live-saving drugs. Additionally, some IPs had difficulties getting products to sites where patients are treated.

As of 2015, the USAID | DELIVER PROJECT and SCMS have procured over:

$205 million
of HIV commodities

$41 million
of anti-malarial commodities

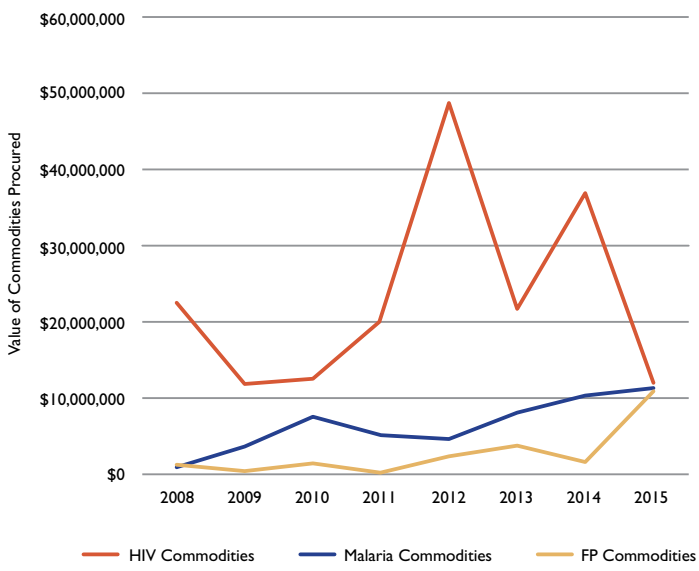
$20 million
of family planning commodities

In response, the MOHCDGEC worked with SCMS and IPs to identify 37 OI drugs that were high priority and commonly unavailable through MSD, then to assess local manufacturers and distributors on their ability to meet Good Manufacturing and Good Distribution standards per WHO guidelines. Following these assessments, SCMS sought and analyzed bids from the vendors for services to be provided under the new procurement model. This new model of procurement and DISTRIBUTION, known as the PVM, featured a primary local vendor that sourced commodities from a variety of approved sub-vendors.

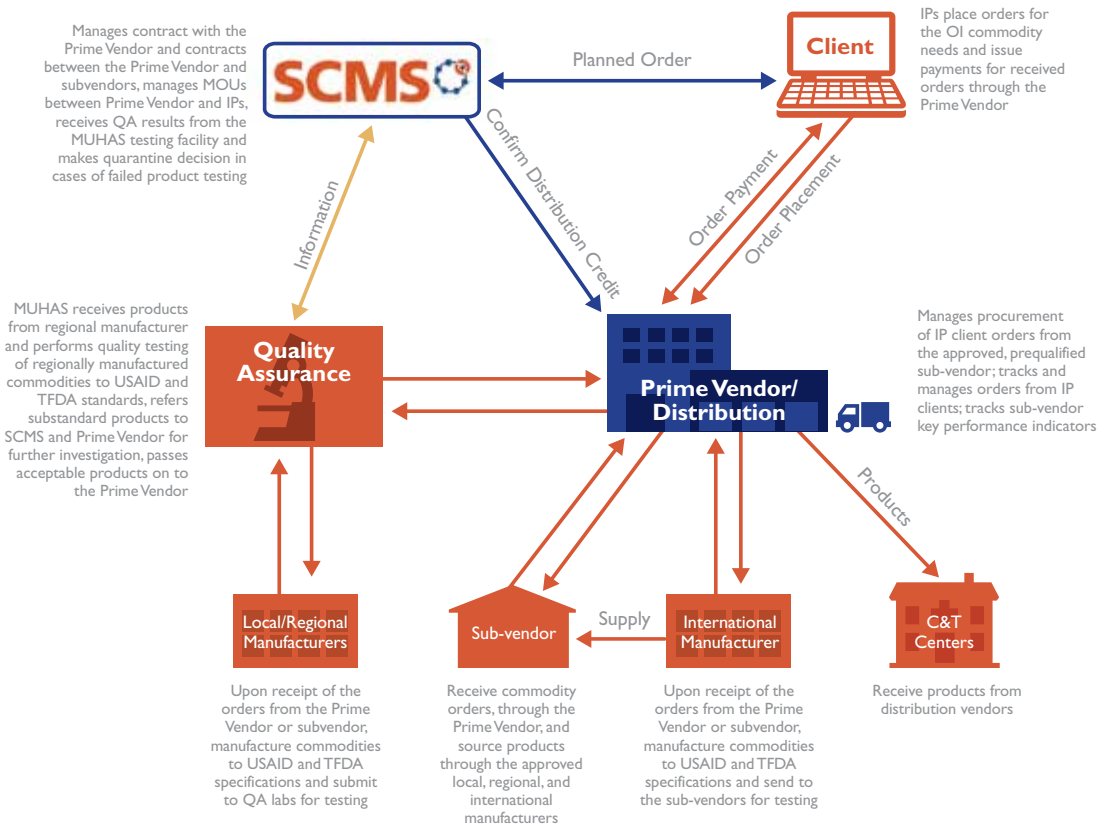
To help improve product quality assurance, SCMS leveraged product testing capacity at Muhimbili University of Health and Allied Sciences (MUHAS) and North-West University in South Africa for the required quality assurance (QA) testing. By selecting specific vendors and using the PVM as a mechanism for encouraging quality improvement and compliance, SCMS guided selection and sourcing of commodities from vendors the IPs would know to have more quality products. The medicines routinely achieve a 100 percent quality pass rate and have proved to meet QUALITY standards set by both the Tanzania Food and Drug Authority (TFDA) and USAID.

> In-country stakeholders now have a better understanding of the procurement process and are better equipped to plan for contingencies.

The PVM has expanded from the original 37 OI commodities in 2011 to include 45 quality assured OI drugs procured from 13 importers by 2012. The



Prime Vendor Model



The medicines routinely achieve a 100 percent quality pass rate and have proved to meet quality standards set by both the Tanzania Food and Drug Authority (TFDA) and USAID.

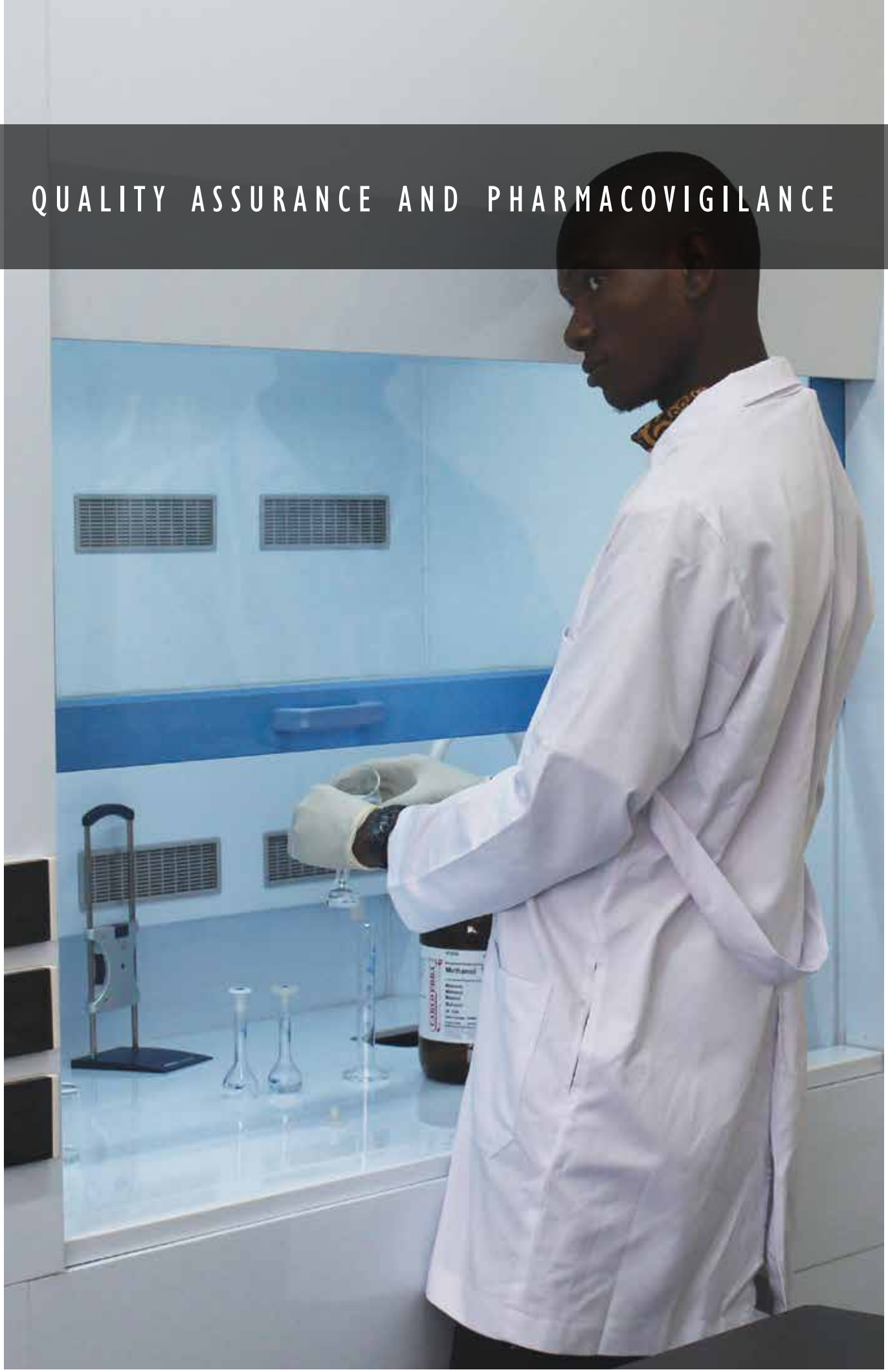
model also features one Tanzanian manufacturer that provides 11 commodities. IPs are experiencing greater than 50 percent reductions in stockouts of these commodities at the CTCs they serve. The DIVERSIFIED network of suppliers gives IPs greater coverage and assurance of product availability in the event of low stocks from a given supplier.

Following initial implementation, SCMS introduced the seed fund program to mitigate issues arising from small and irregular orders having longer lead times than requested. This program allowed the Prime Vendor to store bulk quantities of stock in its warehouse that could be distributed to IPs as needed. SCMS closely MONITORED IP forecasts to support greater planning and ensure optimal quantities of buffer stock in the system.

A section of the WiB at Dodoma MSD.

SCMS and the project's collaboration with the MOHCDGEC and other Government of Tanzania institutions brought procurement and procurement operations to the forefront for public health supply chain operations. Through the capacity building and partnership efforts, SCMS-supported vendors have procured $1,123,513 of OI commodities through the PVM. The projects' efforts at both the Tanzania and global levels have ensured AVAILABILITY and continued supply of life-saving malaria, HIV/AIDS, and family planning commodities.

QUALITY ASSURANCE AND PHARMACOVIGILANCE



Supported and promoted the adoption of standards for drug quality testing, reporting, and assurance.

- Strengthened local capacity in pharmaceutical manufacturing and distribution.
- Enabled a culture of ADR reporting and established a pharmacovigilance system with a 76 percent increase in ADR reporting during the pilot period.
- Built capacity within TFDA through four trainings and information, education, and communication materials and forms developed for TFDA staff.

The USAID and the TFDA have stringent QUALITY requirements for the health commodities procured under the SCMS and the USAID | DELIVER PROJECT. Inconsistent availability of quality medicines is a major hurdle to public health programs. Mechanisms for local procurement, such as SCMS's Prime Vendor and consignment procurement models, rely upon a strong local pharmaceutical sector that can provide quality health commodities.

Ms. Miriam Lutz, Health Office Director, USAID | TANZANIA and Professor Eligius Lyamuya, Acting Vice Chancellor, MUHAS cut the ribbon at the official handover of the renovated research and development laboratory to the MUHAS School of Pharmacy.

In Tanzania, TIMELY quality assurance testing was a challenge, and testers could not guarantee confidentiality of test results due to resource constraints in testing facilities. Additionally, despite existing programs for ADR reporting and pharmacovigilance, the system only saw 100-200 adverse drug cases reported each year, suggesting drastic underreporting as compared to WHO standard of at least 200 reports per million in population, which would be at least 8,800 reports annually for Tanzania[1].

Improving MUHAS's Testing Facility and Equipment

Beginning in 2011, the MUHAS School of Pharmacy's Instrumental Analysis Instructional Laboratory began providing due diligence testing to help assure the quality of pharmaceutical products purchased locally through the PVM and consignment procurement model. While the laboratory exercised sound technical COMPETENCE in quality testing, outdated equipment and space constraints resulted in inefficiencies and difficulties for those performing the testing.

Prior to SCMS interventions, quality testing at the MUHAS laboratory took approximately one month. In 2011, MUHAS and SCMS collaborated to draft a concept note for laboratory

[1] http://www.who-umc.org/DynPage.aspx?id=108476&mn1=7347&mn2=7252&mn3=7322&mn4=7558

Newly trained staff also established a post-market surveillance program at TFDA to monitor drug safety and quality in the market.

space expansion and equipment procurement. SCMS and USAID completed the multi-year RENOVATION and procurement process in late 2014, and MUHAS has already reaped the benefits of the state-of-the-art facility. Professor Eliangiringa Kaale characterized the change as a "major turn from one extreme to another." Drug samples undergoing quality assurance testing now take four to five days for completion, and the laboratory is able to further support student learning in the hands-on setting.

Building TFDA Capacity

Over the life of the project, SCMS has supported numerous OPPORTUNITIES for TFDA staff to travel to other countries for training in medicines regulation best practices and methodologies from accredited laboratories and food and drug authorities. Upon return, TFDA has used these newly trained staff as internal resources to ensure compliance with WHO standards. Newly trained staff also established a post-market surveillance program at TFDA to monitor drug safety and quality in the market.

Lab worker performs quality testing.

Left: Previous laboratory facility for QA testing in the School of Pharmacy at MUHAS.

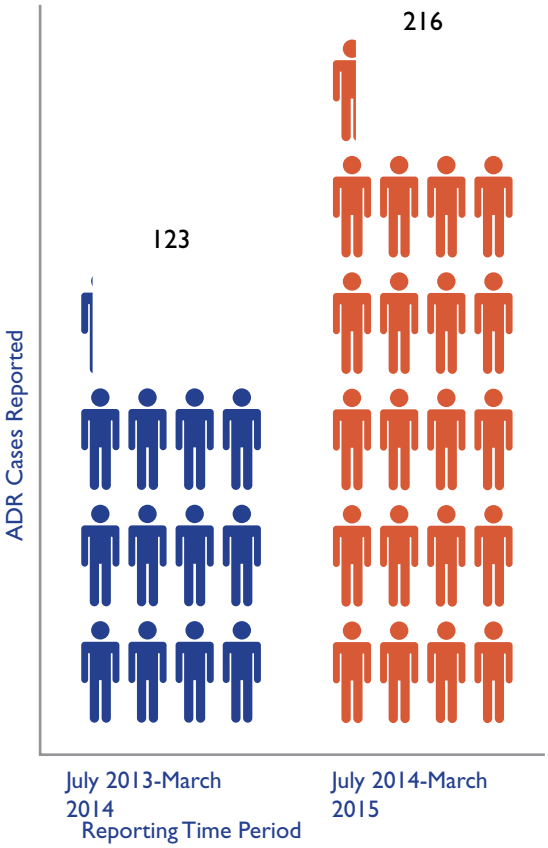
Right: Newly renovated Instrumental Analysis Instructional Laboratory at MUHAS.

Establishing Robust ADR Reporting and Pharmacovigilance

Low ADR reporting rates indicated that health care workers, for a variety of reasons, were not properly reporting all cases when a patient had an adverse reaction to his or her medication. Beginning in 2015, TFDA, in PARTNERSHIP with SCMS, trained 19 trainers and 100 health care workers in four regions on pharmacovigilance guidelines and mechanisms for reporting ADRs. Reporting jumped to 216 reports countrywide in the initial nine months of the program, as compared to 123 reports during same nine-month period in the year prior to implementation.

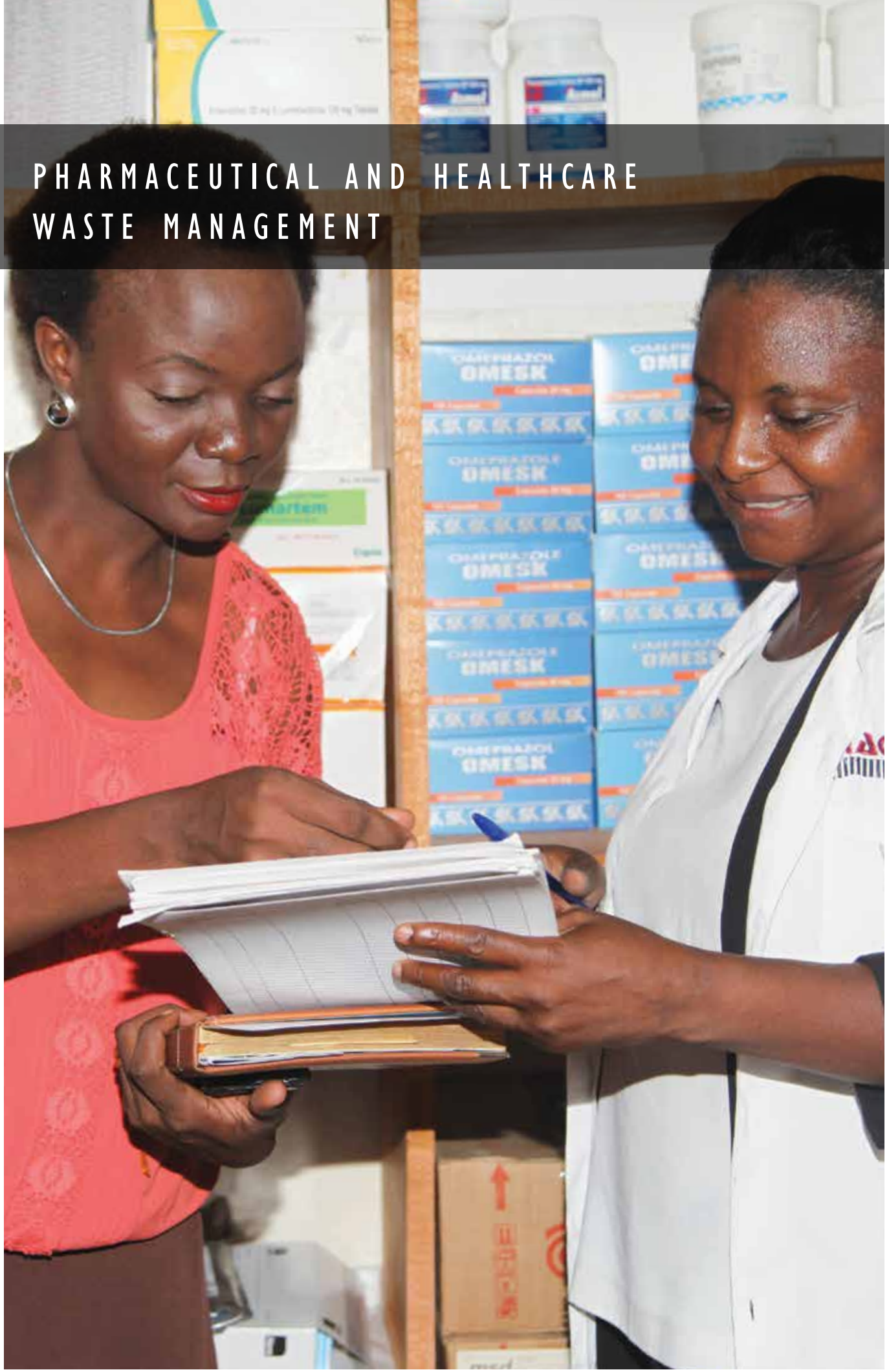
Quality medicines are an INVALUABLE component of effective public health supply chain systems. With the new testing facility at MUHAS, greater organizational capacity at TFDA, and a robust ADR reporting and pharmacovigilance system, Tanzania has the tools in hand for a modern approach to quality assurance that incorporates WHO guidelines on best practices. TFDA plans to continue roll-out of the pharmacovigilance program to additional regions and explore mechanisms for electronic ADR reporting. Domestic and international product standards are achievable given the resources and programs in place, and patient SAFETY will continue to drive in-country quality assurance activities.

Nationwide Adverse Drug Reaction (ADR) Reporting



Tanzania has the tools in hand for a modern approach to quality assurance that incorporates WHO guidelines on best practices.

PHARMACEUTICAL AND HEALTHCARE WASTE MANAGEMENT



Provided health care workers at the facility, district, regional, and central levels with tools and training to implement essential pharmaceutical and health care waste disposal exercises.

- Assisted the MOHCDGEC in updating comprehensive waste management disposal guidelines for pharmaceutical waste.
- Trained 548 health care workers and stock verifiers in 24 regions on pharmaceutical waste disposal guidelines.
- Fifty percent of trained health facilities obtained disposal permits following SCMS and MOHCDGEC-led trainings.
- Successfully trained 13 master trainers and 30 health care providers on voluntary medical male circumcision (VMMC) waste management and infection control practices.

For many years, the Tanzanian health sector suffered from capacity and information gaps related to waste management across several waste streams. Over the years, public health facilities in Tanzania accumulated large quantities of unusable medicines and medical supplies. Facilities lacked knowledge on disposal procedures and proper inventory management to avoid waste. Existing guidelines on pharmaceutical waste disposal PROCEDURES required additional support to fully implement and roll out.

Relatedly, in health sector waste management, when VMMC activities first began in Tanzania, health facilities were using reusable kits for VMMC procedures. Beginning in 2012, VMMC sites made the transition to DISPOSABLE kits to decrease the risk of cross-contamination. This new product introduction required plans, guidelines, and training on proper disposal of the health care waste generated from the use of disposable VMMC kits.

Trainers conducting a workshop on the waste management disposal guidelines.

Built Capacity in Pharmaceutical Waste Disposal Process

In 2013, the MOHCDGEC convened a workshop of stakeholders from the national, regional, district, and facility levels to improve and finalize national waste management guidelines. SCMS assisted the MOHCDGEC in updating the guidelines to provide detailed instructions on identifying, segregating, and recording pharmaceutical waste in facility ledgers; applying for disposal permits from the Ministry of Finance; and conducting proper disposal at each level of the health system. The GUIDELINES also detailed the different types of disposal—including incineration and immobilization—required for different types of commodities.

Once the guidelines were finalized, SCMS worked with the MOHCDGEC to develop a three-day training-of-trainers (ToT) workshop targeting district and regional PHARMACISTS, regional stock verifiers, and district and regional health officers in the five TFDA zones of coverage—Central, Eastern, Lake, Northern, and Southern Highlands. The training covered each section of the new guidelines and gave participants the tools to roll out the training to health care workers and build capacity on completing the required forms. To date, the trainings have reached 548 health care workers in 24 regions and five zones.

Top: Healthcare workers in personal protective equipment.

Middle: Healthcare worker sanitizing materials.

Bottom: Cover of the Health Care Waste Management for Voluntary Medical Male Circumcision Services Quick Guide.

Following the disposal guideline trainings, health facilities were equipped with the tools and PROCEDURES to begin the pharmaceutical waste disposal process and follow a sustainable approach for managing pharmaceutical waste going forward. In months following the trainings, 50 percent of the facilities obtained pharmaceutical waste disposal permits for their pharmaceutical waste. (Pharmaceutical waste disposal in Tanzania requires adherence to regulatory procedures). This important initial step of acquiring waste permits demonstrates engagement by the health facilities and a commitment toward undertaking the required steps to properly dispose of accumulated pharmaceutical waste at their facility.

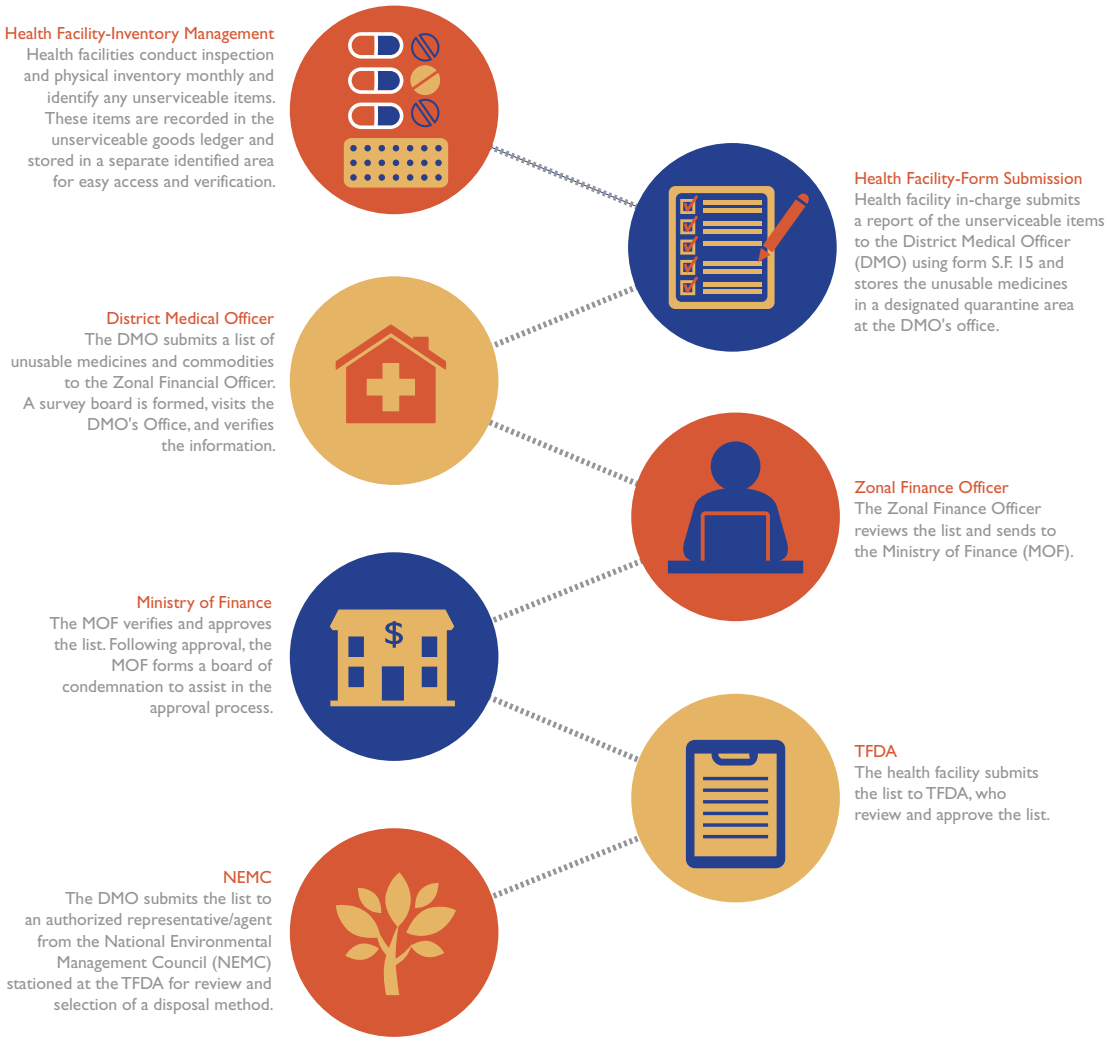
However, resource constraints and the lack of funding for pharmaceutical waste disposal has been a major challenge in IMPLEMENTATION of pharmaceutical waste disposal activities. Implementation will require further commitment and allocation of funds. The Regional and Council Health Management Teams (R/CHMT) have worked to make this work a priority for facilities and plan to include pharmaceutical waste disposal as a budget item in the Comprehensive Council Health Plan.

VMMC Waste Management and Infection Prevention Control

Building upon the pharmaceutical waste disposal guidelines, SCMS also worked with various national stakeholders in the VMMC Technical Working Group (TWG) to successfully advocate for attention toward health care waste management. Through these collaborative efforts, the TWG agreed to include a provision on environmental hygiene and health care waste management in the VMMC 2014-2017 Country Operational Plan.

To date, the trainings have reached 548 health care workers in 24 regions and five zones.

Stemming from this new national COMMITMENT to healthcare waste management and VMMC infection prevention control, SCMS also partnered with the MOHCDGEC and implementing partners to produce health care waste management and infection prevention control pocket



Through these collaborative efforts, the TWG agreed to include a provision on environmental hygiene and health care waste management in the VMMC 2014-2017 Country Operational Plan.

guides. These tools will provide further guidance to health care workers on the proper segregation, handling, storage, transportation, treatment, and disposal of health care waste produced from medical procedures, including VMMC.

SCMS successfully built local capacity among 13 trainers during a ToT on health care waste management and infection PREVENTION and control. These trainers will serve as the leads in providing training on proper health care waste management and infection prevention and control to health care workers providing VMMC services. Additionally, SCMS provided training to an initial group of 30 health care workers, implementing partners, and MOHCDGEC staff on the health care waste management and infection prevention and control guidelines. These trainings furthered SCMS and MOHCDGEC efforts to enhance VMMC service provision and ensure proper handling of health care waste generated from the VMMC procedures. With these initial trainings, health care providers are now properly handling VMMC health care waste. Further roll-out trainings will reach additional VMMC sites nationally.

Healthcare worker demonstrating proper sanitation procedures.

WAREHOUSING AND DISTRIBUTION

Improving warehousing and distribution systems has almost tripled the storage capacity at the five zonal MSD stores. Distribution optimization has streamlined the distribution processes, resulting in cost savings at various zones.

- Procurement and assembly of five WiB state-of-the-art storage facilities, generating operational cost savings of approximately $1.2 million annually.
- Optimal design and layout of the modular WiBs, the number of pallet positions available to MSD has nearly tripled, from 12,400 positions in 2009 to 32,300 positions in 2015. This represents a 165 percent increase in capacity with only a 60 percent increase in area.
- Sales volume of the total commodities managed by MSD has increased by 50 percent between 2006 and 2015.
- Optimized distribution routes for improved access to health commodities reduced distribution costs for MSD and their customers by more than 10 percent.

MSD is the autonomous department within the MOHCDGEC with the mandate to procure, store, and distribute medicines and medical supplies in Tanzania. Prior to 2010, accelerating EXPANSION of programmatic goals and scale-up at the MSD increased the strain on its storage capacity. Limited storage space did not always allow for compliance with proper storage guidelines and quality standards. Furthermore, inadequate storage capacity had a direct correlation to commodity availability at the facility level, which affected diagnosis and treatment of patients. MSD leased additional warehouse space for storage of health commodities, but this had a significant financial cost.

Warehouse-in-a-box in Dodoma.

Installation of WiBs in Five MSD Zones

In 2010, Mwanza zone was the first to undergo warehouse infrastructure improvement to increase the efficiency of storing and issuing commodities. This included installation of adjustable pallet racking and gravity flow racking. The impact and results of these initial infrastructure improvements in Mwanza served as a catalytic event for future

These enhancements at the MSD have greatly improved their ability to manage supply chains.

warehousing upgrades in the country. Witnessing how these ENHANCEMENTS significantly improved storage space, basic quality standards, and good storage practice and adherence to good storage guidelines, SCMS conducted warehouse storage assessments at the three additional zonal warehouses in Dar es Salaam, Dodoma, and Mbeya and determined that the WiB product was the optimal solution for these regions' warehousing needs.

WiB is a state-of the-art storage facility comprised of pre-engineered modular components and fittings that can be erected quickly and easily and provides a turnkey SOLUTION for warehousing renovation that includes infrastructure, equipment, and skills transfer. This successful intervention led the Global Fund to provide additional funds to the MSD in 2013 for the procurement of two more WiBs, to be deployed in Tanga and Tabora regions. In 2015, WiB installation was completed in these regions.

WiBs Bring Storage Space, Efficiency, and Cost Savings

In total, WiBs have EXPANDED storage capacity at the five zonal warehouses to 19,000 m^2 at a total cost of about $14.2 million. Optimal design and layout of the modular WiBs, the number of pallet positions available to MSD has nearly tripled, from 12,400 positions in 2009 to 32,300 positions in 2015. This represents a 165 percent increase in capacity with only a 60 percent increase in area.

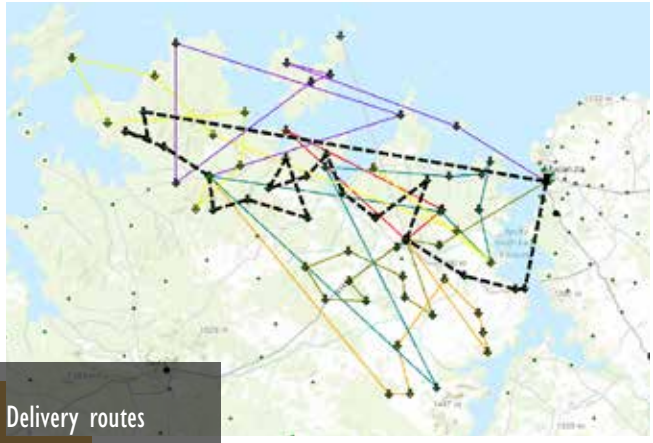
A MSD truck outside the WiB ready to off load of a shipment.

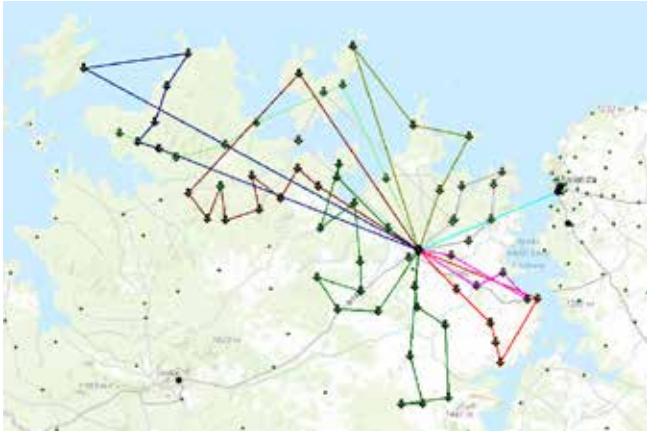
A section inside a WiB.

WiBs realize cost savings of approximately $608,000 per year for MSD at 50 percent utilization and approximately $1.2 million per year at 100 percent utilization through more efficient use of space and financial resources and through resource-planning tools, such as the Enterprise Resource Planning (ERP) system, to STREAMLINE warehousing processes. Sales volume of the total commodities managed by MSD has increased by 50 percent between 2006 and 2015. Additionally, WiBs are a long-term solution that can be scaled to meet future growth demands; the average life span of a WiB is 30-40 years.

Implementation of the ERP at all zonal MSD warehouses has significantly improved warehouse operations MANAGEMENT processes. Barcoding, which was recently introduced, allows for more accurate and efficient product information sharing across all MSD zones. These enhancements at the MSD have greatly improved their ability to manage supply chains.

MSD officer checking on records in the store.





Left: Delivery routes before route optimization.

Right: Delivery routes generated using LLamasoft's Transportation Guru software.

Optimization of Distribution

In addition to storage, MSD also has the mandate to distribute health commodities. With the adoption of the Big Results Now (BRN) Initiative[1], MOHCDGEC has prioritized improvements in transportation and distribution systems as key interventions to strengthening health systems and ensuring commodity availability. With the shift to a direct delivery model — from the zonal MSDs to health facilities — EFFICIENT and reliable transportation is a necessity. To assist the MOHCDGEC with these efforts, SCMS procured seven 15-ton trucks and five hardtop vehicles for the MSD.

In 2013, the USAID | DELIVER PROJECT conducted training on Supply Chain Guru, a network and transportation optimization software, and ran transportation optimization pilots in Dar es Salaam, Pwani, and Zanzibar to find ways to reduce the costs of distribution and transportation using available data. The initial pilots revealed significant data gaps, such as missing geocodes at health facilities and incomplete road network data.

In 2014, the project collected missing information such as facility geocodes and road network data. Upon completion of the data collection and validation exercise, the project, in COLLABORATION with MSD, conducted another pilot in Mtwara zone, which achieved a net decrease of 36 percent in distribution costs against total annual budget estimates for fiscal year 2013-2014. Fuel costs were down from $9300 to $3600 per quarter, and total number of days to deliver commodities to health facilities, from seven to four days.

Transportation OPTIMIZATION also gave the DMO and facility heads greater visibility into their distribution network needs, informing order submission timing, which allowed for consolidating the order process and distribution.

[1] BRN Initiative is a Government of Tanzania multisector strategy aimed at transitioning Tanzania from a low to a middle-income economy in the next decade. It focuses on seven priority areas, including health.

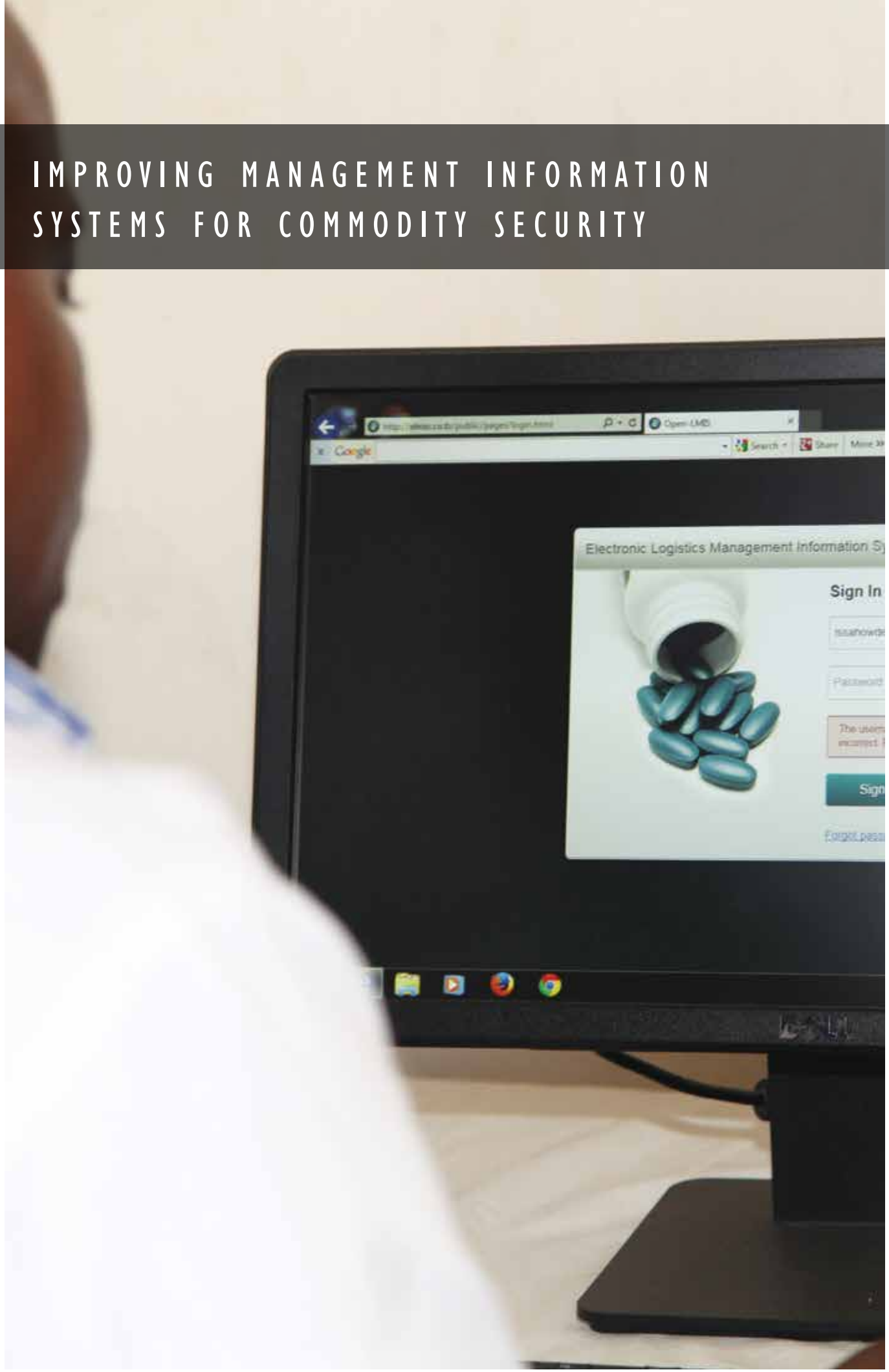
This success was replicated in Dar es Salaam, Moshi, Mwanza, Tabora zones, with all zones returning results that supported cost savings and EFFICIENCIES gained by using a mobile warehouse model for Tanzania's direct delivery. Mobile warehousing uses the entire capacity of trucks and eliminates back-and-forth trips from the zonal warehouse to each district, saving time and fuel costs.

Transportation optimization has led to efficiencies in the management of deliveries, reducing days on the road, per diem, and fuel costs, and increasing stock AVAILABILITY at the last mile. Based on the transportation optimization findings in Dar es Salaam, Moshi, Mtwara, Mwanza, and Tabora zones, MSD can expect a decrease in total distribution costs of at least 10 percent when route optimization is applied nationally.

Summary

Improvements to strengthen both storage and distribution capabilities at MSD have resulted in increased efficiency, streamlined warehousing and distribution processes, cost savings, greater visibility into the movement of commodities, and increased staff capacity on good warehousing practices.

IMPROVING MANAGEMENT INFORMATION SYSTEMS FOR COMMODITY SECURITY



Investments in management information systems have enhanced the flow of information and made data readily available for real-time decision making.

- Created end-to-end visibility across nine MSD zones and 5,000 health facilities while streamlining business processes in the public health supply chain.
- Improved product availability and reduced stockouts, expiries, and wastage at 171 districts across Tanzania with a reduction in stockout rates from 32 to 23 percent across the ARV and ILS systems.
- Created sustainable MIS solutions that the MOHCDGEC is able to implement through the Logistics Management Unit without continuous external support.
- Facilitated real-time data availability and accessibility for faster data driven decision making and policy response to commodity security challenges, with emergency orders possible within a week of being placed.
- Achieved reporting rates of 93 percent and 91 percent for the ARV and ILS systems, respectively .

In 2006, data was largely unavailable for supply chain decision making in the TANZANIA public health system, resulting in procurement and distribution decisions based on incomplete information. The sector featured paper-based requisition and reporting systems for health facilities for different categories of commodities and an outdated operational system at the MSD. At the time, there was limited integration of the different functional processes, from procurement to inventory management, leading to inefficiencies and minimal logistics data visibility within MSD central and in zones and health facilities.

Healthcare worker updating the stock ledger.

MOHCDGEC's ILSGateway System Provides Alerts

Facing these challenges, the USAID | DELIVER PROJECT, in collaboration with the MOHCDGEC, designed the ILSGateway as an SMS-based monitoring and reporting system. The system functions as an alert system for 4,616 health facilities in Tanzania by reminding health care workers to submit their report and requisition (R&R) forms and provides district managers with visibility into their supply chain performance, including STOCK STATUS at the facilities they supervise. In a 2011 evaluation, 90 percent of users reported that the ILSGateway IMPROVED their attentiveness to conducting timely stock counts and submitting R&R forms.

The eLMIS Consolidates Data From Program Areas

Despite the improvements gained following roll-out of the ILSGateway, the Tanzanian public health supply chain still suffered from the limitations of a paper-based system. Following a landscape

analysis conducted in 2011, the MOHCDGEC, in conjunction with SCMS and the USAID | DELIVER PROJECT, concluded that an eLMIS capable of consolidating data from various program areas would be the optimal SOLUTION to address continued challenges with data visibility.

Health facility staff reviewing expiry date on Sulfadoxine/ pyrimethamine.

In conjunction with the projects' Zambia program, which was facing a similar challenge, SCMS and the USAID | DELIVER PROJECT from Tanzania and Zambia developed their own web-based application in an open source environment to COMPUTERIZE existing paper-based systems that collect, organize, and manage logistics data. Launched in 2013, and with roll-out completed by early 2015, Tanzania's eLMIS is now receiving electronic R&Rs from all 171 districts on a quarterly basis, for the FP, malaria, HIV, TB, lab, and essential medicines commodities. Facilities now provide logistics data in their R&Rs and the system performs the calculations, thereby reducing the likelihood of errors. District Pharmacists are able to review the data more readily and follow up to clarify discrepancies.

Reporting rates during the first quarter of complete roll-out, January-March 2015, were 93 percent and 91 percent for the ARV and ILS systems, respectively. Between 2013 and 2015, stockout rates DECREASED from an average of 32 percent to a decrease of 11 percent across commodity areas in the ARV and the ILS systems.

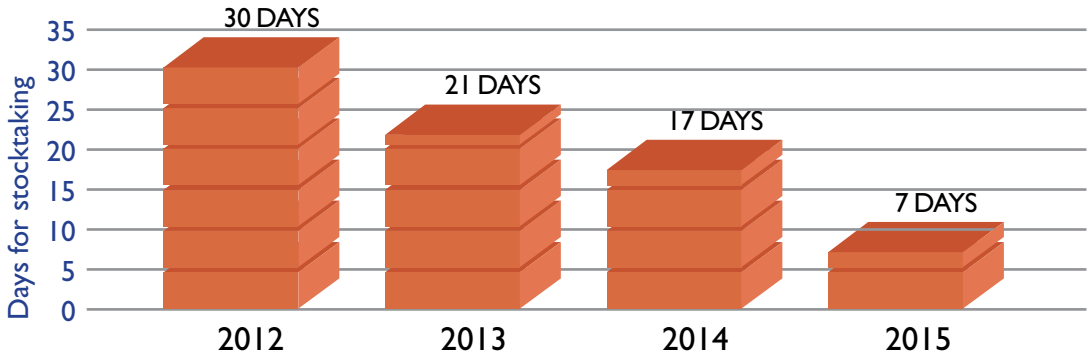
"Everything [stock location, condition] is at your fingertips," says MSD, Dodoma Zonal Manager John Sipendi.

MSD's New ERP Combines Processes and Makes Information Available

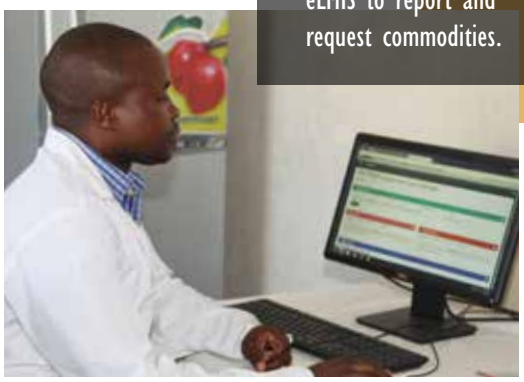
Similarly, at MSD, the results of a government audit in 2008 indicated MSD's business process system was not meeting its needs and would not allow for expanded RESPONSIBILITIES. MSD's receiving through dispatch procedures were all handled in a paper-based system, and there was no visibility into stock availability at the zonal level.

In 2010, in a joint effort with SCMS, MSD began defining new system requirements, identifying business processes, and EVALUATING potential vendors to provide a new ERP system. The new

Number of Days for MSD Annual Stocktaking



Epicor 9 (E9) ERP combines MSD's core business processes and makes information available across the organization's business areas and geographic zones. SCMS and MSD implemented the ERP in two phases. The first phase focused on the sales, logistics, finance, and procurement modules. They then expanded functionality with the cycle counting, barcoding, payroll, material requirements planning, enterprise performance management, load planning, and human capital management modules in the second phase.



Health Care Worker at facility level using eLMIS to report and request commodities.

"Everything [stock location, condition] is at your fingertips," says MSD, Dodoma Zonal Manager John Sipendi. Each commodity has a specific, traceable address and location within its given warehouse, and that data is visible to MSD decision makers at all levels of the organization, providing a level of TRANSPARENCY in commodity management at MSD that previously did not exist.

The ERP provides more visibility and traceability of stock movements, eliminates waste, handles business growth, improves management of third party goods, and understands and meets customer needs.

Next Steps for Tanzania's Management Information Systems

The MOHCDGEC has fully adopted the eLMIS into its eHealth Strategy (as Strategic Objective 06), and it will play a KEY ROLE in achieving the health goals set out by the Tanzanian government in BRN and MSD's Medium-term Strategic Plan II.

One of the final phases in E9 implementation is bar code implementation for managing products in the warehouses. MSD warehouse staff will be able to increase data ACCURACY and INTEGRITY by using barcode equipment for receiving, dispatching, and stock taking.

MSD and SCMS are currently finalizing the interface between E9 and the eLMIS to further the relationship between these innovative information systems. MSD is now receiving orders of commodities through the eLMIS, and these orders come in real time for FASTER order processing, filling, and delivery.

The projects continue to work toward the vision of a fully integrated eLMIS for all commodity groups.

The projects continue to work toward the vision of a fully integrated eLMIS for all commodity groups. Additionally, in COLLABORATION with the MOHCDGEC and partners, the projects are developing a first-of-its-kind vaccine information management system (VIMS) that combines immunization program and logistics data into one system.

These management information systems have transformed Tanzania's supply chain from paper-based to electronic, with data visible for decision makers throughout the system, facilitating more TIMELY placement and fulfillment of orders to generate greater commodity availability.

DEVELOPING HUMAN RESOURCE CAPACITY FOR SUPPLY CHAIN MANAGEMENT

Pre-service training in collaboration with MUHAS School of Pharmacy and supply chain intervention trainings developed a health care workforce with supply chain management skills.

- Developed a pre-service curricula in supply chain management for 45 Bachelors of Pharmacy and 61 Pharmacy Diploma students, who graduated with educational training in supply chain management, as of 2015.
- Trained more than 17,000 health care workers on USAID | DELIVER PROJECT and SCMS supply chain interventions.
- Strengthened the environment for human resource capacity in supply chain management through institutionalization of curricula and training priorities.

Well-functioning public health supply chains are only as strong as the HUMAN RESOURCES available to run them. At the beginning of the SCMS and USAID | DELIVER PROJECT, pharmacists and other health care personnel were typically trained on supply chain management through in-service training (IST). While effective for certain types of training, IST was not an optimal solution to provide health care workers with supply chain skills. IST is costly, must be repeated due to staff turnover, and results in unnecessary interruptions in staff work schedules.

Diploma students from the Institute of Health and Allied Sciences (IHAS) displaying their Certificates in Supply Chain Management after their Graduation Ceremony.

Pre-service training (PST) in supply chain management provides students with skills before they begin their professional careers and better equips them to be capable CONTRIBUTORS to supply chain system functioning. PST also presents a more cost effective and sustainable approach to developing a robust supply chain work force. Additionally, training in core supply chain principles earlier in students' careers proves to be more cost effective than continued trainings for health care workers once they have assumed their roles. Results from a 2014 study of the PST program in Ethiopia showed that that the cost of training a health worker using IST was six times greater than training them using PST. As a

Cross section of Health Care workers during an In Service Training.

more cost effective and sustainable solution, PST is critical to the long-term success in developing a robust supply chain workforce.

Training in core supply chain principles earlier in students' careers proves to be more cost effective than continued trainings for health care workers once they have assumed their roles.

Pre-service Training Helps Build a Cadre of Supply Chain Professionals

In 2011, in COLLABORATION with the MOHCDGEC, SCMS and the USAID | DELIVER PROJECT conducted an assessment of medical schools across Tanzania to evaluate their curricula and determine what role, if any, supply chain management played in those curricula. The majority of medical programs were not covering supply chain management, while schools for clinical officers and pharmacy provided minimal training at best. Both projects met with various stakeholders in the health and the education sectors to solicit input on PST, and were met with great enthusiasm for the initiative.

MUHAS, one of the universities included in the assessment, took the initiative and began working with the projects on developing and implementing PST. In 2013, 18 program lecturers from both the Bachelor of Pharmacy and Pharmacy Technician Diploma programs were trained, and supply chain lessons were integrated into these programs. Students in these programs, who previously had little exposure to supply chain concepts and training, now had supply chain modules built into their curricula and were developing PRACTICAL skills in areas such as stock and record keeping and commodity management.

Peter Njalale, Head of the Pharmacy Program at IHAS.

Since then, 106 students have completed their DEGREES with pre-service training in supply chain management, a credential previously unavailable to them. MUHAS

administrators report that staff supervising students during practical portions of their training are finding them better equipped and well qualified to perform their duties.

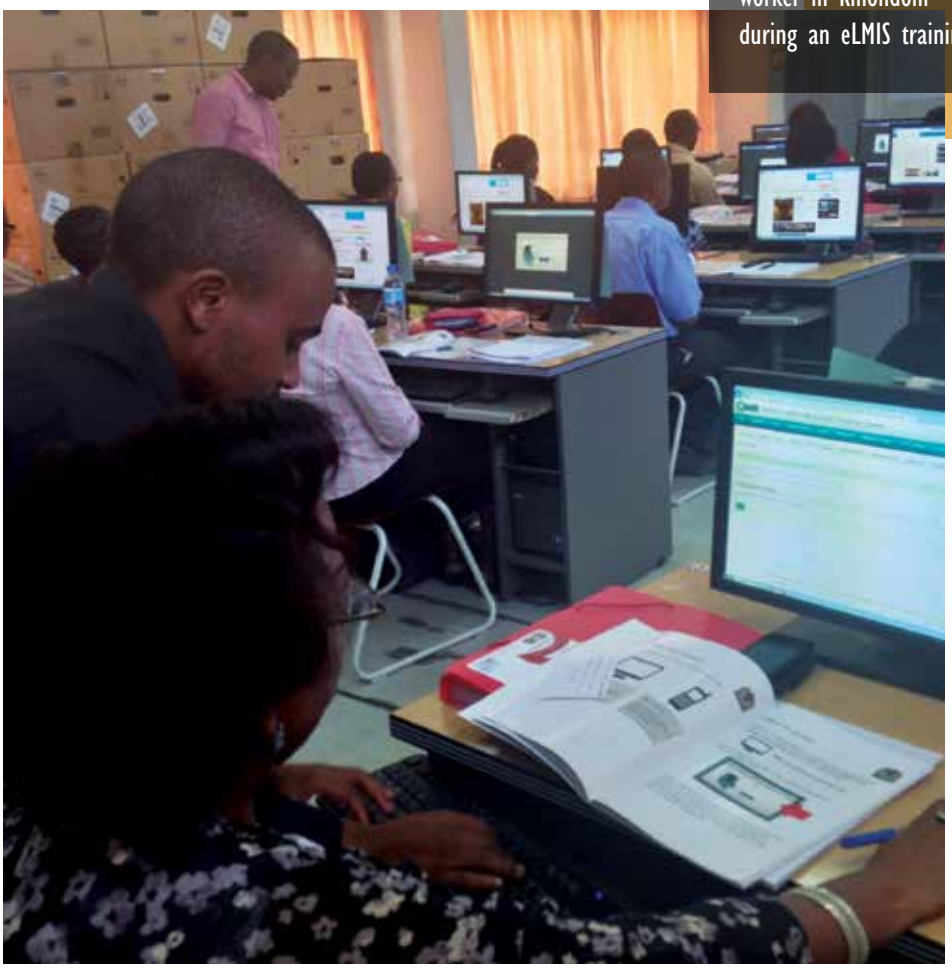
Going forward, the Pharmacy Council and other pharmacy schools are working toward a unified curriculum that includes pre-service supply chain training for students across the country. SCMS and the USAID | DELIVER PROJECT have worked with the Pharmacy Council to unify benchmark supply chain curricula across institutions for the certificate program for dispensers, certificate program for pharmaceutical assistants, and DIPLOMA program for pharmaceutical technicians.

Since 2009, the two projects have successfully trained more than 17,000 health care workers on numerous supply chain interventions at all levels of the supply chain.

Building Capacity in All Supply Chain Interventions

In addition to the robust pre-service training program, SCMS and the USAID | DELIVER PROJECT have built capacity among MOHCDGEC staff and other health care workers in nearly all INTERVENTION areas, including different logistics systems, technical areas such as quantification and transportation optimization, and tools for improving commodity security such as the ILSGateway. By building local capacity and engaging local stakeholders, the two projects aim to establish country ownership of supply chain interventions.

In 2014, the USAID | DELIVER PROJECT, in collaboration with the MOHCDGEC, conducted a human resource assessment in supply chain. The assessment yielded greater interest in professionalization of the supply chain from both the Directorate of Human Resources for Health within the MOHCDGEC and the Pharmacy Council. Through this ASSESSMENT, the USAID | DELIVER PROJECT also identified the lack of supply chain tasks in certain health profession job descriptions, including nurses. Additionally, the assessment included advocacy for inclusion of supply chain activities in the government's Human Resources for Health Strategy.



A facilitator assisting a District Health Care worker in Kinondoni during an eLMIS training.

STRENGTHENING POLICY IMPLEMENTATION AND STAKEHOLDER COLLABORATION

Fostered collaboration and coordination between donors, implementing partners, and host country institutions to promote innovative supply chain financing solutions and policy implementation and support strategic planning.

- Led efforts with multiple donor organizations to support national health commodity supply chain assessments and subsequent strategic planning.
- Collaborated with the MOHCDGEC to document and capture best practices for health commodity management from health councils.
- Partnered with World Bank to support the MOHCDGEC in the design and pilot implementation of an integrated national Results Based Financing (RBF) scheme, designed for health facilities, CHMTs, RHMTs, and the MSD.
- Collaborated with the GOT institutions and the donor community to support the development and financing of the eLMIS and LMU.

The USAID | DELIVER PROJECT and SCMS made close stakeholder collaboration a cornerstone of their supply chain interventions. The two projects have worked extensively to BUILD partnerships and foster collaboration with donors, in-country institutions, and MOHCDGEC programs involved in the Tanzania health commodity supply chain. For each intervention, the projects worked in close partnership with GOT institutions from the inception to the end.

Supply Chain Coordination and Planning

At the start of the USAID | DELIVER PROJECT and SCMS in Tanzania, public health supply chain activities lacked cohesion and coordination among the various actors. Without a supply chain strategic plan, the MOHCDGEC, donors, and partner organizations did not have a coordinated approach to public health supply chain management. Over the years, as the two projects' interventions and activities evolved, their work included increased COLLABORATION with donor partners and coordination between supply chain actors working in the same field. As a new technological innovation, the eLMIS

Stakeholders at supply chain strategic review meeting.

Official launch of the eLMIS, LMU, and donation guidelines.

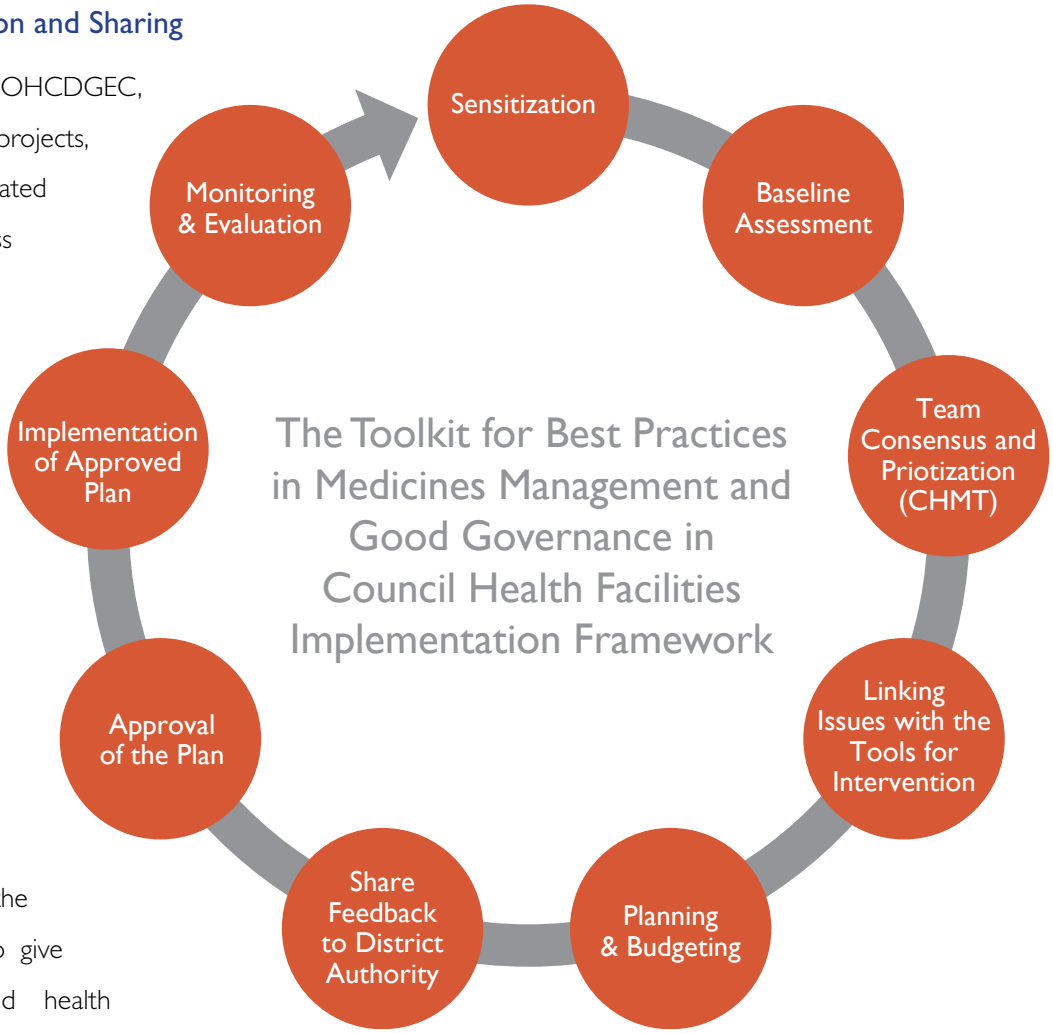
required buy-in and support from stakeholders. Through collaborative efforts, the two projects worked with other donors, such as WHO, PATH, Rockefeller Foundation, and the Bill and Melinda Gates Foundation, to identify opportunities where duplicative efforts could be reduced through application and roll-out of the eLMIS. During design and implementation of the LMU, SCMS and USAID | DELIVER PROJECT worked extensively with the Global Fund for AIDS, Tuberculosis, and Malaria (GFATM) and the MOHCDGEC to structure the LMU requirements and determine the proper funding structure to initiate the LMU and its subsequent handover as a GOT funded entity.

The NPAP, estimated to cost $42,939,536 for the first three years of implementation for all interventions, guides supply chain strengthening activities and creates a vision for how the supply chain should perform.

In 2014, Tanzania began the formal development and implementation of the National Pharmaceutical Sector Action Plan (NPAP). During the process, the USAID | DELIVER PROJECT and SCMS worked with World Bank (WB), GFATM, Department for International Development (DFID), Canadian International Development Agency (CIDA), and Danish International Development Agency (DANIDA) to obtain stakeholder inputs, build COLLABORATION within donor community, and ascertain that all donor perspectives were included in the NPAP. The NPAP, estimated to cost $42,939,536 for the first three years of implementation for all interventions, guides supply chain strengthening activities and creates a vision for how the supply chain should perform.

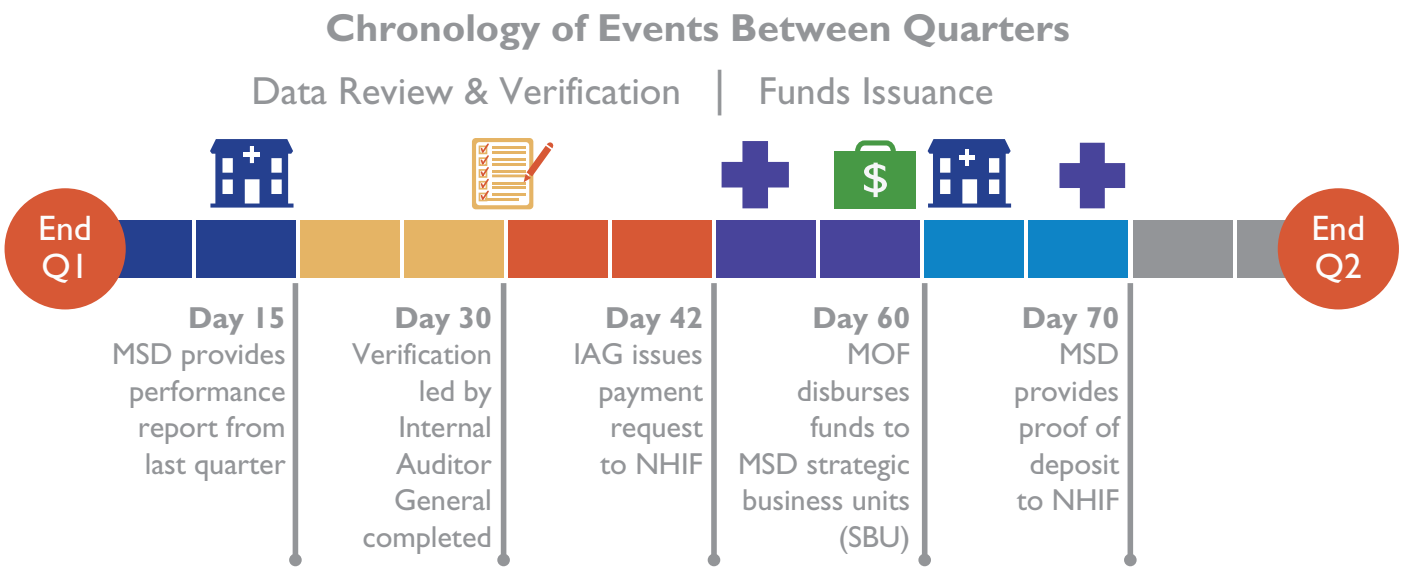
Best Practice Documentation and Sharing

In September 2014, the MOHCDGEC, with support from the projects, began documenting demonstrated best practices and process actions in health commodity management, financing, and governance. Numerous councils, local government bodies at the district level, had begun addressing commodity management challenges with innovative practices of their own. Teams of MOHCDGEC and project staff visited councils with proven best practices and carefully documented the processes, creating a toolkit to give other local-level officials and health workers the procedures and framework to IMPLEMENT these best practices.



Among the many procedures contained in the toolkit are steps to: effectively verify commodities received against stock records and dispensing records, begin implementing pooled procurement, and work with others on improved and coordinated delivery. Numerous councils, 10 during the pilot phase, have used the toolkit to roll-out new interventions, such as innovative funding schemes for operational purposes. During the first evaluation in Kyela and Same districts, the data reporting ACCURACY for the transfer from stock keeping records to report and request forms has increased from 37 to 67 percent and 51 to 74 percent, respectively. Additionally, Mkuranga saw a 160 percent increase in the human resource pool for health

A sample of a medicine register at a District hospital.



facilities following toolkit implementation. Though currently limited to BRN regions, the toolkit will be rolled out to other districts in the future. Initial implementation has already demonstrated the importance of collaborative responsibility and budgeting for roll-out of the initiatives.

Incentivizing Supply Chain Performance and Results

Recognizing the need for a strong, autonomous national medical store, the USAID | DELIVER PROJECT and MSD began collaborating with World Bank in 2014 to HARMONIZE its facility-level RBF scheme with a newly designed central-level scheme tied to MSD performance. Designed to improve MSD's performance and strengthen the public health supply chain, the new financing scheme provides for unified reward mechanisms, key performance indicators, and roles for supply chain actors. The RBF scheme provides monetary and non-monetary incentives to MSD central and zonal warehouses when they meet various levels of indicator performance. USAID | DELIVER PROJECT worked with national institutions involved in health care — including the MOHCDGEC, MSD, Pharmacy Council, Ministry of Finance, Prime Minister's Office–Regional Administration and Local Government President's Office-Regional Administration and Local Government (PO-RALG), and National Health Insurance Fund — to build support and buy-in for the proposed scheme.

Members of the Regional and Council Health management team in Kagera at a consultative meeting with the Regional Pharmacists.

the USAID | DELIVER PROJECT and partner organizations and institutions have completed design and roll-out of the RBF operations manual and training of 117 MSD staff on the new scheme, valued at $560,000 annually. Through continued roll-out, MSD and other public health supply chain actors will have the tools in place to drive supply chain performance, RESULTS, and outcomes through the new, innovative financing mechanism. As an adopted private sector innovation, Tanzania's RBF scheme gives supply chain actors a new incentive structure to reward supply chain performance and results.

Through continued collaborative efforts with donor partners and the GOT, the USAID | DELIVER PROJECT and SCMS made supply chain a focus for many stakeholders across the country and established collaborative efforts in INNOVATIVE approaches to supply chain problems. Going forward, these interventions and activities will be founded and institutionalized within the GOT for longevity and sustainability.

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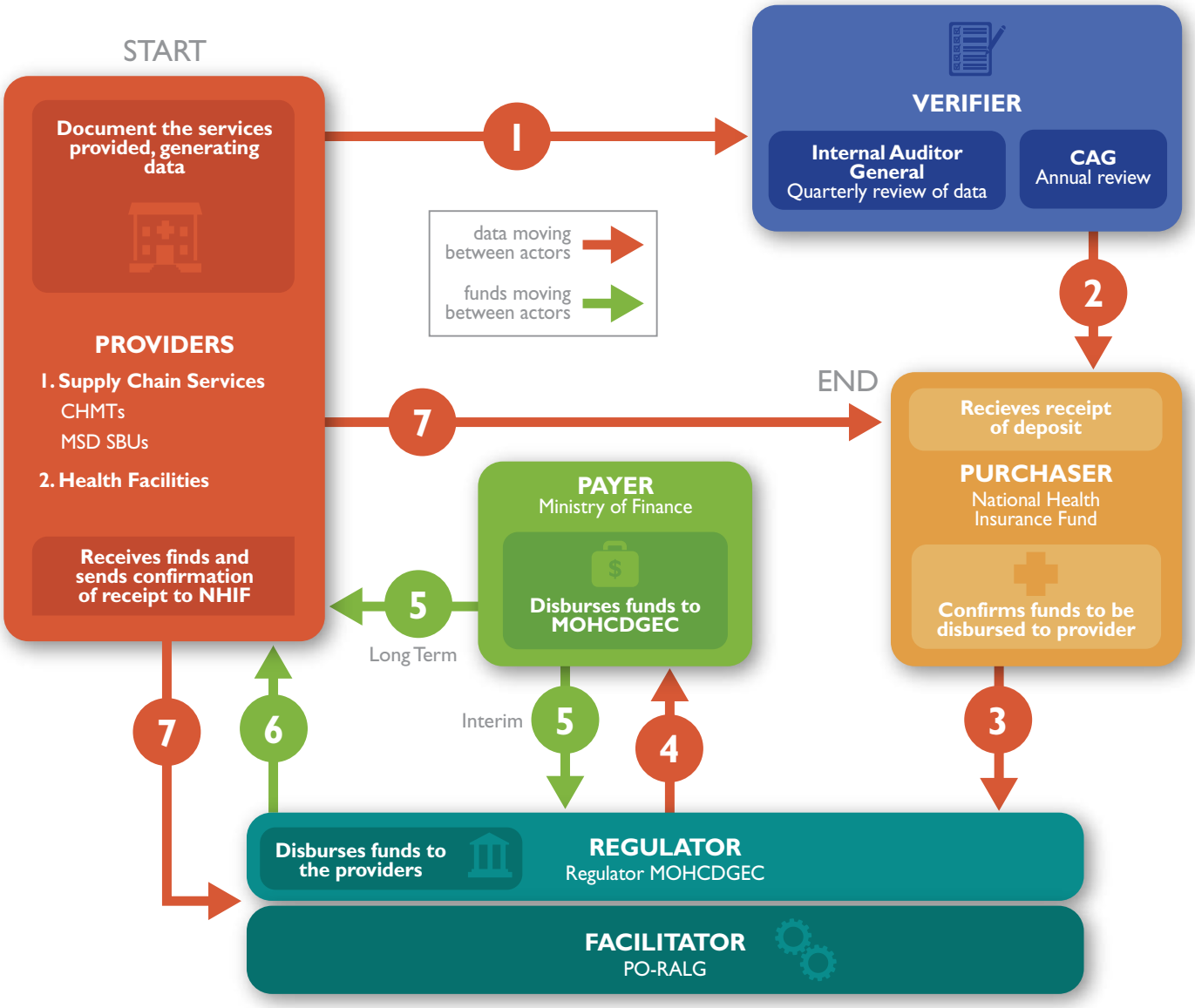


COUNTRY OWNERSHIP AND SUSTAINABILITY OF SUPPLY CHAIN INTERVENTIONS IN TANZANIA

Creation of the LMU has resulted in a well-organized, in a well staffed, highly equipped coordinating entity within the MOHCDGEC to address supply chain challenges. LMU staff have been instrumental in identifying supply chain problems, developing solutions, and implementing interventions.

- Institutionalized supply chain management (SCM) as a national priority. 73 LMU staff have been hired and placed within the MOHCDGEC and at MSD.
- Within one year, 83 percent of the approximately 5,000 health facilities received supportive supervision visits that focused on commodity management.
- Increased ownership and sustainability of supply chain monitoring interventions. Supply Chain Monitoring Advisors (SCMAs) performed nearly 4,000 on the job training (OJT) visits in 2012, and ARV reporting rates increased from 80 percent in 2010 to 95 percent in 2016.
- Harmonized, consolidated, and coordinated activities across seven technical function areas to reduce duplication of efforts.

Prior to implementation of the LMU, disparate health programs and various stakeholders were involved in managing various supply chain functions. There was no single government entity to coordinate and provide guidance on supply chain functions. Facilities routinely failed to follow commodity management PROCEDURES. Often, health facilities did not routinely complete their R&R forms and observed minimal compliance with established inventory control parameters. Separate management of the supply chains by the various programs and the resulting lack of data visibility served as an impetus for the MOHCDGEC to form an LMU.

MOHCDGEC staff reviewing logistics data.

In March 2012, the USAID | DELIVER PROJECT and SCMS held a two-day workshop with the MOHCDGEC, MSD, and other stakeholders to outline the LMU's FUNCTIONS and structure. Stakeholders agreed that the LMU would support all logistics systems in the country. By serving as a hub and consolidating supply chain management OVERSIGHT under one body, the LMU would manage supply chains holistically and reduce redundancies in management processes for multiple supply chains. It would also enable LMU staff to better cultivate relationships with district-level and health facility staff, who manage all commodities regardless of the mode or mechanism of their supply.

In October 2012, a team from Tanzania — including the Minister of Health and staff from the PSS, MOHCDGEC Information Communication and Technology Unit, and MSD — went on a study

Kagera Regional and Council Health Management Team (R/CHMT) members discussing commodity security issues.

tour to assess the functioning of an LMU in Zambia and used this experience to help inform the development of an LMU in Tanzania.

Implementation of the Logistics Management Unit

In October 2013, the LMU was implemented, with the aim to be a sustainable solution to promote country ownership and ensure CONTINUITY of all supply chain functions with limited support from donors and partners. It serves as both a strategic and operational mechanism to provide supply chain coordination and data visibility. With financial support from USAID and the GFATM, 73 LMU staff have been hired and placed at central level within the MOHCDGEC, at MSD central, and in the nine MSD zones.

As Eric Shoo, Regional Logistics Coordinator from Mwanza region, commented, "People have started working outside of their silos, and there is more coordination and collaboration."

The USAID | DELIVER PROJECT and SCMS, in COLLABORATION with PSS and MSD, have conducted trainings for the newly recruited LMU staff on components of supply chain management, including the role of an LMU, the ERP and eLMIS systems, and facilitation skills.

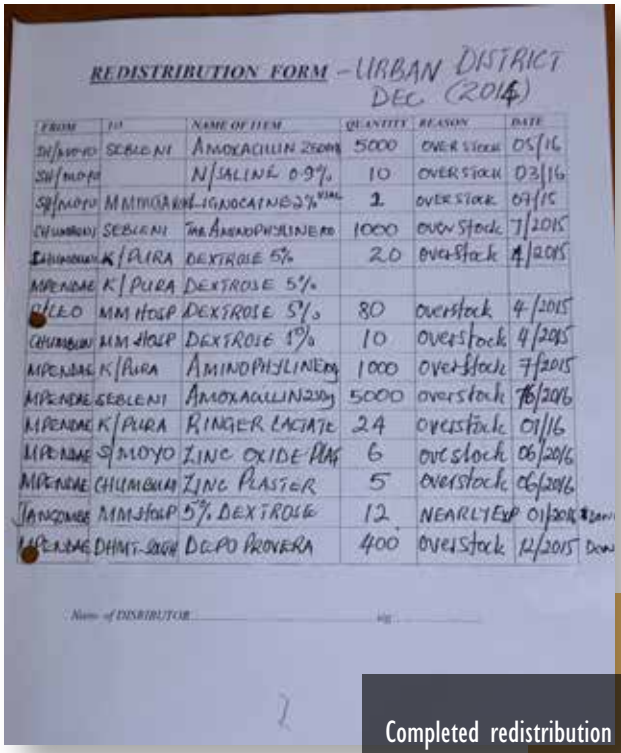
The LMU's ownership of all supply chain functions includes logistics data management, quantification, monitoring and evaluation, COORDINATION and collaboration, supply chain intervention planning, training and capacity building, and supervision. All health commodity logistics systems supported by the MOHCDGEC are supported through the LMU, including the ARV logistics system, laboratory logistics system (including HIV test kits), integrated logistics system, tuberculosis and leprosy logistics system, and vaccine immunization management system.

The Growing Role of Supply Chain Monitoring Advisors

73 LMU staff have been hired and placed at central level within the MOHCDGEC, at MSD central, and in the nine MSD zones. From January 2014 through March 2015, about 83 percent of the approximately 5,000 health facilities received supportive supervision visits that focused on commodity management, eLMIS, and ILSGateway.

With the LMU's formation, the SCMA role also evolved. To capitalize on the success that the ARV program experienced with SCMAs, the USAID | DELIVER PROJECT and SCMS elected to make the SCMAs part of the LMU and give them responsibility for mentoring and providing guidance for all programs including the ILS. As part of the LMU, SCMAs now monitor stock movements for all commodities to and from MSD every month; review R&R forms for accuracy, completeness, and timeliness; advise warehouse officers on

good storage practices; and serve as the primary liaison between the facility and MSD and other levels.


REDISTRIBUTION FORM – URBAN DISTRICT DEC (2014)

FROM	TO	NAME OF ITEM	QUANTITY	REASON	DATE
DH/MOYO	SEBLENI	AMOXACILLIN 250mg	5000	OVER STOCK	05/16
SH/MOYO		N/SALINE 0.9%	10	OVERSTOCK	03/16
SH/MOYO	MMHOSP	LIGNOCAINE 2%	2	OVERSTOCK	07/15
CHUMBUNI	SEBLENI	TAB AMINOPHYLLINE	1000	OVERSTOCK	7/2015
CHUMBUNI	K/PURA	DEXTROSE 5%	20	OVERSTOCK	4/2015
MPENDAE	K/PURA	DEXTROSE 5%			
OLEO	MM HOSP	DEXTROSE 5%	80	overstock	4/2015
CHUMBUNI	MM HOSP	DEXTROSE 5%	10	overstock	4/2015
MPENDAE	K/PURA	AMINOPHYLLINE	1000	overstock	7/2015
MPENDAE	SEBLENI	AMOXACILLIN 250mg	5000	overstock	7/2016
MPENDAE	K/PURA	RINGER LACTATE	24	overstock	01/16
MPENDAE	S/MOYO	ZINC OXIDE PLAS	6	overstock	06/2016
MPENDAE	CHUMBUNI	ZINC PLASTER	5	overstock	06/2016
TANGOMBE	MM HOSP	5% DEXTROSE	12	NEARLY EXP	01/2016
MPENDAE	DHMT-2014	DEPO PROVERA	400	overstock	12/2015

Name of DISTRIBUTOR _____ Sig _____

Completed redistribution form.

Supervision Visits and Redistribution Activities Increase

As a result of LMU staff's direct involvement, health facilities now receive routine supervision visits; from January 2014 through March 2015, about 83 percent of the approximately 5,000 health facilities received supportive supervision visits that focused on commodity MANAGEMENT, eLMIS, and ILSGateway. In cases of impending stockouts, overstocks, or expiries, LMU staff led redistribution of commodities within zones and facilities. Thanks to better coordination among LMU staff, the RHMT, and CHMT, approximately 1,774 cases of redistribution were recorded during the same time period, reducing expiries and wastage.

Increased Collaboration and Implementation of a Performance Monitoring Plan

Since January 2014, the LMU has held four quarterly technical meetings, at which staff share experiences, best practices, and knowledge; discuss achievements, challenges, and solutions; and set performance standards for the LMU team.

Furthermore, the LMU has conducted 20 stakeholder meetings involving members of the RHMT and CHMT, the District Executive Director (DED), and implementing partners. In September 2014, the LMU team developed an LMU PERFORMANCE monitoring plan with support from the USAID | DELIVER PROJECT and SCMS, and implemented it in January 2015.

A district pharmacist reviewing stock keeping records during a supervision visit to a health facility.

LMU staff at the regional level have created Whatsapp groups (an SMS based mobile phone application) to communicate across District Pharmacists, Lab Technologists, implementing partners, and MSD, among others, in real time. As Eric Shoo, Regional Logistics Coordinator from Mwanza region, commented, "People have started working outside of their silos, and there is more coordination and collaboration."

Creation of the LMU has resulted in improved visibility of information, STREAMLINED processes, and clarity of roles, responsibilities, and processes at all levels in the supply chain. Under the leadership of the MOHCDGEC, the LMU has served as a catalyst to institutionalize supply chain management as a national priority in Tanzania.

THE WAY FORWARD

The USAID | DELIVER PROJECT and SCMS's work in public health supply chain management in Tanzania has had a tremendous impact on the sector. Through innovations, collaborative efforts, and integrated approaches, the two projects have developed SUSTAINABLE systems and structures to support continuous improvement efforts in the public health supply chain sector. To ensure sustained momentum in immediate and future endeavors, it will be critical for the MOHCDGEC and related ministries, departments, and agencies; USAID and other donors; and other supply chain stakeholders to continue leveraging these interventions for a strengthened health system.

Warehouse workers organizing pallets.

The projects have made substantial efforts to address human resource deficits in the public health supply chain sector through PST intervention and ADVOCACY within the MOHCDGEC to strengthen the supply chain cadre of health workers. Supply chain PST will need to expand from MUHAS to other institutions and degree programs to further grow the available health care workforce with supply chain skills.

The eLMIS, Epicor 9, and ILSGateway make data available in ways that were previously impossible for the public health supply chain. As use of the eLMIS expands and data visibility improves across the supply chain, supply chain decision makers need to continue using the data generated from the TECHNOLOGIES at their disposal for informed decision making and action. Building upon these systems to implement the facility edition of the eLMIS and expand monitoring and evaluation through data quality assessments will be a priority focus area in the future.

Country ownership of supply chain functional areas has been a cornerstone of USAID | DELIVER PROJECT and SCMS interventions. It is critical for the MOHCDGEC, its departments, and related agencies to capitalize on their expanded capacity and maintain the technical knowledge gained.

Quantification will continue to be a crucial activity sustained within the LMU with the tools and resources made available over the life of the projects. As the central hub for supply chain activities, the LMU must continue demonstrating the importance of supply chains to the overall health system by leveraging data to support its MANAGEMENT practices and driving sustainability for essential supply chain services.

MSD's new WiB units have REVOLUTIONIZED and modernized the warehousing and inventory management practices at the zonal level. The WiB units give MSD not only state-of-the-art facilities for managing public and donated health commodities, but also a mechanism for accessing additional revenue streams to diversify their incomes.

Accountability continues to be an issue of the utmost importance to a well-functioning public health supply chain. Tanzania has already demonstrated its commitment to governance and accountability through the adoption of the toolkit for best practices. This intervention needs continued government SUPPORT and investment to expand, document additional best practices, and share the toolkit with additional councils and regional teams.

MOHCDGEC management team, supply chain IPs, and project staff at eLMIS, LMU, and Donations Guidelines launch.

Above all else, the culture that USAID, the GOT, SCMS, the USAID | DELIVER PROJECT, and other partner organizations have created over the past ten years must endure. Tanzania's public health supply chain sector now operates within a culture of transparency, ACCOUNTABILITY, data-driven decision making, commitment to capacity building, and cross-sectoral collaboration. Supply chains and the systems now in place help to effectively, efficiently, transparently, and sustainably provide life-saving health commodities to millions of Tanzanians, an essential public health priority that will continue beyond the closure of SCMS and the USAID | DELIVER PROJECT.