Mozambique National Supply Chain Assessment Results

A review of the public health supply chain in Mozambique

DECEMBER 2014

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About 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.

USAID | DELIVER PROJECT, Task Order 4

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Abstract

In November and December 2014, the Supply Chain Management System and the USAID | DELIVER PROJECT, with assistance from Mozambique Ministry of Health (MISAU), conducted an assessment of the maturity and performance of the logistics management and supply chain systems for selected health commodities in Mozambique. The central level was self-evaluated while the provincial to health facility levels were assessed by the central level. Results show that Mozambique's health supply chain has reached a marginal maturity level. Proposed project actions to increase maturity and improve performance include: conducting a cost and outsourcing feasibility study for the central and regional level warehouses and a transportation cost and outsourcing feasibility study.

Cover photo: Warehouse staff discussing data in warehouse management system. Mozambique, 2014.

Acknowledgments

This assessment would not have been possible without support and guidance from many individuals within the Ministry of Health during the planning and implementation phases and the leadership of USAID | Mozambique, particularly Shannon Marsh and Benedito Chauque. We would especially like to thank National Director Dr. Antonio Assane and his central-level staff as well as CMAM staff, ministry and provincial staff for participating in the assessment. Also, we are grateful for the assistance received from USAID Washington, and particularly Meaghan Douglas and Joshua Rosenfeld, who reviewed several drafts of the report and provided feedback.

We are grateful also to our data collectors for their unwavering work ethic and sense of humor. Without their efforts it would not have been possible for us to collect the quantity and quality of data that we did in such a short time. The full list of data collectors is included in Annex 7.

Many thanks to all of the individuals who traveled long distances from across Mozambique to participate in the assessment workshops and to project staff for graciously hosting our meetings throughout our visit.

Thank you also to the dozens of health care workers at provincial, district, and health facility levels who took time out of their busy schedules to open their storerooms and dispensaries for us and to participate in key informant discussions.

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Acronyms

AL	artemether/lumefantrine
AIDS	acquired immunodeficiency syndrome
ART	antiretroviral therapy
ARV	antiretroviral
CA	*Centro de Abastecimento,* Supply Center
CD4	cluster of differentiation 4
CTTF	*Comissão Técnica de Terapêutica e Farmácia,* Therapeutic and Pharmacy Technical Board
CMAM	*Centro de Medicamentos e Artigos Médicos,* Central Medical Store
CMM	Capability Maturity Model
CMS	Central Medical Store
CW	central warehouse
DDM	*Depósito Distrital de Medicamentos,* district medical store
DNAM	*Direcção Nacional de Assistencia Médica,* National Directorate of Medical Assistance
DPM	*Depósito Provincial de Medicamentos,* provincial drug depot
EML	essential medicines list
ERP	enterprise resource planning
FASP	forecasting and supply planning
FEFO	first to expire, first out
FNM	*Formulário Nacional dos Medicamentos*, the Drug National Formulary
GF	Global Fund
GOM	Government of Mozambique
GWP	good warehousing practice
H&S	health and safety
HIV	human immunodeficiency virus
HR	human resources
KPI	key performance indicator
LMIS	logistics management information system
LMU	Logistics Management Unit

LNCQM	*Laboratorio de Control de Qualidade de Medicamentos,* National Laboratory for Medicines Quality Control
LT	long term
MEDIMOC	*Empresa Moçambicana de Importação e Exportação de Medicamentos,* Mozambican company of import and export of medicines
MIS	management information system
MISAU	*Ministério de Saúde,* Mozambique Ministry of Health
MOS	months of stock
MT	medium term
NA	not applicable
NEML	National Essential Medicines List
NSCA	National Supply Chain Assessment
OTJ	On the job
PELF	*Plano Estratégico da Logística Farmacêutica,* pharmaceutical logistics strategic plan
PEPFAR	Presidents Emergency Plan for AIDS Relief
PESS	*Plano Estratégico do Sector da Saúde,* health sector strategic plan
PLMP	Pharmaceutical Logistics Management Plan
PMP	performance management plan
PMTCT	prevention of mother-to-child transmission
POD	proof of delivery
PPE	personal protective equipment
RDT	rapid diagnostic test
SCM	supply chain management
SCMS	Supply Chain Management Systems
SIMAM	*Sistema de Informação de Medicamentos e Artigos Médicos,* logistics management information system
SIF	*Sistema de Informação de Finanças,* the finance information system
SIP	*Sistema de Informação de Procura,* the procurement information system
SOP	standard operating procedure
SSI	*Sistema de Seguimento das Importações,* the imports tracking system
ST	short term
STG	standard treatment guideline
TB	tuberculosis
3PL	third-party logistics

TOR	term of reference
TWG	technical working group
USP	United States Pharmacopeial Convention
VEN	vital, essential, and necessary
WHO	World Health Organization
WMS	warehouse management system

Executive Summary

The Supply Chain Management System (SCMS) and the USAID | DELIVER PROJECT, in collaboration with the *Centro de Medicamentos e Artigos Médicos* (CMAM), conducted an assessment of Mozambique's health supply chain November 24 to December 5, 2014. The purpose was to assist CMAM, the Central Medical Store, in understanding the current condition of the supply chain and to prioritize critical areas for strengthening it.

Mozambique's public health sector supply chain system is centrally managed by two institutions: CMAM and the Supply Center (*Centro de Abastecimento,* or CA). CMAM is responsible for the forecasting, procurement, warehousing, and distribution of medicines and medical supplies for the National Health Service. As a whole, CMAM functions as the Mozambique Ministry of Health's (MISAU)'s Logistics Management Unit (LMU) for health commodities.

Methodology

The assessment was conducted using the National Supply Chain Assessment (NSCA) toolkit, which consists of two tools to assess supply chain capability and performance:

- **Capability Maturity Model (CMM) diagnostic tool**, a quantitative diagnostic tool based on industry best practice. It assesses the capability maturity of a supply chain using a scale of 1–5, with 5 being the most mature.[1] Data on each functional area was collected by conducting a workshop and interviews with key stakeholders.

- **Supply chain key performance indicator (KPI) assessment**, a set of indicators that comprehensively measures health supply chain performance. Data was collected at each facility for country-specific indicators measuring performance of stock availability, product selection, forecasting, procurement, and warehousing and inventory management.

Site Selection

To ensure a nationally representative sample, sites were selected from all supply chain levels: central, provincial, district, and health facility. This also ensured that data collectors could follow the movement of the tracer commodities throughout the system. While data was collected for all three[2] central-level and all 11 provincial-level warehouses, a purposive stratified sample[3] approach was applied to select districts and health units to address constraints caused by human resources (HR) and timing.

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[1] The CMM tool measures performance on a scale of 1–5. Results are presented as percentages, where 1=20%, 2=40%, 3=60%, 4=80%, and 5=100%.

[2] At the time of the assessment, three central warehouses were in place. After completion of the assessment and before publication, an additional central warehouse was established. This document refers only to the original three warehouses.

[3] Purposive stratified sampling is a method that takes a sample within another sample. This second sample can be selected according to a key characteristic or dimension that may influence how the phenomenon is manifested. Cohen D, Crabtree B. "Qualitative Research Guidelines Project." July 2006.< http://www.qualres.org/HomeStra-3813.html>.

Data Collection

The NSCA was conducted by a total of 11 data collection teams of at least two members, composed of CMAM staff, MISAU provincial-level staff, plus one SCMS and USAID | DELIVER PROJECT staff member. Teams collected data and submitted it each day using Samsung Galaxy 3 tablets. Automating the data collection through the tablets allowed for daily data quality checks, follow-up with data collectors, and automated data aggregation.

Data Analysis and Results

Results show that the overall maturity of Mozambique's health supply chain is 55.1 percent, which is an average of the functional area scores across all system levels. This score means that the health supply chain has reached marginal maturity, where basic processes are in place but are used inconsistently. The NSCA recommends that a public health supply chain operate at 60 percent or above maturity level, where processes are well defined and implemented with some technology present.

This CMM score considers the personnel and operations support provided directly to the supply chain by many partners, including SCMS and the USAID | DELIVER PROJECT. This support will change in 2016 when both projects end.

The following table summarizes the CMM self-assessment results:

National Supply Chain Capacity, CMM (self-assessment)

Functional area	CMM score
Overarching	55.1%
Product selection	70.0%*
Forecasting and supply planning	63.5%*
Procurement	64.8%*
Warehousing and inventory management	37.9%
Transportation	39.5%
National Level Enablers	
Management information**	53.6%
Human resources**	60.1%

*Pertains only to the central level

The CMM scores for product selection, forecasting and supply planning (FASP), and procurement are central level only, as these supply chain functions are conducted only at the central level. The CMM scores for warehousing and inventory management and transportation are an average of all sites at the central, provincial, district, and health facility levels, where each site carries the same weight. All functional areas currently receive substantial technical assistance. The maturity of the supply chain is a snapshot of the whole system and does not allow for the separation of components receiving or not receiving technical assistance.

Due to the lack of an effective and reliable procurement information system, and the complexity of obtaining the data needed to measure all the potential procurement KPIs, quality testing is the only KPI used for procurement.

The table below provides a summary of the KPI survey results:

National Supply Chain Assessment, KPIs (quantitative data assessment)

KPI score*	
Stockout rate (historical), central level	51.7% (Facilities sampled =3, CMAM)
Stockout rate (historical), provincial, district, and health facility levels	17.0% (Facilities sampled =103)
Stockout rate (day of visit), provincial, district, and health facility levels	22.0% (Facilities sampled =103)
Stocked according to plan (day of visit), only central level	13.9% (Facilities sampled =3, CMAM)
Stocked according to plan (day of visit), provincial, district, and health facility levels	19.5% (Facilities sampled =20)[4]
Quality testing rate, central and provincial levels	85.6%, please note only 62.9% of samples were tested (Number of tests =514)
Up-to-date stock cards, provincial, district, and health facility levels	61.7% (Facilities sampled =103)
Stock accuracy, provincial, district, and health facility levels	57.2% (Facilities sampled =103)
Expiry rate, only central level	0.4% (Facilities sampled =3, CMAM)
Acceptable storage capacity	34.0% (Facilities sampled =106)
Logistics management information system (LMIS) stock accuracy	85.3% (Facilities sampled =26)[5]
On-time and complete reporting rate, only provincial level	63.6% (Facilities sampled =11)
Staff turnover rate	18.5% (Facilities sampled =106)
Supply chain staff trained in the Standard Operating Procedures (SOPs) Manual, 3rd edition	45.3% (Facilities sampled =106)
Facilities with at least one staff member trained in the SOPs Manual, 3rd edition	70.8% (Facilities sampled =106)

* Sample size and formula parameters are explained in Annex 6.

Analysis of KPIs provides information on the aggregate performance of Mozambique's health supply chain. The primary outcome indicators for the KPIs are stockout rates and stocked according to plan. Primary outcome scores for historical stockout rates for the central level were 51.7 percent and for the provincial, district, and health facility levels, 17.0 percent. Stocked according to plan on the day of the visit to central-level warehouses was 13.9 percent, which increases to 19.5 percent at the provincial, district, and health facility levels. The central level has lower levels of products because it sends all available products down the supply chain line. Since product is distributed from the central to the provincial level and beyond, a lower percentage at the central level is expected.

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[4] Only 20 facilities reported having maximum and minimum stock levels established at these levels.
[5] Only 26 sites had functioning LMIS.

Human resources appear to be performing well with a low staff turnover at 18.5 percent. These figures can be partially attributed to the seconded employees from USAID | DELIVER PROJECT and SCMS and other partners, which support 14.4 percent of total staff are seconded, this includes 34 percent of the CMAM positions. Unless another stakeholder can fund these positions, this number is anticipated to change dramatically when the projects end in 2016.

Although the district level has the highest percentage of staff turnover, staff turnover is low, averaging 18.5 percent e across all levels of the supply chain. At the same time, the central level has experienced high turnover for the critical role of warehouse manager, particularly in Adil and Zimpeto, where four different people occupied this role in the past year.

More than 80 percent of the central-, provincial-, and district-level warehouses as well as 54.3 percent of the health facilities reported more than 80 percent of their available space occupied with health commodities. While central-level facilities are overstocked, low levels of months of stock on hand and a monthly ordering cycle are a challenge, in particular for health facilities. This is in part because resources dedicated to transportation from districts to health facilities are limited and clinical personnel performing supply chain management (SCM) within the health facilities often lack adequate supply chain training.

Of all the levels, the provincial level has the highest percentage (100 percent) of facilities with at least one staff member who attended the SOPs training. However, the provincial level had low performance in stocked according to plan, stock accuracy, and storage conditions meeting minimum requirements. This low performance presents an opportunity to investigate further if the appropriate person is being trained and if that training is being disseminated effectively throughout the facility This low performance presents an opportunity to investigate further if the appropriate person is being trained and if there are other inefficiencies (i.e. poor management and supervision, lack of clear job expectations and/or adequate tools) within the supply chain that could be affecting staff performance.

When support from both above mentioned projects ends in 2016, and unless current gaps are covered by providing additional MISAU staff, continuing partner support, or outsourcing more supply chain functions, the risk is substantial that the gains achieved in capability maturity and performance will decline.

A summary of the scores for each functional area, as well as short-term (ST), medium-term (MT), and long-term (LT) recommended priority activities for improving supply chain performance, are described in the matrices below.

Product selection		ST	MT
CMM score	• 70.0%		
KPIs	• Not applicable (NA)		
Priority activities description	• Finalize the National Essential Medicine's List (NEML) update process and ensure that the document is aligned with most updated standard treatment guidelines (STGs) for key diseases. Disseminate nationwide. • Update Mozambique National Formulary of Essential Drugs to include all products listed in the NEML and STGs. • Within the NEML, define the priority of each item to be in "full supply" according to the vital, essential, and necessary (VEN) list because some medicines are more essential than others. • In all three documents, include product strengths and formulations that are expected to be procured/needed.	✔	
	• Streamline and update approval process within MISAU to ensure that documents are updated according to MISAU policies. • Develop terms of reference (TORs) and guidelines for technical working groups (TWGs) to update STGs and essential medicine lists (EMLs). Ensure that NEML is reviewed, updated, and published every two to three years and STGs every three to five years.		✔

Forecasting and supply planning		ST	MT	LT
CMM score	• 63.5%			
KPIs	• NA			
Priority activities description	• Develop and apply clear prioritization criteria to assess need (ABC inventory analysis and VEN) (*Plano Estratégico da Logística Farmacêutica (PELF),* the pharmaceutical logistics strategic plan). • Train all CMAM staff in using forecast and supply plan tools. • Finalize the development of modules linking SIMAM (logistics management information system), *Sistema de Informação de Procura* (SIP, the procurement information system), and MACS to the Central Tool. • Install suitable software for forecast and supply planning. • Assess consumption of medications according to the health facility level.	✔		

Forecasting and supply planning	ST	MT	LT
• Ensure the MISAU has full ownership of the forecast process and results and that senior CMAM staff lead the process with technical assistance as needed. • Ensure that CMAM staff positions in the organizational structure are filled and available staff have the competencies required to effectively complete forecast and supply planning activities. • Ensure that the Central Tool integrates forecast and supply planning tools.		✓	
• Ensure that CMAM staff positions designated in the organizational structure are all filled by staff with strong SCM core competencies, specifically in forecast and supply planning. • Develop real-time national LMIS data availability in a format that integrates with forecast and supply planning tools in the enterprise resource planning (ERP) functionality. • Develop a forecasting tool with LMIS and ERP procurement and supply planning functionality, so that forecast and supply planning data is visible to all managers in real time.			✓

Procurement		ST	MT	LT
CMM score	• 64.8%			
KPIs	• Quality testing, post-market (central and provincial) 85.6%, please note only 62.9% of samples were tested. Number of tests =514			
Priority activities description	**Oversight and Strategic Planning** • Sensitize the MISAU and Ministry of Finance to the need to adapt the procurement process to the specificity of pharmaceuticals and health products (PELF).	✓		
	• Ensure that procurement processes and contract management are audited by external companies (PELF). • Initiate the use of framework contracts for procuring key pharmaceuticals and health products (PELF). • Develop a new integrated system to manage procurement, contracts, importation, and financial management (PELF).		✓	
	• Support implementation and daily use of the SIP, and *Sistema de Informação de Finanças* (SIF).			✓

Warehousing and inventory management		ST	MT	LT
CMM score	• 37.9%			
KPIs	• Historical stockout rate (central) 51.7% Facilities sampled =3 • Historical stockout rate (provincial, district, and health facility) 17.0% Facilities sampled =103 • Day of visit stockout rate (provincial, district, and health facility) 22.0% Facilities sampled =103 • Stocked according to plan (central) 13.9% Facilities sampled =3 • Stocked according to plan (provincial, district, and health facility) 19.5% Facilities sampled =20 • Percent of stock cards up-to-date (provincial, district, and health facility) 61.7% Facilities sampled =103 • Stock accuracy (provincial, district, and health facility) 57.2% Facilities sampled =103 • Percent of total stock that expired in previous reporting period, quantity (central) 0.4% Facilities sampled =3 • Percent of storage facilities meeting acceptable storage capacity (central, provincial, district, and health facility) 34.0%			
Priority activities description	• Conduct cost and outsourcing feasibility study for the central- and regional-level warehouses. • Adjust CMAM distribution systems parameters (minimum, maximum, order frequency) for better supply chain efficiency and assist with decision making on when to order (pull) or distribute (push) and in which quantities to minimize stockouts and expiries at all levels (PELF). • Create more storage conditions and cold chain area at the district and health facility levels • Retrain warehouse staff in warehouse management system (WMS) and updated warehouse SOPs. • Consolidate the LMIS in the *Depósito Provincial de Medicamentos* (DPM, provincial drug depot) and *Depósito Distrital de Medicamentos* (DDMs, district medical store). • Link SIMAM with the warehouse management system (MACS) in the central warehouses (Maputo, Beira, and Nampula) (PELF). • Finalize Central Tool integration (PELF). • Equip and open Nampula Central Warehouse (PELF). • Begin preparing the phased removal of one level of the supply chain for medicines and medical material (PELF).	✔		
	• Develop and implement a new version of the existing LMIS for the intermediate warehouses using a new digital platform (PELF).		✔	
	• Create a training department that can provide pre-service as well as on-the-job warehouse management training to staff. • Install WMS in all intermediate-level warehouses • Follow up and assist in implementing the infrastructure investment plan and the needed changes in the operational model and functions (PELF).			✔

Transportation		ST	MT	LT
CMM score	• 39.5%			
KPIs	• NA			
Priority activities description	• Conduct a transportation cost and outsourcing feasibility study. • Create SOPs for transportation. • Develop adequate service-level agreements for transporters. • Develop system to collect and measure transport KPIs. • Develop TORs for transport department/staff. • Conduct a requirement analysis for transportation management software. • Conduct a transport optimization study (PELF).	✓		
	• Recruit transport specialists/staff to plan transport and monitor third-party transport providers. • Develop plan and budget for own fleet and third-party transport providers.		✓	
	• Expand fleet.			✓

Human resources capacity development		ST	MT	LT
CMM score	• 60.1%			
KPIs	• Staff turnover rate (provincial, district, and health facility) 18.5% Facilities sampled =106 • Percent of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training 70.8% Facilities sampled =106			
Priority activities description	• Advocate for the need to modify the approach for developing, recruiting, retaining, and motivating supply chain staff (PELF). • Define the specific supply chain-related competencies required of health workers. • Introduce the concept and framework for a cadre of supply chain professionals.	✓		
	• Institutionalize greater administrative and operational autonomy for human resources (PELF). • Recruit staff with specific knowledge of supply chain management (PELF). • Give CMAM administrative autonomy over HR to recruit, retain, and motivate staff and build staff capacity to improve supply chain management. • Develop competency-based modules for pre-service training for new and existing courses.		✓	

Human resources capacity development	ST	MT	LT
• Develop university degree in logistics, procurement, and management. • Create *técnico superior* (advanced technician) categories for supply chain management, hospital administration, etc.			✓

1.0 Background

1.1 About Mozambique

Located in southeastern Africa, Mozambique has a population of 25,059,000[6] and occupies an area nearly twice the size of California. Soon after the country gained independence in 1975, a prolonged civil war hindered its development until the early 1990s. In 1987, the government embarked on a series of macroeconomic reforms designed to stabilize the economy. These steps, combined with donor assistance, and the political stability gained since the multiparty elections in 1994, have led to dramatic improvements in the country's growth rate, along with rapid economic expansion. Fiscal reforms, including introducing a value-added tax and reforming the customs service, have improved the government's ability to collect revenue.

In spite of these gains, Mozambique still depended on foreign assistance for 40 percent of its 2012 annual budget, and more than half the population remained below the poverty line.[7] In 2013, Mozambique's per capita income was US$593, less than one-third of the Sub-Saharan African average.[8]

Mozambique faces enormous challenges in improving social indicators. The country ranks 178th out of 187 countries in the United Nations Human Development Index in 2014. The adult literacy rate is 56 percent. Malaria remains the most common cause of death, responsible for 35 percent of child mortality. Progress has been limited in improving water and sanitation and alleviating hunger and malnutrition. However, in some other areas, Mozambique has made important progress. School enrollment rates and gender parity in enrollment, for instance, have increased dramatically over the past decade, while infant and maternal mortality rates have consistently declined.[9]

Since the country's independence, its development has been guided by a sequence of five-year development plans (*Planos Quinquenais de Desenvolvimento*). In 2002 the Government of Mozambique (GOM) initiated a series of reforms in all development sectors. The purpose was to start decentralization and bring management closer to the lower levels of state organization (provinces and districts). Within this context the health sector initiated its five-year strategic plans (*Plano Estratégico do Sector da Saúde,* or PESS) with the aim of gradually improving the health status of its people.[10]

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[6] Population Reference Bureau. 2014 World Population Data Sheet. www.prb.org/DataFinder/Geography/Data.aspx?loc=284

[7] Central Intelligence Agency. 2015. www.cia.gov/library/publications/the-world-factbook. Africa: Mozambique

[8] World Bank, 2014. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2014/11/13/000470435_20141113101213/Rendered/INDEX/902990PGD0P1460 10Box385366B00OUO090.txt

[9] World Bank. 2015. www.worldbank.org/en/country/mozambique/overview

[10] IHP+. Joint Assessment of the Mozambican Health Sector Strategic Plan (PESS, 2014–2019). www.internationalhealthpartnership.net/fileadmin/uploads/ihp/Documents/Country_Pages/Mozambique/JANS_English_Report_Final_with_Annexes _2013.pdf

For the 2013–2017 PESS, one of the most important and critical areas is ensuring access to medicines and medical products. Therefore, development of the strategic plan for pharmaceutical logistics (PELF) aims to support key reforms to the logistics of health care products for the public health system.[11]

1.2 Mozambique and the public health system

The Mozambican National Health System is financed through two main resources[12]: domestic funds from the state budget and external funds received from different mechanisms. These include the Common Fund, a basket fund where partners pool their resources, and various bilateral project support initiatives.

According to the World Health Organization (WHO) Global Health Expenditure database, public spending on health as a proportion of Mozambique's total health spending has decreased since 2005, after reaching about 14 percent of government spending in 2004. However, concurrently, donor allocations to health have substantially increased, particularly for HIV/AIDS under the President's Emergency Plan for AIDS Relief (PEPFAR).

Total health spending per capita increased from US$4.6 in 1997 to US$21 in 2010. The share of external resources as a proportion of total health spending surpassed 60 percent in 2008–2009. GOM is the main financial agent, managing around 72 percent of the resources to purchase/provide health care services. Other agents purchasing health care services include households (around 14 percent) and employers. While cost recovery accounts for about 1 percent of the health budget, out-of-pocket spending remains less than 30 percent of total health spending, according to 2010 statistics.[13]

1.3. HIV/AIDS in Mozambique

Despite Mozambique's remarkable progress in development since the end of the armed conflict, the HIV/AIDS pandemic is still a major threat; the country is ranked eighth in Africa, with a prevalence rate of 11.5 percent for adults aged 15 to 49.[14]

In 2004 the GOM vowed to provide equal access to antiretroviral therapy (ART), which at the time was limited to infected patients in the Maputo area. This initiative was expanded between 2008 and 2012 to provide ART to all provincial and district capitals and to key health centers in the country. By 2012, progress was significant: 308,578 people were on ART and 316 out of 1,400 public health facilities were providing ART.

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[11] Republic of Mozambique. *Central de Medicamentos e Artigos Médicos*. Strategic Plan for Pharmaceutical Logistics (PELF). 2012.
[12] World Health Organization. Country Cooperation Strategy at a Glance www.who.int/countryfocus/cooperation_strategy/ccsbrief_moz_en.pdf
[13] WHO Global Health Expenditure Database http://apps.who.int/nha/database/Home/Index/en
[14] UNAIDS Report on the Global AIDS Epidemic 2010.

Figure 1. ART density in Mozambique
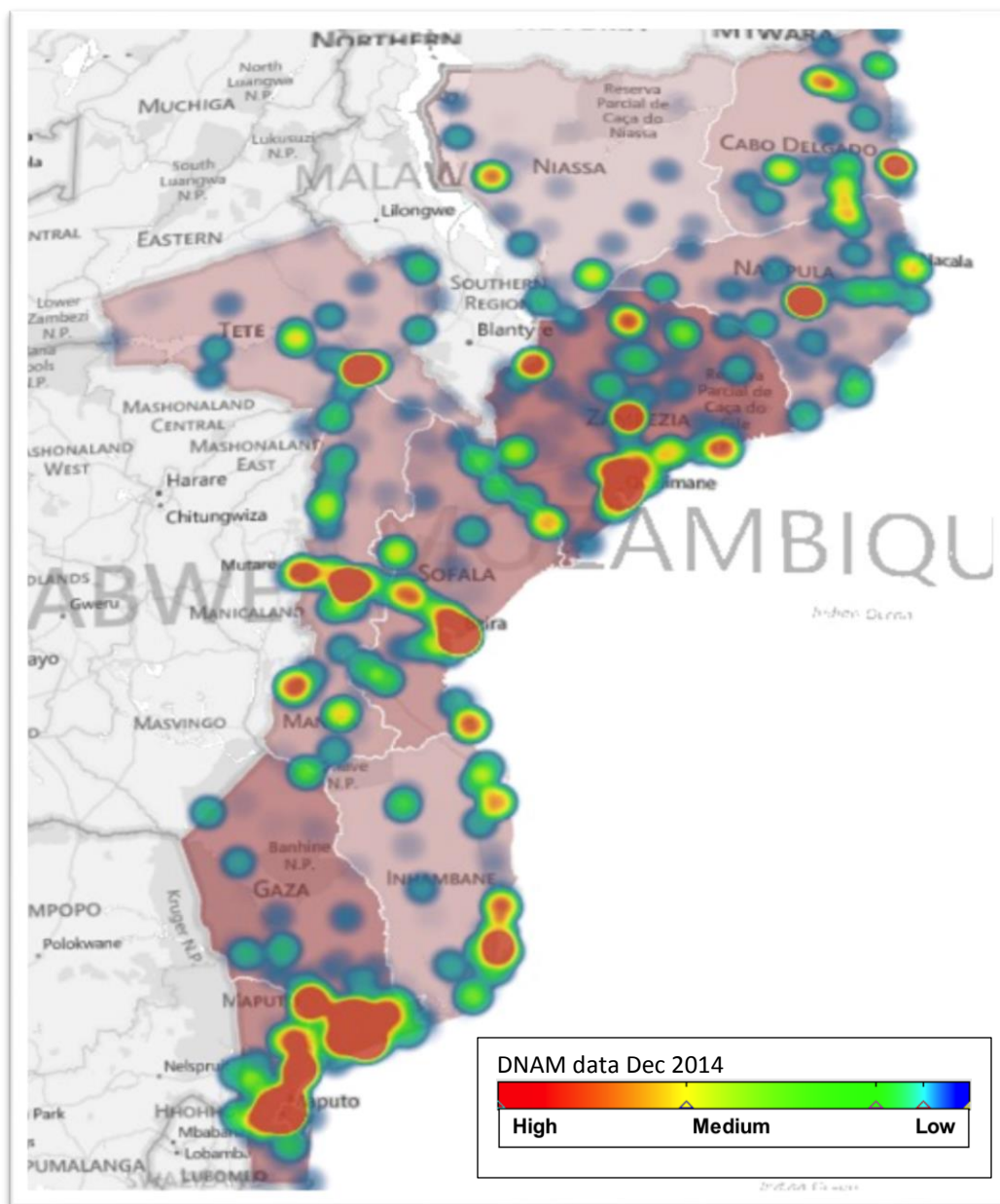
In 2011, Mozambique signed a key political and social commitment document to intensify efforts to eliminate HIV/AIDS and provide universal access to treatment by 2015.[15] Following this commitment, a technical working group (TWG) coordinated by the National STI/HIV/AIDS Control Program began drafting a concise plan of action to expand and scale up artemisinin combination therapies (ACTs) with key evidence-based interventions for HIV positive patients with malaria. The plan of action resulted in an ambitious acceleration plan to provide treatment to 80 percent of people who tested positive for HIV by the end of 2015. At the time of this assessment, the National Public Health

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[15] PEPFAR. Mozambique Operational Plan Report 2012.

System estimates ARTs to more than 640,000 patients, representing more than 64 percent of Mozambicans eligible for ART and moving fast toward the 2015 Global Health Initiative and GOM target to put 80 percent of all eligible HIV-infected patients on ART.[16]

The acceleration plan has represented an enormous challenge for the national supply chain. The plan has stretched logistics to the system's limits in reaching rural areas, ensuring warehousing infrastructure, providing timely and frequent transport of quantities of ART, having qualified pharmacy personnel to dispense and manage antiretrovirals (ARVs) and patients at all distribution centers and health facilities, ensuring a responsive LMIS and accurate stock records, and stocking sufficient quantities of HIV-related commodities needed for diagnosis and treatment.

ART hospitals, and most importantly, urban health centers were the first to begin providing ART services. Most opened before 2008 and account for more than 70 percent of services. Due to changes in international HIV/AIDS policies such as PEPFAR 3.0 and the WHO's 90/90/90 policies, funding must now focus on higher yield sites in an effort to reach epidemic control. Sites that are low yield will need to find alternative funding sources to maintain activities and ensure high quality services[17].

The system is now facing the ambitious task of having the HR and logistics needed for massive expansion. In the past two years, 439 new ART sites in health centers and health posts were opened but provide treatment to only 10 percent of patients. Most are staffed by maternal and child health nurses who provide treatment to pregnant women in Option B+.[18]

1.4 Mozambique's public health supply chain

Mozambique's public health supply chain system is centrally managed by two institutions: the Central Medical Store (CMAM) and the Supply Center (*Centro de Abastecimento,* or CA).

CMAM is responsible for the forecasting, procurement, warehousing, and distribution of medicines and medical supplies for the National Health Service. CMAM was recently elevated from a department within the Mozambique Ministry of Health (MISAU) to the level of a national directorate, providing significantly more visibility into supply chain operations and data. This is in line with recent reforms within MISAU and the 2013–2017 PELF.

As a whole, CMAM functions as MISAU's Logistics Management Unit (LMU) for health commodities. An LMU is a management structure that can be used to organize, monitor, and support all activities within the logistics system. Through the lens of continuous improvement, the LMU uses up-to-date data and identifies supply chain problems, develops solutions, and implements those interventions.

Unlike CMAM, the CA does not procure or determine the need for the equipment and nonmedical supplies that it stores and distributes. Procurement and commodity needs are assessed by the National Directorate of Medical Assistance (DNAM) or by national programs, such as the HIV/AIDS Program or the Central Laboratory Department. Once needs are assessed, MISAU's Acquisitions Execution

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[16] The United States Global Health Initiative. Mozambique Strategy 2011-2015. http://www.ghi.gov/wherewework/docs/mozambiquestrategy.pdf

[17] http://www.pepfar.gov/documents/organization/234744.pdf

[18] WHO Standard Treatment Guidelines 2013 – available at www….Under Option B+, all pregnant women living with HIV are offered lifelong ART, regardless of their CD4 count.

Management Unit, *Unidade Gestora e Executora das Aquisições,* procures them for CMAM, which is a unit of the Administration and Finance Board, or directly by the cooperating partners, such as SCMS and the Global Fund (GF).

At the provincial and district levels, CMAM and CA are replicated in the form of provincial stores and their district equivalents, although there is no binding hierarchy. In the *unidad sanitária (*health units that are patient-facing, not to include community health workers), regardless of size, there is also, in principle, a pharmacy (where drugs are dispensed to patients) and a depot, where medications and other health supplies are stored.[19]

Until 2007, the tender and procurement process for medicines was carried out by *Empresa Moçambicana de Importaçao e Exportaçao de Medicamentos* (MEDIMOC). Originally a state body, it has since been privatized, but the GOM still owns part of the organization. In 2008, procurement responsibilities were transferred from MEDIMOC to CMAM, but due to a lack of trained personnel, CMAM was not equipped to carry out this function.[20]

While the MISAU Therapeutic and Pharmacy Technical Board, *Comissão Técnica de Terapêutica e Farmácia* (CTTF), is in charge of selecting essential medicines, CMAM is responsible for their forecasting. The national programs, in particular those for HIV/AIDS, malaria, and tuberculosis, follow separate individualized processes to select the medicines and the auxiliary diagnostic tools they use with little or no coordination with the CTTF. Decisions on these programs are made at a central level with implementing partners. Since the EML has not been updated since 2009, numerous items procured at the central level are not on the list. Additionally, there are multiple pharmaceutical supply chains in Mozambique, further compounding the challenges of coordination efforts.

In 2011, CMAM developed the Pharmaceutical Logistics Management Plan (PLMP) in collaboration with SCMS. Before the PLMP could be implemented, CMAM determined the need for a strategic plan, or PELF. In 2014, the PELF was followed by the development and approval of an implementation plan. The PELF drew on ideas developed in the PLMP, and recommended, the following policy changes:

1. As a result of a study conducted by SCMS using Llamasoft's Supply Chain Guru™ software, consolidating 11 provincial and 148 district warehouses into one level of 30 intermediate-level facilities to optimize the supply chain system. Once the optimization is complete, these intermediate warehouses would then deliver product to 90 percent of the health units within one day's drive.

2. Vertically integrating the supply chain under the MISAU-CMAM by shifting the management of the intermediate level from the provincial level to CMAM.

3. Providing CMAM with financial and administrative autonomy.

4. Outsourcing CMAM's noncore functions, such as transportation.

5. Reforming the law to improve the efficiency of the procurement process for medicines.

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[19] Republic of Mozambique. *Central de Medicamentos e Artigos Médicos.* Strategic Plan for Pharmaceutical Logistics (PELF). 2012.
[20] Ibid.

1.4.1 Health commodity flow

Figure 2 depicts how health commodities flow through the current public health supply chain, starting from the top.

Figure 2. The Mozambique National Supply Chain
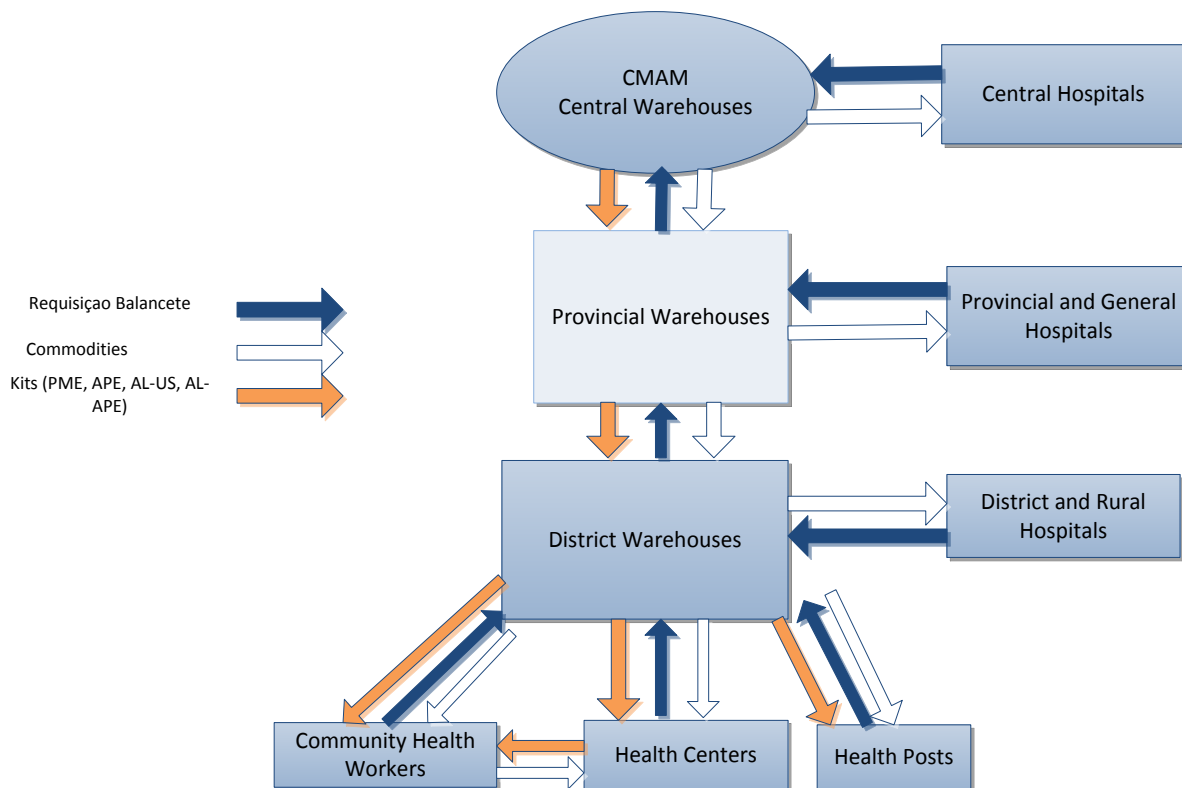
Note: Requisiçao Balancete is the Request Balance Sheet

The CMAM/central level is responsible for delivery from the central warehouses to 18 direct clients: 11 provincial warehouses and seven central and general hospitals. CMAM restocks provincial-level warehouses with essential medicines each quarter. Other alternative forms of transportation for ARVs and HIV rapid test kits are distributed monthly by a Coca-Cola Company transporter funded by the Clinton Health Access Initiative from provincial to district warehouses. This transporter also distributes these products to health facilities in some districts. The assessment, however, looks at the supply chain as a whole and does not separate funding and resource streams.

The provincial level (currently comprised of 10 provincial stores, plus Maputo City) is intended to deliver all products monthly to the district level warehouses (consisting of 142 stores).

The district level is intended to deliver health commodities monthly to health units (about 1,400 locations), which include district and rural hospitals, health centers, and health units. Community health care workers (*agentes polivalentes elementares*), of which there are more than 3,500, are resupplied from the district but will be resupplied from the health unit level once the PELF is implemented.

1.5 Mozambique and the SCMS and USAID | DELIVER PROJECT

Since 2006, John Snow, Inc., through SCMS and the USAID | DELIVER PROJECT, has been the lead US government partner supporting HIV-related and other essential health supply chain activities in Mozambique, particularly at the central level. SCMS and the USAID | DELIVER PROJECT have procured essential health medicines and supplies, including ARVs, laboratory commodities, contraceptives, condoms, and malaria commodities, at affordable prices; helped strengthen and build reliable, secure, and sustainable supply chain systems; worked to improve laboratory logistics; and fostered coordination of key stakeholders.

With the GOM, the projects have instituted quantification methodologies that strive to ensure the most efficient use of resources and uninterrupted supply, along warehouse management systems and SOPs that safeguard supplies in-country. Also, the projects have worked closely with CMAM to strengthen information systems that provide data for decision-making from 723 ART sites and ensure transparent supply chain-related communication between the provincial and central levels. Through coordination efforts by the projects' decentralized staff, and the organization of quarterly supply chain improvement meetings with provincial and district managers, availability, timeliness, and completeness of logistics data reporting have improved.

SCMS ensures a continuous supply of cluster of differentiation 4 (CD4), hematology, and biochemistry reagents for 170 instruments in 69 PEPFAR-supported laboratories throughout the country and is now establishing a similar supply network for four viral-load instruments.

The central, provincial, and district warehouses are currently receiving technical assistance through supply chain staff seconded through SCMS and other implementing partners. This support has an impact on the current capability maturity and performance of the supply chain. Along with providing technical assistance to strengthen the logistics systems and build MISAU staff capacity, partner staff also performs operational functions to cover CMAM staff shortages as well as a lack of supply chain knowledge and skills among existing staff. At the conclusion of SCMS support in 2016, and unless current staffing gaps are covered by additional MISAU staff, continuing partner support, or outsourcing of more supply chain functions, the risk is substantial that the gains achieved in capability maturity and performance will decline.

Table 1. Seconded supply chain staff

	Total staff (MISAU + partners)	MISAU	Partners			
			SCMS	Others	Total	Percent total staff
CMAM-Headquarters	86	57	21	8	29	34%
CMAM-Central Warehouse South (Adil Warehouse, Zimpeto Warehouse)	32	24	8	0	8	25%
CMAM-Central Warehouse Central (Beira Warehouse	21	20	1	0	1	5%
Provincial warehouses	142	125	6	11	17	12%
District warehouses	259	236	0	23	23	9%
Totals:	540	462	36	42	78	14.4%

2.0 Methodology

2.1 The National Supply Chain Assessment Toolkit

This assessment, conducted November 24 to December 5, 2014, used the NSCA toolkit, comprised of the CMM and country-specific KPIs, to determine whether operational functions are achieving expected outcomes and to develop an evidence-based roadmap for improvement. The assessment was achieved by using the following tools and activities:

- Half-day central-level workshops with CMAM, warehouse staff, and procurement and planning department staff to assess capability maturity of each CMM functional area as a group by using the scoring model. The workshops were facilitated by SCMS staff.

- Site visits completed by data collection teams, who administered surveys/questionnaires on the CMM and KPI tools at the central, district, and health facility levels of the public health supply chain.

2.1.1 Capability Maturity Model overview

A diagnostic tool, the CMM assesses the maturity of the capabilities of a supply chain at multiple levels—from the central level to service delivery points, and across operational functional areas and cross-cutting organizational elements, or enablers, such as HR, processes, and infrastructure. Scores are assigned for each capability in each functional area and aggregated and then averaged to understand the functional area as a whole, as well as the enabling elements that affect the functional area.

Figure 3. CMM functional areas and cross-cutting enablers
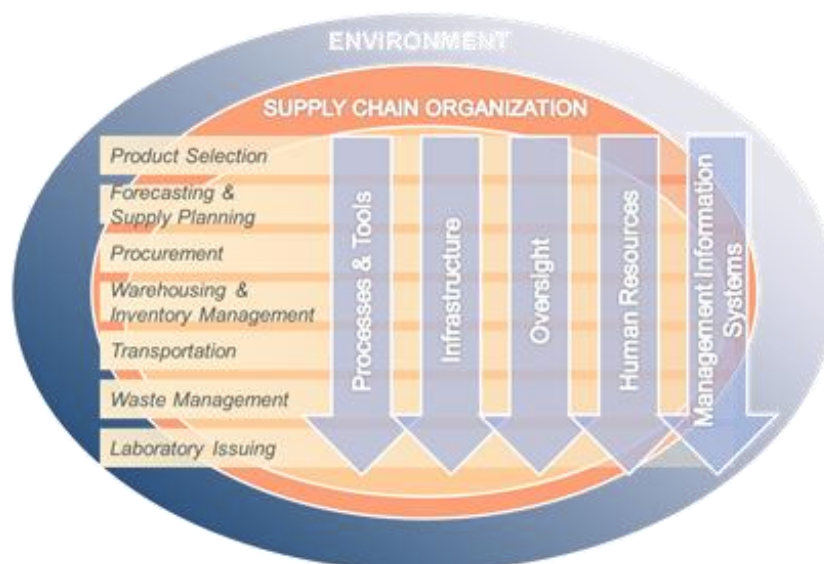
To assess capability maturity, key informant interviews guide data collectors through a series of functional area-specific questionnaires, including:

- Product selection

- Forecasting and supply planning

- Procurement

- Warehousing and inventory management

- Transportation

- Waste management

- Laboratory issuing

Each functional area includes a set of capabilities. These capabilities were selected through an in-depth and rigorous evaluation of supply chain best practices by TWGs consisting of supply experts. And, in turn, each capability (e.g., warehouse "checking") consists of processes that must be met before that particular maturity level can be satisfied. While a score of "1" is the lowest, and "5" the highest, in the "developing country-context," a score of "3" is considered adequate, where processes are well defined and technology is used to some degree. When scores are calculated, the scale of 1 to 5 is converted to a percentage scale between 20 and 100 percent for ease of reference (see Figure 4).

For example, when looking at the warehouse process of "checking," a score of "1," or 20 percent, indicates that orders are not checked, whereas a score of "5," or 100 percent, indicates best practices are in place, such as weighing product cartons to validate items picked.

Figure 4. Five levels of capability maturity

Minimal
Processes are informal and few or no systems are in place.

Marginal
Basic processes are not used consistently and systems are mostly manual.

Qualified
Processes are well defined and documented, and some technology is used.

Advanced Practices
Processes are well defined and technology is internally integrated.

Best Practices
Processes are continuously improved and technology is fully integrated.

1 or 20%   2 or 40%   3 or 60%   4 or 80%   5 or 100%

In Mozambique, the CMM tool was applied at the central, provincial, district, and health facility levels (see Figure 5 for a sample questionnaire).

Figure 5. Sample capability from CMM questionnaire

Level: Health Facility Functional Area: Warehousing and Distribution Enabler: Infrastructure Capability: Building Conditions		CMM 4c12
Interview	Direct observation	
Question: Is the main storage area intact?		
Follow-up questions: 1) Is the building structurally sound?		

1	2	3
☐ Storage areas have a roof and floor.	☐ Storage areas have a roof, floor, walls, and doors for storing product. ☐ Storage areas have a level floor with space for storage and receiving/dispatch. ☐ Storage areas have adequate lighting.	☐ Storage areas have a solid insulated roof, free of leaks. ☐ Storage areas have an impervious (e.g., concrete/cement) level floor with separate areas for storage and receiving/dispatch. ☐ Storage areas have adequate lighting.
General observations:		

2.1.2 Key performance indicators

The KPI review uses a set of key indicators to analyze and measure supply chain performance, which provide insight into supply chain efficiency and effectiveness. Analyzing the KPI data helps address the supply chain system's performance overall and within specific functional areas. From a standardized list recommended by SCMS, each country identifies the KPIs that will best measure performance. KPIs selected from this list are based on data availability, quality, feasibility, strategic priority, and whether the KPI will be useful for decision making. Application of the KPIs by site is dependent on those sites meeting a minimum set of criteria for their inclusion in the KPI sample size (Facilities sampled =sample size). Based on these criteria, the KPIs listed in Table 2 were collected for a list of key tracer products in Mozambique (listed in Table 3). KPI results can be found in section 3.0 of this report, as well as in Annex 6.

KPIs selected for Mozambique were collected at the central, provincial, district, and health facility levels using a variety of sources when available: stock data collection forms and facility information forms (not always available), direct observation, physical stock counts, and various stock-keeping records gained from the warehouse management system (MACS), National Laboratory for Medicines Quality Control (LNCQM) post-marketing survey, SIMAM, and paper-based stock-keeping records.

Table 2 includes the list of KPIs selected for Mozambique and their data sources.

Table 2. List of collected KPIs

Data sources**	KPI		System level	Data collection period
MACS and stock data collection form	Stockout rate (historical)	Percentage of tracers experiencing a stockout during the reporting period by tracer commodity	Central, provincial, district, and health facility	August 2014–October 2014
Stock data collection form and direct observation	Stockout rate (day of visit)	Percentage of tracers experiencing a stockout during day of visit by tracer commodity	Provincial, district, and health facility	Day of visit
Stock data collection form	Stocked according to plan	Percentage of tracer commodities stocked between established minimum and maximum levels	Central, provincial, district, and health facility	August 2014–October 2014
LNCQM post-marketing surveillance report	Quality testing rate	Percentage of product samples tested passing quality testing	Central and provincial	2014
CMAM annual stock-taking exercise	Stock accuracy	Percentage of product recorded on stock card as compared with physical inventory	Central	January 2015
Stock data collection form			Provincial, district, and health facility	Day of visit
Stock data collection form	Up-to-date* stock cards	Percentage of stock cards that were up-to-date over all stock cards	Provincial, district, and health facility	Day of visit
Expiry report	Expiry rate	Percentage of total stock expired in the reporting period (quantity)	Central	January–October 2014
Direct observation form	Acceptable storage capacity	Percentage of storage facilities at less than 80% storage capacity	Central, provincial, district, and health facility	Day of visit

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Data sources**	KPI		System level	Data collection period
LMIS stock accuracy	LMIS stock accuracy (up-to-date*)	Percentage of product recorded in SIMAM as compared with physical inventory	Provincial, district, and health facility	Day of visit
Stock data collection form	On-time and complete reporting rate	Percentage of LMIS reports submitted on-time and complete to the central level through SIMAM	Provincial	October–December 2014
Facility information form	Staff turnover rate	Percentage of key supply chain staff who vacated their position during the reporting period	Central, provincial, district, and health facility	November 2013 - November 2014
Facility information form	Human resource capacity development	Percentage of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training	Central, provincial, district, and health facility	November 2013 – November 2014

* Up-to-date is defined as stock cards that have been completed up to the date of data collection and that have the most recent receipt or dispersal recorded.

** Data sources are the NSCA data collection tools used for that respective KPI.

2.1.3 The relationship between the CMM and KPIs

The relationship between the CMM and KPIs is a proposed correlation between capability maturity and supply chain system performance. As capability maturity improves, performance should also improve. However, some supply chains are found to have low maturity and high performance, while others have high maturity and low performance. The comparison between CMM and KPI allows for identifying false positives, which can occur when viewing CMM or KPI scores only in isolation. As a result, system-strengthening activities can be focused on addressing weak areas identified either in the KPIs or the CMM. With repeat application, the impact of system strengthening efforts can be identified when comparing the scores between this NSCA and a future NSCA or future application of the KPIs.

The assessment includes two tools, described above and shown in Figure 6:

- **The CMM diagnostic tool**, a quantitative tool which scores qualitative data that assesses supply chain capability maturity, as shown in Figure 5.

- **The supply chain KPI assessment**, a set of indicators that comprehensively measure health supply chain performance

The figure below shows data from both tools. This data can be used to identify anomalies in the performance and capabilities or to identify areas most in need of support. The purpose of this figure is not meant to identify causal relationships but to be used a tool for further investigation.

Figure 6. Capability maturity and performance comparison
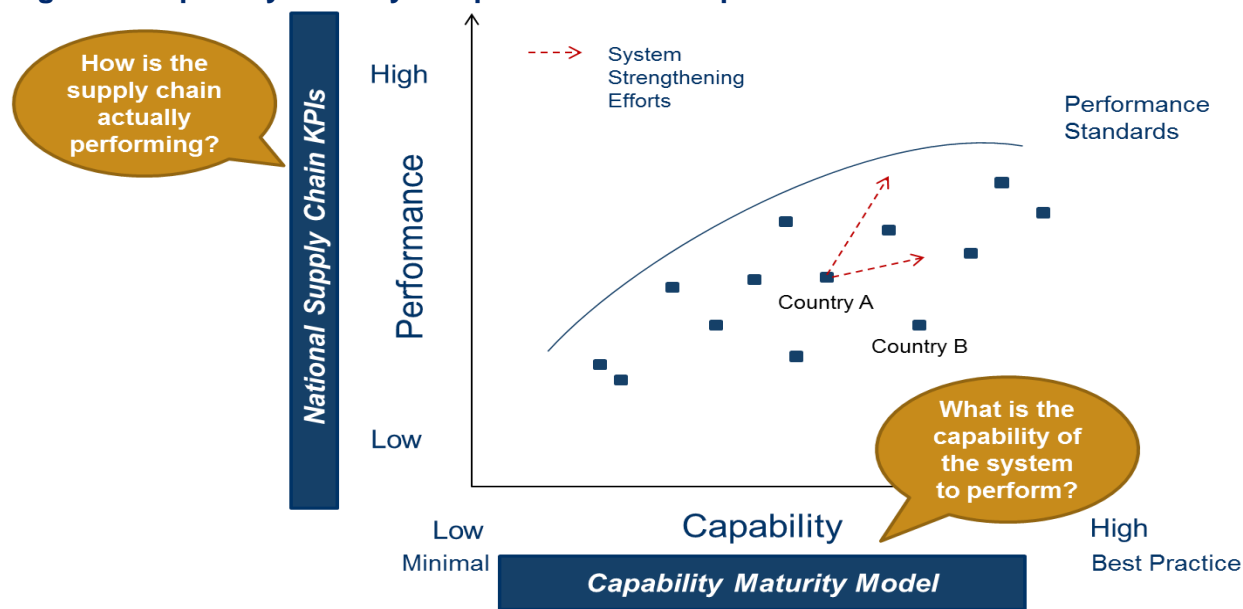
2.2 Assessment scope

2.2.1 Tracer commodity selection

After reviewing several lists of HIV/AIDS and malaria products, essential medicines, and family planning methods, project staff prepared a list with 32 priority commodities for use within the KPI questionnaires (see Table 3).

 Selection criteria included whether the product was likely managed by the public health supply chain and whether it was monitored by the projects as part of end-use verification activities. Tuberculosis (TB) commodities were included at the request of the Centers for Disease Control and Prevention. (The full tracer commodity list is also available in Annex 1.)

Also, the assessment teams leveraged the site visits to collect historical data, in addition to day of visit data, for a subset of eight tracer commodities. Historical data collection for these eight commodities was collected by SCMS each month from August to October 2014. The historical period of August–October 2014 was selected to reflect the most recent three-month period before the assessment data collection. These eight commodities are included in the 32 priority commodities and are the last eight items listed in Table 3.

Table 3. Tracer list

Products	Product type	Time frame
Misoprostol 200 μg, tabs	Essential medicine	Day of visit
Oxytocin, 5UI/mil, ampule	Essential medicine	Day of visit
Magnesium sulfate 10% 100mg/ml, ampule of 40ml	Essential medicine	Day of visit
Intra-uterine device (IUD), piece	Family planning	Day of visit
Male condoms, piece	Family planning	Day of visit
Microlut, carteira pack	Family planning	Day of visit
Levonorgestrel 150/Ethinylestradiol 300MCG (Microgynon), carteira pack of 28 tabs	Family planning	Day of visit
Paracetamol 500 mg tabs	Essential medicine	Day of visit
Paracetamol susp. 1g, bottle of 100 mls	Essential medicine	Day of visit
Amoxicillin 500mg, capsule	Essential medicine	Day of visit
Amoxicillin 250/5ml., powder for oral suspension, 100ml vial	Essential medicine	Day of visit
Ampicillin 500 mg, vial for injection	Essential medicine	Day of visit
Cotrimoxazole 480mg, tabs	Essential medicine	Day of visit
Cotrimoxazole 240mg/5ml suspension, bottle	Essential medicine	Day of visit
Rifampicine 150mg, Isoniazide 75mg, Pyrazinamide 400mg, Ethambutol 275mg (4DFC), carteira pack	Tuberculosis	Day of visit
Artemether/lumefantrine (AL) 1x6, carteira pack of 6 tabs	Malaria	Day of visit
AL 3x6, carteira pack of 18 tabs	Malaria	Day of visit
AL 2x6, carteira pack of 12 tabs	Malaria	Day of visit
Artesunate 60mg, vial for injection	Malaria	Day of visit
Quinine300 mg tabs	Malaria	Day of visit
Quinine 600mg/2ml inj. Ampoules	Malaria	Day of visit
Sulfadoxine + Pyremethamine (SP) 500mg+25mg, tabs	Malaria	Day of visit
Zinc, 20 mg, tabs, box of 10 blisters of 10 tablets	Essential medicine	Day of visit
UNIGOLD® HIV-1/2, test	HIV test	Day of visit
Medroxiprogest-erone acetate (Depo-Provera®) 150mg/1ml, vial	Family planning	Day of visit, August–October 2014
AL 4x6, carteira of 24 tabs	Malaria	Day of visit, August–October 2014
Nevirapine 200mg, capsule, bottle of 60 capsules	ARVs	Day of visit, August–October 2014
Malaria rapid testing device, test	Malaria test	Day of visit, August–October 2014
Determine® HIV -1/2, test	HIV test	Day of visit, August–October 2014
Lamivudine (3TC) + Zidovudine (AZT) + Nevirapine (NVP) 150/300/200mg, tabs	ARVs	Day of visit, August–October 2014
Lamivodine (3TC) + Nevirapine (NVP) + Zidovudine (AZT), 30/50/60mg, tabs	ARVs	Day of visit, August–October 2014
Tenofovir (TDF)+ Lamivudine (3TC) + Efavirenz (EFV) 300/300/600mg, tabs	ARVs	Day of visit, August 2–October 2014

2.2.2 Sampling methodology and site selection

As a starting point, to balance the need for accurate results while minimizing data collection costs, a 90 percent confidence interval was used, with a ±10 percent margin of error. The sampling methodology was constrained because the number of sites that could be visited during the evaluation period was limited by 1) a two-week data collection period and 2) a shortage of data collectors with fluency in the local language, familiarity with Mozambique's supply chain, and experience in data collection and survey administration.

With these parameters, Raosoft[21] was used to calculate a statistically significant sample size at the district warehouse and health facility levels. Because the central-level has only three sites and the provincial-level has only 11, all sites at these levels were included in the sample (see Table 4). A stratified purposeful sampling technique was then used within each of the 11 provinces, whereby stratified district and health-unit-level samples were randomly selected from within each province.

Within each of the 11 provinces, two districts were randomly selected. Despite the requirement that 44 district warehouses be in the sample to achieve statistical significance, given time and resource constraints, only 22 district warehouses were included in the sample. Within the district-level sampling a potential "design effect[22]" has been accepted as necessary based on assessment constraints. This sampling methodology was chosen to reflect the composition of the supply chain in Mozambique and to allow data collectors to follow product through the supply chain levels.

Within each district, three health facilities were also randomly selected, for an initial total of 66 health facilities. However, due to efficient use of time, four additional randomly selected health facilities were added to the sample. So the sample increased to 70 for the health unit level.

Table 4. Site sample breakdown

Supply chain level	No. of sites within supply chain level	Sample size	Actual no. of sites visited
Central warehouse	3[23]	3	3
Provincial warehouse	11	10	11
District warehouse	148	44	22
Unidad sanitária (health unit)	1,425	66	70
Total	**1,587**	**123**	**106**

Figure 7 shows the nationwide reach of the selected sites.

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[21] www.raosoft.com/samplesize.html

[22] Design effect: "The loss of effectiveness by the use of cluster sampling, instead of simple random sampling, is the design effect. The design effect is basically the ratio of the actual variance, under the sampling method actually used, to the variance computed under the assumption of simple random sampling".(US Census Bureau. Technical Paper 63: Current Population Survey - Design and Methodology,

<http://www.bls.census.gov/cps/tp/tp63.htm> accessed 12 January, 2001. Page 14-8.) (Frongillo, EA. StatNews #12: Analysis of Complex Surveys. October 22, 1996. Cornell University, Office of Statistical Consulting. College of Human Ecology and Agricultural and Life Sciences, Division of Nutritional Sciences.

http://www.human.cornell.edu/Admin/StatCons/StatNews/stnews12.htm) (Henry, GT. Practical Sampling. Sage Publications, 1990. Applied social research methods series, volume 21)

[23]At the time of the assessment there were three central warehouses. After completion of the assessment and before publication, another central warehouse was added. This document refers only to the original three warehouses.

Due to the inclusion criteria, some KPIs and CMM scores did not achieve 90 percent confidence. The changing denominators listed in the KPI results table make this evident. However, the lack of data is seen as a powerful statement about the environment in which the data was collected.

Figure 7. Sites visited for data collection
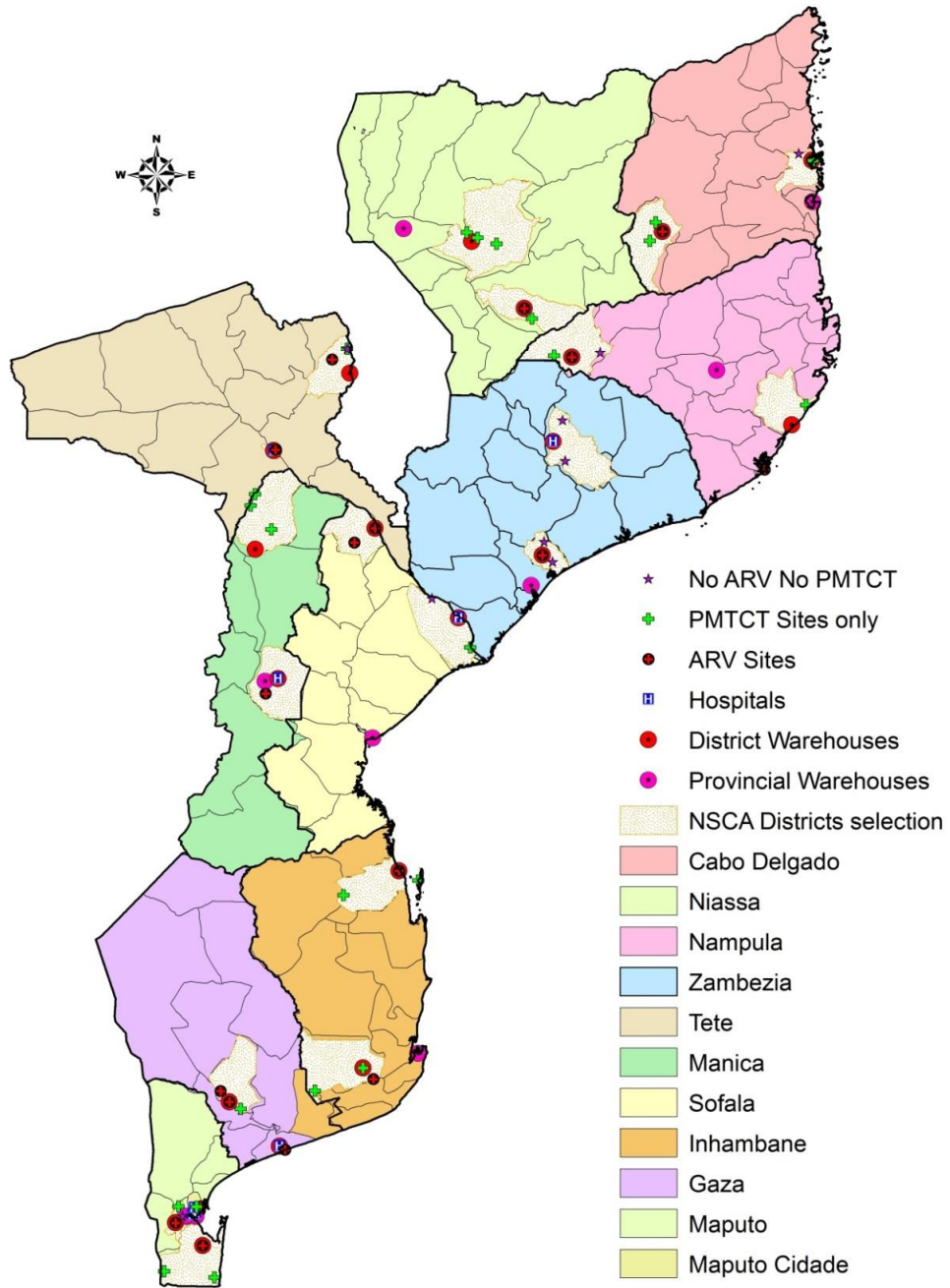
2.3 Training and data collection

2.3.1 Data collection teams

The NSCA was conducted by 11 data collection teams of at least two members, composed of CMAM staff and MISAU provincial-level staff, plus one SCMS and USAID | DELIVER PROJECT staff member.

2.3.2 Tablet

The projects used mobile technology for the first time to complete parts of the CMM and all of the KPI data collection phase of the Mozambique NSCA. Data was collected using Samsung Galaxy 3 tablets and SurveyCTO data collection software, an open-source platform. After collecting data at each site, the data collection teams sent in their results daily through Wi-Fi or Third Generation network connections, when available.

Image 1. Samsung Galaxy 3 tablet
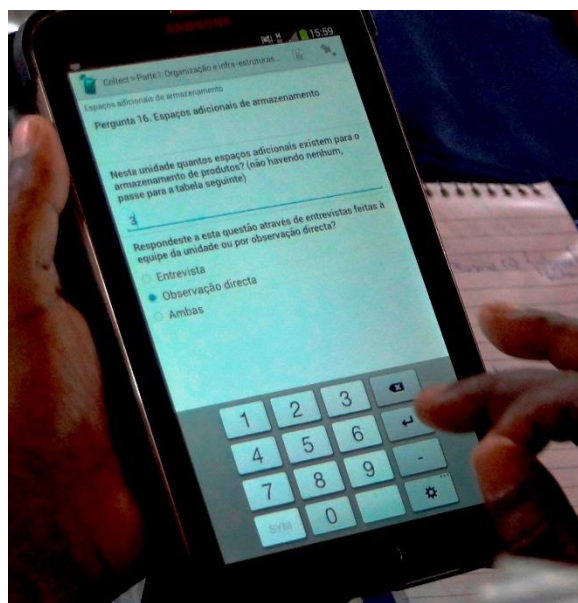
The use of mobile technology and automation of data collection offered several benefits. It enabled the evaluation team, consisting of two Washington, DC-based project employees, to conduct daily data quality checks, follow up with data collectors, and automatically aggregate data from the 11 data collection teams. It also decreased level of effort for data collectors who were able to directly enter data into the tablets at the time of the site visit, reduced the time needed for data cleaning and analysis, and increased data quality.

2.3.3 Training

All data collectors completed a one-week training November 17–21, 2014, that covered the evaluation tools, scoring methodology, interview techniques, and use of tablets for data collection. On the third day of the training, data collectors were assigned to one of six teams that travelled to six sites (one provincial warehouse and five health units) to pilot test the evaluation tools and tablets. The following day, the teams met again in Maputo to provide feedback that was used to troubleshoot and improve interview and tablet-use techniques.

2.3.4 Data collection

Central-level CMM questionnaires for 1) product selection, 2) forecasting and supply planning, 3) procurement, 4) warehousing and inventory management, and 5) transportation were completed during five separate workshops with the key CMAM staff responsible for each functional area. This methodology was used at the central level and served to create buy-in and ownership of the process and results. Ideally, future assessments will conduct initial site-level interviews at all levels.

During each workshop, relevant CMAM staff met with an SCMS technical expert to review the CMM questionnaire, understand the scoring methodology, and collectively determine the maturity of the functional area. SCMS staff members participating in these workshops had received training on how to avoid leading questions and allow participants to analyze each question and brainstorm appropriate answers.

If participants seemed not to understand a question, missed its emphasis, or could not agree on a score, the SCMS staff person would make neutral comments or ask follow-up questions, such as "anything else?," "any other reason?," and "could you tell us more about your thinking on the subject?," to achieve group consensus on a score. Scores assigned by the group were found to be higher than scores later assigned by data collectors during site visits. This scoring difference may reflect a difference in tool application, and possibly show the upward bias resulting from the implementation of the CMM in a large group. Ultimately, the group's collective decisions are the scores represented in this assessment.

At the provincial, district, and health unit levels, data collectors interviewed key informants (warehouse managers, pharmacists, MISAU, personnel, etc.). The intermediate- and health unit-level questionnaires for warehousing and inventory management and transportation were completed at the provincial and district warehouses and health facilities during site visits using key informant interviews.

Eleven teams were each responsible for collecting data at nine sites within a province: one provincial warehouse, two district warehouses, and six health facilities. One staff person from either the provincial health director's office or from the provincial warehouse accompanied each team. The participation of provincial level staff in the data collection teams ensured access to key informants and data sources as well as ownership of and buy-in into NSCA results.

The evaluation team maintained an aggregate spreadsheet, updated daily during the NSCA, for all data collected at the projects' field office. This enabled SCMS staff to review and clean the data daily to prepare for analysis. If issues were identified, SCMS staff contacted the data collectors for clarification. SCMS staff in Washington and in Mozambique conducted the data analysis during the data collection period through early February 2015.

Analysis was conducted using MS Excel and MS Access-based tools. Data was quality checked throughout the assessment to identify any data quality issues or anomalies such as incorrect data entry or an outlier score. Issues identified were addressed during the assessment to allow for timely correction when possible.

2.4 Methodology reliability and validity challenges

2.4.1 Sampling methodology

Although the district-level sample size generated by Raosoft® was 44, the assessment design created constraints in sampling all recommended data collection sites (warehouses, health units, etc.). The sample size was limited by the number of sites that could be visited during the assessment period due to the size of the data collection teams, and the timeframe of two weeks to conduct all key informant interviews. It was therefore determined that 22 districts could be visited, and a random cluster sample was conducted. Once the districts were identified, health unit sites were randomly selected within those districts in order to effectively follow the supply chain through the system. The inherent weakness in the reduced sample size is that the assessment outputs are not nationally representative. However, the sites randomly selected do represent the districts identified in this assessment.

Furthermore, sites that did not have the documentation or other criteria needed to provide an accurate KPI were not included in the sample size for that respective indicator. This exclusion created issues in statistical significance but ensured that the methodology was consistent. Each KPI sample size is a subset of the overall sample size based on data availability and quality. In-depth assessments of processes and data quality are recommended for areas with statistically insignificant sample sizes. The data presented are representative of the sites visited but not the national system.

A full list of KPI sample sizes and the filters used to determine the number of facilities is provided in Annex 6.

2.4.2 CMM methodology applied at the central level

The methodology applied at the central level for capturing CMM data was a workshop with key informants. This decision was based on the familiarity with the logistics system assessment tool (LSAT) methodology, a USAID | DELIVER developed tool and the desire to use something similar. The purpose of the workshop was to build buy-in among key stakeholders around the methodology of the tool and gain acceptance of the outputs of that tool. However, this methodology inherently leads to limitations in perceived data quality due to the inclusion of self-reporting bias. Although a supply chain expert reviewed the scores and corresponding justifications, the original group scores, determined at the workshop, are the results used in this assessment even in areas where the supply chain expert may have felt that the scores were artificially high.

2.4.3 Areas of potential bias for both the CMM and KPI results

Potential areas of bias are found based on the methodologies used and the realities of the supply chain system in Mozambique:

1. The tool lacks the sensitivity to account for embedded staff and the potential impact on the overall score.

2. The CMM tool for HR is limited by the number of capabilities used to determine system maturity. The KPIs add greater context here, but because key supply chain staff roles have not been consistently identified nationwide, the HR KPI is hampered by subjectivity. For instance, key roles were determined solely by the key informants' understanding of those roles within their facilities.

3. Assessment teams were not allowed access to procurement records and therefore could not validate procurement performance. Lack of procurement data limited generation of KPIs for Product Select, Forecasting and Supply Planning, and Procurement functions of the supply chain. Therefore we do not have a fully understanding of the performance of the supply chain processes in these sections.

4. The quality-testing sample size is statistically insignificant for national quality. The percentages of samples tested were a portion of all samples taken, leading to even greater issues with the sample significance. This data was not collected by the assessment team, but was provided by LNCQM post marketing surveillance report.

3.0 Data Analysis and Results

3.1 Overview of CMM and KPI Scores

The NSCA toolkit evaluates a supply chain in its present state. Consequently, it is infeasible to disassociate any external support provided by partner and donor organizations from the maturity of the capability and performance of governmental and/or local organizations in a given country.

Mozambique is no exception. Currently, the country's supply chain receives significant external support through funding, technical assistance, and seconded staff in key supply chain positions, an important consideration in reviewing the CMM and KPI scores presented in this report.

Of particular concern is the fact that two of the largest projects supporting Mozambique's supply chain, SCMS and the USAID | DELIVER PROJECT, will conclude in 2016. Discontinuation of support could have a significant impact on Mozambique's supply chain performance and maturity, if various technical assistance provided by SCMS and DELIVER are not provided by other stakeholders and the Mozambican government. Thereby, risk statements have been included at the end of each technical section, to note areas where capacity and performance is expected to decrease if inadequate technical assistance is not provided.

3.1.1 CMM scores

A "high-level" national supply chain maturity score can be calculated by averaging functional area scores across all supply chain levels. In this instance, scores for production selection, forecasting and supply planning (FASP), procurement, warehousing and inventory management, and transportation were averaged across Mozambique's central, provincial, district, and health facility levels, resulting in a score of 55.1 percent.

Table 5. National supply chain capacity, CMM from central-level self-assessment* and lower-level assessment

CMM scores	
Functional area	**CMM score**
Overarching	55.1%
Product selection	70.0%*
FASP	63.5%*
Procurement	64.8%*
Warehousing and inventory management	37.9%
Transportation	39.5%
National Level Enablers	
Management information	53.6%
HR	60.1%

*Collected at the central level only

As a point of reference, a score of 20 percent is the lowest-possible CMM score, and 100 percent is the highest. However, in a "developing" country context a score of 60 percent is considered to be adequate, where processes are well-defined and technology is used to some degree. Thus, a score of 55.1 percent indicates that Mozambique's supply chain has basic processes in place, albeit used inconsistently, and technology is not fully used throughout the system. Therefore, when SCMS and USAID | DELIVER PROJECT end, the scores represented in this document are expected to decrease quickly without continuous, equivalent, and seamless donor support.

Scores are calculated by averaging all individual scores across all enablers within a functional area. The national level enablers, Management Information and HR, are included in the above table for ease of comparison with their corresponding KPIs.

3.1.2 KPI scores

Three key KPIs are used to gauge a supply chain's aggregate performance. These primary outcome indicators are:

1. Historical stockout rate: the percentage of tracers experiencing a stockout during the reporting period by tracer commodity

2. Day-of-visit stockout rate: the percentage of tracers experiencing a stockout during day of visit by tracer commodity

3. Stocked according to plan: the percentage of tracer commodities stocked between established minimum and maximum levels

Tables 5 and 6 provide a summary of results for the Mozambique assessment, while Figure 8 compares supply chain capability and performance. The results of the key functional area CMM scores and KPI scores are discussed in detail in the pages that follow. The data in Table 5 and 6 are inclusive of the supply chain support that SCMS, Global Fund, and other donors provide to the supply chain as of the date when this assessment took place.

Best-practice models are outlined for each enabler—processes and tools, infrastructure, strategic planning and oversight, management information system (MIS), and HR. Best practices are shown next to a description of the findings in Mozambique. Challenges are highlighted followed by short-, medium-, and long-term recommendations.

Table 6. National Supply Chain Assessment, KPIs (quantitative data)

KPI scores	
Stockout rate (historical), central level	51.7% (Facilities sampled =3, CMAM)
Stockout rate (historical), provincial, district, and health facility levels	17.0% (Facilities sampled =103)
Stockout rate (day of visit), provincial, district, and health facility levels	22.0% (Facilities sampled =103)
Stocked according to plan (day of visit), central level	13.9% (Facilities sampled =3, CMAM)
Stocked according to plan (day of visit), provincial, district, and health facility levels	19.5% (Facilities sampled =20)[24]
Quality testing rate, central and provincial levels	85.6%, please note only 62.9% of samples were tested (Number of tests =514)
Up-to-date stock cards, provincial, district, and health facility levels	61.7% (Facilities sampled =103)
Stock accuracy, central level	66.2% (Facilities sampled =3)
Stock accuracy, provincial, district, and health facility levels	57.2% (Facilities sampled =103)
Expiry rate, central level	0.4% (Facilities sampled =3, CMAM)
Acceptable storage capacity	34.0% (Facilities sampled =106)
LMIS stock accuracy	85.3% (Facilities sampled =26)[25]
On-time and complete reporting rate, provincial level	63.6% (Facilities sampled =11)
Staff turnover rate	18.5% (Facilities sampled =106)
Supply chain staff trained in the SOPs Manual, 3rd edition	45.3% (Facilities sampled =106)
Facilities with at least one staff member trained in the SOPs Manual, 3rd edition	70.8% (Facilities sampled =106)

* Up-to-date is defined as stock cards completed up to the date of data collection and that have recorded the most recent receipt of dispersal.

* Sample size parameters are explained in Annex 6.

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[24] Only 20 facilities reported having maximum and minimum stock levels established at these levels.
[25] Only 26 sites had functioning LMIS.

The CMM scores for product selection, FASP, and procurement are central level only, as these supply chain functions are conducted only at the central level. The CMM scores for warehousing and inventory management and transportation are an average of all sites at the central, provincial, district, and health facility levels, where each site carries the same weight. The central-level CMM data was collected during meetings convening key stakeholders, where scores were determined as a group. The CMM scores collected for the provincial, district, and health facility levels were assigned by data collectors in key informant interviews during site visits. Scores that were assigned by the group were found to be higher than scores assigned by data collectors during site visits, possibly indicating a self-reporting upward social desirability bias[26] that implementing the CMM in a large group can produce. Ultimately, the collective decisions by the group are the scores represented in this assessment.

Tracer products and historical data (August through October 2014) periods used for central and lower levels are slightly different due to data availability. As the information system used keeps track of data only by quarter and not monthly, and as the three-month period before the assessment did not correspond to a calendar quarter, project staff had to use performance management plan (PMP) data from two consecutive quarters to ensure that the entire period of the assessment was covered.

The historical stockout rate of 51.7 percent at the central level was taken from the warehouse management system MACS and is comprised of 32 tracers over six months. On the other hand, the historical stockout rate for the provincial, district, and health facility levels corresponds to eight of these 32 tracers and for a three-month period. This means that there were more opportunities for stockouts at the central level when compared with the historical stockout rate of 17 percent at the provincial, district, and health facility levels. Although it would have been ideal to use 32 tracer products at all levels, time constraints and resources allowed only for the comparable data of eight tracer commodities at levels below the central warehouses.

While the historical stockout rate is based on stock cards, the day-of-visit stockout rate of 22 percent for the provincial, district, and health facility levels is based on the physical stock count, and is thus much higher and more comprehensive. On the day of visit, only 82.3 percent of the tracers had stock cards and only 75 percent of those stock cards were up to date. When comparing the percentage of stock cards that were up to date against the total managed tracers, up-to date stock card performance drops to 61.7 percent.

When comparing the up-to-date stock cards with the day-of-visit stock count, stock card accuracy is 92.6 percent. This means that when stock cards are used, they are being used correctly. However, when comparing the total managed tracers with up-to-date and accurate stock cards, performance drops to 57.2 percent. This means that only 57.2 percent of critical tracer products are being managed using up-to-date and accurate stock cards. Lastly, when comparing the physical stock count at the central level with the MACS system stock accuracy was 66.2 percent.

As would be expected, SIMAM utilization is concentrated at the higher levels of the system with only 26 (11 provincial warehouses, 14 district warehouses, and 1 health unit) facilities reporting use. When comparing the physical count and the stock balance recorded in SIMAM the performance was 85.3%.

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[26] Social desirability bias: "Social desirability is the tendency of some respondents to report an answer in a way they deem to be more socially acceptable than would be their "true" answer. They do this to project a favorable image of themselves and to avoid receiving negative evaluations. The outcome of the strategy is over reporting of socially desirable behaviors or attitudes and underreporting of socially undesirable behaviors or attitudes. Social desirability is classified as one of the respondent-related sources of error (bias)".< http://srmo.sagepub.com/view/encyclopedia-of-survey-research-methods/n537.xml >

As the sample was limited, confidence in the applicability of this indicator beyond the provincial level should be limited.

3.2 Comparison of supply chain performance and maturity

The interplay between performance and maturity is depicted in Figure 8. a score of 60 percent is considered to be qualified to function satisfactorily where processes are standardized and technology is beginning to be introduced. Likewise, 80 percent is considered to be functioning satisfactorily in performance.

Figure 8. Comparison of supply chain capability and performance

Supply Chain Capability and Performance
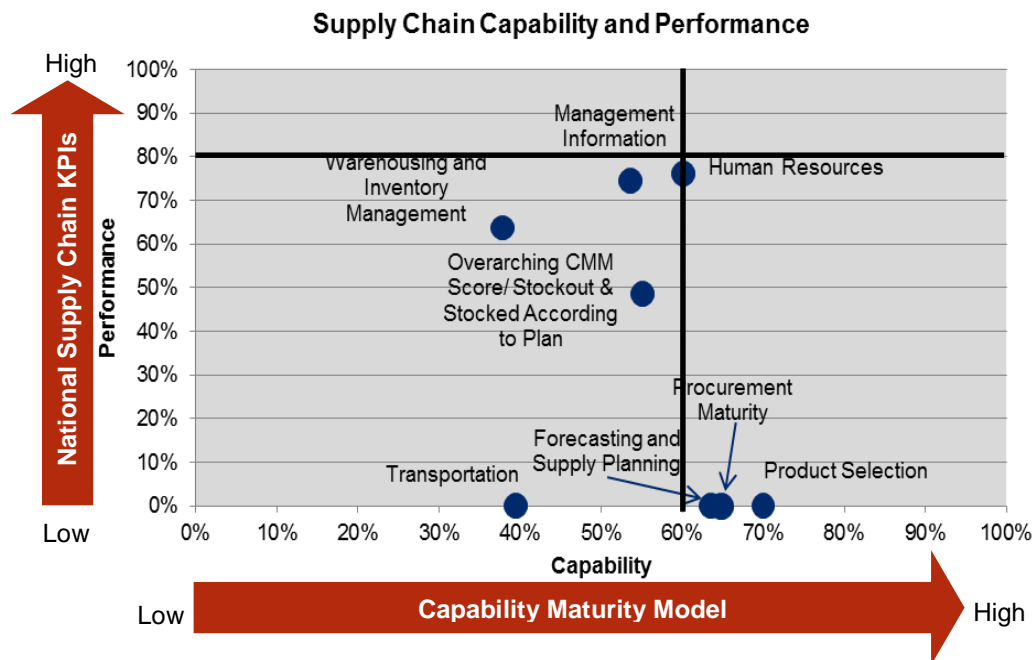
3.2.1 Comparison of supply chain performance and maturity across supply chain levels

The maturity of the overall supply chain system is 55.1 percent. If we look at each system level, the maturity of the central level is closer to 60 percent. If we look at each system level, the maturity of the central level is closer to 60 percent. As shown in the costing study conducted as part of the PELF[27], maturity drops significantly at the provincial, district, and health facility level which are less supported by the MISAU and projects.[28] The national CMM scores described in Table 5 are broken down across all supply chain levels in Table 7. Note that the central level was self-evaluated while the provincial to health facility levels were assessed by the central level.

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[27] Costing study. Pharmaceutical Logistics Strategic Plan (PELF). 2014.
[28] Costing study. Pharmaceutical Logistics Strategic Plan (PELF). 2014.

Table 7. CMM scores by supply chain level

Functional area	Central	Provincial	District	Health facility
Product selection	70.0%*			
Forecasting and supply planning	63.5%*			
Procurement maturity	64.8%*			
Warehousing and inventory management	67.6%*	51.2%*	41.5%	12.3%
Transportation	49.1%*	43.2%	37.1%	

*Central Facilities sampled =1, provincial Facilities sampled =11, district Facilities sampled =22, and health facility Facilities sampled =70

* Red typeface indicates poor maturity with a score of less than 60 percent.

The warehousing and inventory management function shows a steady decline in maturity as we move from the central level down to the health facilities. Transportation appears to be consistently immature across all applicable levels of the supply chain.

3.3 Product selection

Product selection: CMM scores	
Capability maturity score Note that the product selection questionnaire was completed during a workshop with CMAM, where capabilities were scored as a group to build understanding around the tool, scoring, and capability maturity.	**70.0%**
KPIs	
Product selection The NEML is outdated and no longer relevant to compare with current procurement practices.	NA

Table 8. Product selection capability by enabler

Product selection	Average	Percentage
Process and tools	4.00	80.0%
Oversight	3.00	60.0%

Product selection: Enablers and observations		
Product selection	Product selection is a critical process that aligns STGs with products procured. This should be a flexible process that can be easily adapted as treatment protocols or patient demand change.	
Enabler	**Best practice**	**Observations in Mozambique**
Process and tools **CMM score: 80.0%**	Key components supporting effective product selection activities include an NEML and government-approved STGs, which actively drive cost-effective treatment, procurement, and related SCM decisions. The NEML is aligned with STGs. The NEML is systematically reviewed by a national formulary group, and STGs by a national guidelines committee (subcommittees of the national drug and therapeutics committee). Guideline updates are officially disseminated to all program stakeholders, including supply chain managers.	**National Essential Medicines List** • Updated in 2009, published and disseminated in 2010, and currently being updated. No updates, additions, or reviews were made to this list since the first edition. **National STGs** • Exist for key public health programs and diseases. HIV/AIDS, TB, and malaria are periodically reviewed (3–5 years).

Strategic planning and oversight	An oversight board or committee manages adherence to STGs. The NEML is essential to inform appropriate product selection planning.	**NEML and STGs** • Are used to inform the product selection for the essential drugs, to include essential medicines, ARVs, TB, etc.
CMM score: 60.0%	The development and execution of priority program strategies (e.g., for the National Malaria Control Program, National AIDS Program, or National Tuberculosis Program) are key components of procurement planning, and therefore product selection, for the specified programs. Each health program strategy includes strategies for the near, medium and long term (five or more years). Each program strategy includes a methodology to monitor and evaluate progress toward achieving program goals.	**Pharmacovigilance** • Mozambique is developing a pharmacovigilance system. **Quality control testing** • Mozambique has a National Laboratory for Drug Quality Control **Supplier pre-registration** • National Drug Regulatory Authority (NDRA) has a drug and health products registration policy that is operational. • CMAM is implementing a pre-registration and pre-qualification policy for suppliers.

Risk statement:

The projects are not involved in product selection so this area does not represent a current risk. The departure of both projects will not impact product selection. While product selection indicates a higher maturity, KPI data was not available for comparison. For further evaluation, access to procurement data is necessary.

Key Challenges and Recommendations

Description of key challenge

• The NEML edition was developed and published in 2010. Most products remain current and aligned with the most recent update of the WHO EML, but with an aging EML, some critical items are missing and some products are outdated. The list includes medications for cardiology diseases, some antibiotics, oncological drugs, HIV/AIDS drugs, and malaria drugs. The goal was to review the EML every two years and make addenda or corrections whenever needed, but the list has not been revisited since it was published. It is critical that the list be updated with the correct product selection every two years and that additions be made, when needed, to align with the STG update cycles.

• Many key health programs have outdated STGs, since no mandatory periodic review is in place. The HIV/AIDS, TB, and malaria programs are good examples and have been updated periodically and recently. Many other diseases do not have comprehensive STGs or if they do have them, they may be outdated.

Short-term intervention	Medium-term intervention
Processes and tools • Finalize the NEML update process and ensure that the document is aligned with the most updated STGs for key diseases. Disseminate nationwide. • Ensure that the updated Mozambique National Formulary of Essential Drugs includes all products mentioned in the NEML and STGs. • Define the priority of each item within the NEML to be in "full supply" according to the VEN list, as some medicines are more essential than others. • Make sure that all three documents include product strengths and formulations that are expected to be procured/needed.	**Processes and tools** • Streamline and update the approval process within MISAU to ensure that documents are updated according to MISAU policies to include the TORs and guidelines for the TWGs to update STGs and EMLs. The NEML should be reviewed, updated and published every two to three years and the STGs every three to five years.

3.4 Forecasting and Supply Planning

Forecasting and supply planning: CMM and KPI scores	
Capability maturity score Note that the forecasting and supply planning questionnaire was completed during a workshop with CMAM, where capabilities were scored as a group to build understanding around the tool, scoring, and capability maturity.	**63.5%**
KPIs	
Forecast accuracy Required data was not available to generate a holistic forecast accuracy for all products.	**N/A**

Table 9. Forecasting and supply planning capability by enabler

Forecasting and supply planning	Average	Percentage
Process and tools	3.00	60%
Management information system	3.50	70%
Oversight	3.00	60%
Human resources	4.00	80%

Forecasting and supply planning: enablers and observations		
Forecasting and supply planning	By forecasting consumption, public health agencies can estimate health commodity demand, mobilize resources, and better inform budgetary activities. The supply plan takes into account commodity stock levels, procurement lead times, and products in the supply pipeline. Public health agencies can align supply plans with consumption forecasts to develop an action plan for managing procurements and shipments.	
Enabler	**Best practice**	**Observations in Mozambique**
Process and tools **CMM score: 60.0%**	**Forecasting** A forecast identifies the quantities of priority health products needed for a "full supply" and is prepared annually to cover a 24-month period. All assumptions made when developing a forecast are documented. This allows the forecast to be replicated and justified, and facilitates subsequent amendments using updated data or assumptions. **Supply planning** A supply plan documents a schedule of shipments needed to 1) ensure adequate stocks are available to meet a consumption forecast and 2) maintain continuity of supply to the distribution system. Supply plans cover an 18-month period and are updated quarterly.	**Forecasting** • Key health commodities, such as HIV, malaria, TB, and essential drugs, have an annual forecast, covering a period from two to five years. • Key assumptions are somewhat documented and summarized in a report. Full forecast replication remains a challenge. • When updated data or assumptions are made available, forecasting amendments and different scenarios are produced with significant technical assistance from the projects. **Supply planning** • Key health commodities have a supply plan in place to ensure adequate stocks and provide early warning if risks to full supply are identified. • Supply plans are updated quarterly with available data for a period up to 36 months and with significant technical assistance from the projects. • A financial gap analysis is produced based on shipments with no donor identified. • Gap analysis is used to mobilize financial resources to key products and ensure long-time product security. • A long-term strategy for product security has not been developed.

Management information systems **CMM score: 70.0%**	Effective forecasting and supply planning are heavily dependent on reliable prevalence, incidence, stock, and regimen data. Best practice requires effective recording, reporting, collection, review, and analysis of this data as needed to improve forecasting and supply planning.	**Management information systems** • Regimen and consumption data is available only for ARVs. Obtaining reliable, high-quality data for all areas has been a challenge. With SIMAM implementation and operationalization, stock and distribution data up to the district level is now available due in part to significant assistance from the projects. • With significant technical assistance from the projects, data is reviewed and adjusted to produce the forecast and supply plan.
Strategic planning and oversight **CMM score: 60.0%**	Forecasting and supply planning are led by an entity within MISAU that has clearly defined responsibility for oversight. MISAU has full ownership of the forecasting and supply planning process and results.	**Strategic planning and oversight** • MISAU assigned the technical working group (TWG) to lead, be responsible for, and oversee forecasting and supply planning activities and conduct a financial gap analysis. • TWG is not functional due to the inability of *Grupo Tecnico de Medicamentos*, the medications technical group, to function properly. The skills and capacity to take full ownership of the forecasting and supply planning process and results are lacking. • Staff turnover in forecasting and supply planning is a challenge to ownership due to the loss of institutional memory, even with written SOPs. • The SCMS project is making the updates to the supply plans for HIVAIDS and Malaria

Human resources	The forecasting and supply planning role is formally recognized as part of the organization chart within the MISAU.	Human resources
CMM score: 80.0%	Job descriptions that encompass core competencies for SCM specifically relate to developing, monitoring, and updating forecasts and supply plans.	• Planning and quantification team roles are formally recognized and part of the organization chart within the CMAM. • TORs for the Planning and Quantification department have been developed but are missing individual job descriptions that encompass core competencies for SCM and specifically relate to developing, monitoring, and updating forecasts and supply plans. • A new team has been assigned to the Planning and Quantification department. • The SCMS project leads the quantification for HIV AIDS and Malaria.

Risk statement:

When SCMS assistance ends in June 2016, and unless current gaps are covered by additional MISAU staff, continuing partner support, or outsourcing of more supply chain functions, forecasting and supply planning activities run the following risks:

- CMAM's quantification team experienced major changes in 2014: a new manager was appointed and new staff was hired. The new quantification team members are fresh out of university, with limited knowledge of health programs, MISAU policies, roles and rules, and the complex needs of key funding agencies and donors. Current quantification team members do not have the skills and experience in the methodology and the MIS tools to consistently develop and maintain a relatively complex forecast and produce reports. By the time the projects end, the quantification team will not be ready to manage these tasks without external assistance, and the capability currently present will decrease.

- Because of their limited experience and knowledge, CMAM's quantification team has not been able to keep up with core team priorities and with the continuously growing need to collect and aggregate good-quality and timely data with SIMAM LMIS and Central Tool data aggregation systems. Although SCMS has been training quantification team members in basic Excel and Pipeline and they are starting to master quantification tools and resources, they still rely heavily on SCMS. This functional area currently receives significant project technical and operational support. For example, SCMS is often asked to analyze large quantities of data produced by the LMIS and other information systems and to lead the development of complex models to fulfill the growing requirements of donors such as the World Bank, Global Fund, and PEPFAR. Without external technical assistance after June 2016, the capability currently present will decrease.

Key Challenges and Recommendations

Description of key challenges

- Electronic data integration across the different LMIS databases must be maintained, with a key focus on product description and coding integrity to allow data integration across tools until a fully functional ERP is in place (long-term plan).
- Forecast accuracy must be measured and continuous improvement processes integrated into the forecast and supply planning exercises. (To improve efficiency and quality, systematically implement small, incremental changes in processes.)
- High-quality, timely, complete, and systematically validated data is needed, reported through electronic integrated systems. CMAM staff can master the information and tools to produce high-quality forecast and supply planning exercises.
- CMAM needs a supply chain team, with job descriptions that encompass core competencies for SCM, specifically for developing, monitoring, and updating forecasts and supply plans.
- Country ownership of forecasting and supply planning is needed, with exercises led by an entity within the MISAU that has clearly defined responsibility for oversight.
- A functional performance management system is needed for forecast and supply planning with established KPIs for processes and benchmarked periodically among other CMAM departments.
- With limited visibility in forecast accuracy from previous years, improvement in supply planning cannot be shown. Additionally, procurement and consumption data availability is needed to complete the associated KPIs and their respective trends.

Short-term intervention	Medium-term intervention	Long-term intervention
Process and tools • Review existing SOPs and ensure that processes are addressed. Include measurement methods in the quantification SOPs and begin measuring forecast accuracy regularly for key health products. • Clarify and implement procedures for basic data capture and reporting. • Ensure that a forecast is developed within a TWG through a collaborative exercise that includes all partners involved in the product/program supply chain and those responsible for commodity funding decisions. • Deploy an informal (qualitative) measurement system to measure efficiencies throughout	**Process and tools** • Include quantification process routine root cause analysis exercises to explain discrepancies between forecast and actual consumption. • Develop and enforce a policy for implementing and managing the SOPs process and assign a person to be responsible for policy management. • Mandate the forecast and supply plan team to read SOPs and document their compliance. **HR** • Ensure that MISAU has full ownership of the process and results of the forecast and that senior CMAM staff lead the process with technical	**Process and tools** • Consider findings from root cause analysis of discrepancies during quantification exercises and ensure that forecast accuracy is measure in every update. • Establish KPIs for forecasting and supply planning process • Ensure the forecast is led by an entity within the MISAU that is clearly defined as responsible for the activity • Ensure that KPIs are measured and generated each month and benchmarked among CMAM departments. **HR** • Develop and implement HR retention policy for CMAM

forecasting and supply planning.

HR

- Train all CMAM staff in how to use forecast and supply-planning tools.

MIS

- Finalize the development and electronic LMIS data collection (Central Tool) from other electronic LMIS databases, including SIMAM, *Sistema de Informação de Procura* (SIP, the procurement information system), and MACS.
- Maintain the integrity of product description and/or pricing information across LMIS databases
- Ensure that computers have suitable software installed and operating for forecast and supply planning.

Oversight and strategic planning

- In the context of CMAM taking over CA medical supplies, assess the impact of high-bulk items on storage capacity need.

- Ensure the MISAU takes ownership of and a more active role in forecast and supply planning oversight, intensifying the participation of and collaboration with MISAU staff in the whole process as a way to strengthen their capacity.

- Integrate the appropriate forecasting adjustments to account for the transition of

assistance as needed

- Ensure that key managers are empowered and understand and use information to streamline processes and improve performance.
- Deploy a formal (quantitative) measurement of process efficiencies linked to validated data.
- Designate full-time staff to complete forecast and supply chain activities, avoiding addition to other supply chain roles within the institution.
- Train and develop the team in core competencies for SCM and forecast and supply planning.
- Ensure that all CMAM staff are trained and know how to harvest from the different sources the key data and inputs into the forecast and supply planning tool.
- Guarantee that CMAM staff positions, designated in the organizational structure, are partially filled and the available staff have the competencies required to effectively complete forecast and supply planning activities.

MIS

- Integrate the Central Tool and forecast and supply planning tools.
- Ensure that all computers and data servers are in working condition, internet connectivity is working, and scheduled maintenance is performed.

Oversight and strategic planning

- Guarantee that a senior staff

staff.

- Ensure that CMAM staff positions designated in the organizational structure are all filled by staff with strong supply chain management core competencies, specifically for forecast and supply planning.

MIS

- Develop real-time national LMIS data availability in a format that integrates with forecast and supply planning tools in the ERP functionality.
- Integrate the advanced forecasting tool with LMIS and ERP procurement and supply planning functionality; make sure forecast and supply planning data is visible to all managers in real time.

Oversight and strategic planning

- Ensure that the forecast and supply planning process is a collaborative exercise, fully led by MISAU, which includes all local partners involved in the supply chain of the product/program and those responsible for commodity funding decisions.

Nevirapine to Option B or B+.	member from MISAU leads the process of forecast and supply planning, even if is produced with support of specialized technical assistance, to ensure that MISAU has ownership for the process and results.	

3.5 Procurement

Procurement: CMM and KPI scores	
Capability maturity score Note that the procurement questionnaire was completed during a workshop with CMAM, where participants completed the questionnaire on their own, self-assessing the capacity of the health supply chain and agreeing on the scores.	**64.8%**
KPIs	
The evaluation team was unable to collect procurement-related KPIs. Therefore, understanding around procurement performance is limited to quality testing. **Quality testing** This indicator measures the percentage of product samples (post-market) tested by the quality laboratory that meet the established standards. The NMQCL is responsible for implementing the quality monitoring system. Samples are collected from sites (central, provincial, and district levels) according to a sampling plan that considers climate, warehouse storage, and history of previous quality problems. Since the laboratory is not WHO pre-qualified or ISO 17025 accredited, samples of GF-funded medicines are outsourced to accredited foreign laboratories in Kenya, Vietnam, and Uruguay. SCMS manages the testing of medications procured with USAID/PEPFAR funds in accredited laboratories and following random sampling procedures. Samples are obtained upon shipment arrival at the CMS. Results are shared with the CMS. Please note that the quality testing KPI does not have a 90 percent confidence interval.	**85.6%, please note only 62.9% of samples were tested**
Procurement data was not available.	**NA**

Table 10. Procurement capability by enabler

Procurement maturity	Average	Percentage
Process and tools	3.00	60.0%
Management information system	3.67	73.3%
Oversight	3.38	67.5%
Human resources	4.00	80.0%

Due to lack of access to procurement data, procurement performance is not adequately represented. Quality testing is the only key performance indicator available. The post-market quality testing pass rate of 85.6 percent represents only 62.9 percent of the samples collected at the central and provincial levels for testing.

Procurement: enablers and observations		
Procurement	Procurement strategies must strike a complex balance between ensuring that the right quantities of quality health commodities are available to patients and that excess stock is not accumulated. Procurement for the public health supply chain should be limited to the National Essential Drugs List.	
Enabler	**Best practice**	**Observations in Mozambique**
Process and tools **CMM score: 60.0%**	Standard product specifications and an item master list are part of a high-functioning procurement system. These are updated periodically and informed by staff with technical expertise in the existing product lines. Purchasing entities are aware of acceptable substitutions, including generic and internationally recognized product lines. Transparency in the procurement processes is created when vendors are continuously identified through formal, well-documented processes and performance is measured continuously with feedback. When conducting procurement SOPs, ensure purchasing agents follow appropriate processes.	*Formulário Nacional dos Medicamentos* (FNM, the Drug National Formulary) codifies and describes specifications of medicines used in the health system. The national programs, supported by partners, define specifications of nonstandard medicines and other health products. However, the FNM is different from the WHO Model Formulary, and consequently, the list of Mozambican formulary medicines also deviates from the list of essential medicines that the WHO considers safe and cost effective for public sector use (compared with international reference lists, less than half of the current FNM medicines correspond to the WHO Essential Medicines List). Purchasing entities collaborate with the Pharmaceutical Department and the National Regulatory Entity to make sure that substitutions are registered in the country. However, only about half of the FNM medicines are currently registered in Mozambique. Vendor performance procedures are still being developed and implemented through newly created SOPs. A positive effect is expected in the long term. Procurement SOPs in accordance with Mozambican Public Procurement law are in place. A total 11 procurement processes are described in the SOPs: five are for procurement per se and six for contract management. Nevertheless, the total pre-award process time (six months) is still extremely long.

Management information systems **CMM score: 73.3%**	A procurement MIS is used to track requests for proposals released, purchase orders/contracts awarded, orders received, and vendor payments made. MIS provides a platform for monitoring vendor performance. A record management system with SOPs and regular internal and external audits ensures proper documentation is maintained.	The SIP was recently launched and is still not fully functional. It will track, at the product-line level, the list established by the planning department through the whole procurement process: tendering, contracting, key shipment milestones, goods reception, and payment approval. For donations the tracking starts with the price quotes issued by the donors. *Sistema de Seguimento das Importações* (SSI, the imports tracking system) is being developed and will be launched in 2015. It will track, at the shipment level, the importation and customs clearance process (32 documents and milestones) from the receipt of the pro forma invoice to the receipt of the proof of delivery (POD). Key milestones from the SSI will be used to update the SIP. The SIP will monitor different vendor performance indicators such as on-time delivery of contract documents, products, and services. Still, SIP and SSI implementation depend heavily on external partner efforts. Internal control SOPs are currently being developed. External audits comply with donor requirements and MISAU regulations.
Strategic planning and oversight **CMM score: 67.5%**	In the procurement process, internal controls are a key part of transparency. This includes formal separation between the purchase order approval and the payment approval with clearly defined, enforced, and audited control mechanisms to oversee the procurement function. In addition to internal controls, an ethics and anticorruption training program adequately addresses the requirements for dealing with transparent procurement process. An independent vendor appeals mechanism is available, and regular audits are conducted by external procurement-trained auditors. Auditors' documented recommendations are followed up on, leading to continual improvement.	Procurement and internal control are clearly segregated. However, the procurement department approves orders and also approves payments, which is an evident conflict of interest. Donors' procurement auditors regularly perform external audits. Also, one of the requirements of the GF is that the MISAU must have an annual external procurement audit. Nonetheless, follow-up and implementation of recommendations remain a challenge.

Human resources	Job descriptions are defined by their primary responsibilities, including developing tenders, receiving vendor proposals, managing tender evaluation committees, writing contracts/purchase orders, developing supply plans, and managing vendors.	The department and each team member have TORs. Four teams are currently being implemented: 1) tender and contract management, 2) shipment tracking/ importation/customs clearance, goods reception, 3) payment approval, and 4) process analysis. It is estimated that it will take at least one year for teams to be fully implemented and operational.
CMM score: 80.0%		

Risk statement:

When SCMS assistance ends in June 2016, and unless current gaps are covered by additional MISAU staff, continuing partner support, or outsourcing of more supply chain functions, procurement activities run the following risks:

- The SIP may not be used to its full potential after the project ends. The system, currently supported by Deloitte-FORSSAS Project, is still not fully functional and may not be finished before the end of the project in June 2016.

- Even if the SIP is ready, there may not be time to train staff in the SIP SOPs and this may also affect how or if the SIP is used. At the present time, CMAM staff tends to rely more heavily on SCMS staff instead of on SIP technical support to run the program. If the SIP is not used, or not used to its full potential, the procurement process time will not continue to improve and procurement data visibility will be affected.

- The SSI, developed with technical assistance from SCMS, may not be used to its full potential. Although staff has been trained in its use, they still require a lot of technical assistance before they can confidently run it on their own. If it is not used, the timeliness and predictability of the importation and customs clearing process will not improve.

Key Challenges and Recommendations

Description of key challenges
- National Public Procurement law does not take into account specificity of pharmaceuticals. - Knowledge of and skills in procurement are lacking. - Specific information technology tools are lacking. - The import process is slow, and pre-shipment inspection brings no added value in quality.

Short-term intervention	Medium-term intervention	Long-term intervention
Process and tools - Focus on and procure only a limited number of products from the National Essential Drugs List. - Update procurement SOPs regularly, train staff, and ensure SOPs are followed. - Use the TOR written for each	**Process and tools** - Implement a fast-track process for donations from organizations with strong quality procedures or for medicines from countries with highly regulated authorities - Develop and implement a supplier performance	**Process and tools** - Update and implement SOPs according to modified national Public Procurement law **MIS** - Support implementation and daily use of the information

role in the department to ensure that the right people are in the right positions. • Increase CMAM payment capacity to speed up customs clearance. • Improve communications between warehouse and procurement teams. Organize systematic transmission of information on pending shipments. Ensure that POD documents are submitted to the procurement team on time. **MIS** • Finalize the development and/or implementation of SIP, the procurement information system, and SSI, the importation follow-up system. **Oversight and strategic planning** • Make the concerned ministries aware of the limitations of the current Public Procurement law. • Make the MISAU aware of the ineffectiveness of pre-shipment inspections for donations from organizations with strong quality procedures or for medicines from countries with highly regulated authorities.	monitoring system **HR:** • Ensure that CMAM staff positions designated in organizational structure are all filled by staff with strong SCM core competencies, specifically for procurement **MIS** • Ensure IT tools are routinely used. **Oversight and strategic planning** • Include specificity of pharmaceuticals in the national Public Procurement law. • Develop and implement HR retention policy.	management systems (SIP, SIF) **Oversight and strategic planning** • Develop and implement HR retention policy

3.6 Warehousing and Inventory Management

Warehousing and inventory management: CMM and KPI scores	
Capability maturity score	**38%**
KPIs	
Tracers with stock cards	**82.4% (Facilities sampled =103)**
Up-to-date stock cards Overarching: Provincial: District: Health facility:	**61.7%[29] (Facilities sampled =103)** **73.9% (Facilities sampled =11)** **66.2% (Facilities sampled =22)** **58.3% (Facilities sampled =70)**
Stock accuracy Central: Provincial: District: Health facility:	**62.2% (Facilities sampled =3)** **56.8% (Facilities sampled =11)** **55.2% (Facilities sampled =22)** **57.2% (Facilities sampled =70)**
Stockout rate (historical) Central: Provincial: District: Health facility:	**51.7% (Facilities sampled =3)** **11.4% (Facilities sampled =11)** **15.6% (Facilities sampled =22)** **18.3% (Facilities sampled =70)**

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[29]In addition to the standard definition a constant denominator of 2,684 was applied to two KPIs: up-to-date stock cards and stock accuracy. The number 2,684 represents the total number of tracers managed across all sampled facilities.

Stockout rate (day-of-visit)	
Provincial:	**10.8% (Facilities sampled =11)**
District:	**14.4% (Facilities sampled =22)**
Health facility:	**26.4% (Facilities sampled =70)**
Expiry rate (quantity, central level)	**0.4% (Facilities sampled =3)**
Acceptable storage capacity	**34.0% (Facilities sampled =106)**
LMIS stock accuracy	**85.3% (Facilities sampled =26)***
On-time and complete reporting rate	**63.6% (Facilities sampled =11)**
Staff turnover rate	**18.5% (Facilities sampled =106)**
Facilities with at least one staff member trained in the SOPs Manual, 3rd Edition	**70.8% (Facilities sampled =106)**

* Only 26 facilities answered yes for using SIMAM.

Table 11. Warehousing and inventory management capability by enabler

Warehousing and inventory management	Average	Percentage
Process and tools	2.01	40.1%
Management information system	1.77	35.5%
Infrastructure	1.72	34.3%
Oversight	2.01	40.2%
Human resources	2.20	44.0%

An analysis of the KPIs for warehousing and inventory management show challenges related to stock accuracy, stocked according to plan, expiry rates and human resources. First, electronic stock accuracy is limited, as only 26 of the below-central-level sample facilities reported using the logistics management information system SIMAM at the provincial (11), district (14), and health facility levels (1). SIMAM is not yet widespread. Of those 26 facilities that are using SIMAM, 85.3 percent are using it correctly. At the provincial level, all sites use SIMAM, and it is being used correctly by 93.5 percent of facilities. The on-time and complete reporting rate of 63.6 percent is limited to the provincial level reporting to the central level, which are the levels the projects support.

Second, stocked according to plan is 13.9 percent at the central level and 19.5 percent at the provincial, district, and health facility levels. Only 20 facilities at the provincial (5), district (7), and health facility (8) levels even reported having established maximum and minimum stock levels. This means that the rest of the sites included in the sample were not following the policies and practices outlined within the supply chain SOPs. With only 61.7 percent of tracers managed with up-to-date stock cards, determining an accurate average monthly consumption to use this best practice would be difficult. This may be due to the possible incorrect application of the SOPs training. Also, there is no way to ensure that follow-up, refresher, or on-the-job training is taking place, as this is outside the scope of this assessment and an area for further investigation.

Third, the current expiry rate at the central level is 0.4 percent for the period of January–October 2014. This rate may be low due to SCMS and USAID | DELIVER PROJECT's support to the central level, particularly in supporting the first to expire, first out (FEFO) system of stock management. SCMS also monitors this metric in its performance management plan. This finding is particularly good, considering that before SCMS and USAID | DELIVER PROJECT supported the day-to-day operations of the central level, the expiry rate was unknown and led to a large destruction of expired products in 2012, when the projects started to assist the central level. Another possible explanation is that product is being pushed down the supply chain, collected, and destroyed at the district level. In support of this conclusion, only 34 percent of facilities reported having adequate storage capacity. The remaining facilities are over 80 percent full, compromising appropriate use of pallets, shelves, and gangways.

Human resources appear to be performing well with a low staff turnover at 18.5 percent. This low rate of staff turnover can be partially attributed to the seconded employees from USAID | DELIVER PROJECT and SCMS and other partners, which support between 34 percent and 5 percent of the CMAM positions, or about 17 percent of the warehouse staff positions within the national system (see Table 1). Due to the high proportion of seconded staff, the current staffing allotment may be inadequate to fully meet demand.

Each facility is required to have at least one supply chain staff member trained in the SOPs Manual, 3rd edition. Currently, 70.8 percent of facilities have at least one staff member trained; however, only 45.3 percent of all supply chain staff have received this training. It is unknown whether having one staff member trained led to dissemination and adoption of the procedures across all supply chain staff within the facility.

Warehousing and inventory management: enablers and observations		
Warehousing and inventory management	To ensure the quality of pharmaceutical products, commodities need to be kept under acceptable pharmaceutical warehousing and storage conditions. Warehouses should be designed to enable efficient operations, SOPs implemented, and regular maintenance schedules established. Inventory management is essential for ensuring optimal inventory levels, balancing replenishment lead times with space management, providing order visibility, and aligning distribution strategies. SOPs are the foundation of effective and efficient operations.	
Enabler	**Best practice**	**Observations in Mozambique**
Process and tools **CMM score: 40.1%**	Good inventory management practices are maintained and consistently applied, such as: • Rotating stock each time it is shelved to follow the FEFO rule for avoiding expiries • Having order pickup and checks conducted by separate parties • Conducting routine stock counts • Establishing quarantine areas In a mature system, shipment confirmations include items and quantities fulfilled and are automatically emailed from the warehouse management system (WMS). Each supply chain level has an established minimum and maximum months of stock. The resupply to maintain these levels is systematically calculated by the forecasting and supply planning procurement units or the WMS based on a programmed formula for each level. Warehouses or storage facilities conduct wall-to-wall inventory counts at least once a year. Daily or monthly cycle counts by classification are conducted. Adjustments are reconciled in the WMS or appropriate software. Then, discrepancies are investigated and causes documented. Ideally, these adjustments are linked to finance to make any adjustments to the facilities' financial tracking. SOPs outline processes for each warehouse department and inventory management operation. They are managed by a central unit, rolled out to employees for training, reviewed at least	The maturity of warehousing and inventory management is low but central-level performance is high due to project staff actively overseeing the management of central-level warehouses. **Central** • Stock rotation is usually applied but warehouses are full, and mixed block-stacked products sometimes impede compliance with FEFO rules. • Routine stock counts of certain tracer products are done for the KPIs but no cycle counting SOPs or regular cycle counting is taking place. • Annual physical inventories do take place but are infrequent (and not carried out every calendar year) and sometimes are not completed due to time and staff constraints. • Stock discrepancies are updated in the system but often not investigated. There is no link with the financial system. • Most central warehouse (CW) locations have designated areas for quarantined products, but a product that becomes obsolete or expires is often "stored" for long periods wherever there is space. • Warehouse SOPs have been introduced and are being updated. SOPs are not regularly updated. Warehouse staff have been trained in basic warehouse SOPs, but they need refresher training and reminders to reinforce correct operational procedures. **Provincial** • Stock rotation is applied and FEFO rules are usually followed but some

	annually, updated when functionality changes, and filed in a central location.	provincial warehouses are full. • Routine stock counts of certain tracers are done for KPI collection, but no cycle counting SOPs or regular cycle counting is taking place. • Staff conduct quarterly physical inventories for essential drugs and monthly physical inventories for ARVs and rapid tests. Sometimes this process takes long because of staff shortages. • Stock discrepancies are updated in the system but often are not investigated. There is no link with the financial system. • All expired product is moved to the quarantine area and regularly destroyed. • Warehouse SOPs were updated in 2012 and staff trained. SOPs are not regularly updated. **District** • Stock rotation is usually applied, but some district warehouses are full and FEFO rules are not followed. • Routine stock counts of certain tracers are done for KPI collection, but no cycle counting SOPs or regular cycle counting is taking place. • Staff conduct monthly physical inventories for essential drugs, ARVs, and rapid tests. Sometime this process takes a long time because of staff shortages. • Stock discrepancies are updated in the system but often not investigated. There is no link with the financial system. • In several districts, expired products are removed and kept in a separate box for expired products. However the expired product boxes are stored in the same warehouse zone as product in use. • Warehouse SOPs were updated in 2012 and staff trained. **Health facility** • Stock rotation is usually applied and FEFO rules are followed. • Routine stock counts of certain tracers are done for KPI collection but no cycle counting SOPs or regular cycle

		counting is taking place.
		• Staff conduct monthly physical inventories for essential drugs, ARVs, and rapid tests. Sometimes this process takes longer because of staff shortages.
		• Stock discrepancies are updated in the system but often are not investigated. There is no link with the financial system.
		• All expired products are removed and kept in their box, stored in the same warehouse zone as product in use, and later sent to the district level.
		• Warehouse SOPs were updated in 2012 and staff trained.

Comparison of KPI indicators across supply chain levels:

To effectively compare KPIs across the supply chain, a subset of the total KPIs was collected at all supply chain levels. KPIs removed from this analysis were quality-testing rates, expiry rates, and on-time and complete reporting rates, as they are captured at specific levels within the supply chain and not across all levels of the supply chain.

Figure 9 compares KPIs across the four supply chain levels: central, provincial, district, and health facility.

Figure 9. Comparison of KPI scores across all supply chain levels
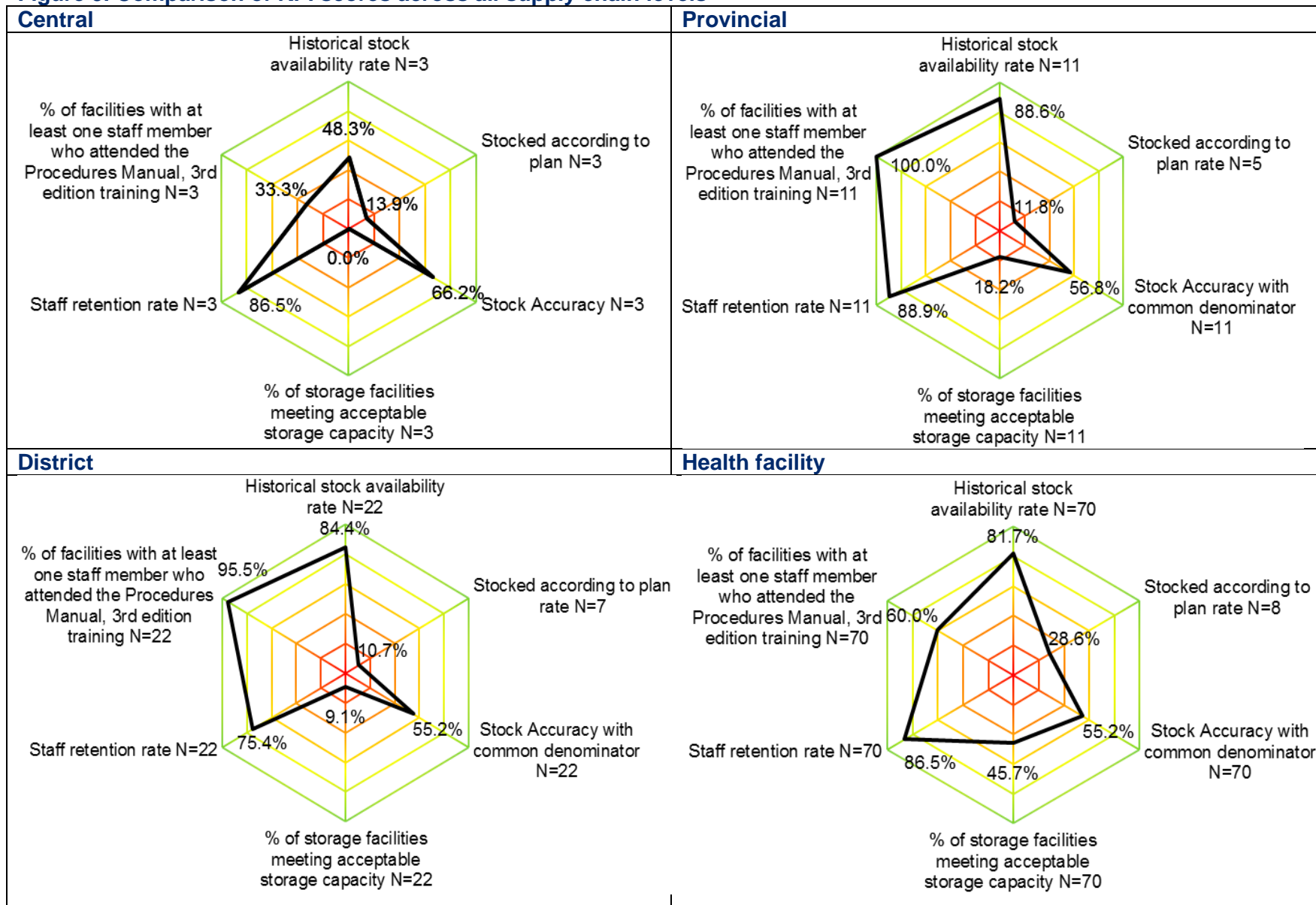
Note: Red to green indicates performance is increasing from low to high.

Note that KPI scores for stock availability rate and staff retention have been inverted for the purpose of this diagram. Performance as described by the KPIs collected was higher than expected because all KPIs are shown as positive in Figure 9.

Stock availability rates at the central level, stocked according to plan, and percentage of storage facilities meeting acceptable storage capacity are a challenge. Stockouts are a problem across the supply chain and particularly in lower levels, where supply chain technical assistance is not available and where transportation presents challenges.

Comparing performance across supply chain levels finds that the district level reflects lower performance in stocked-according-to-plan rate, stock accuracy, percent of storage facilities meeting acceptable storage capacity, and staff retention rate. In the last year, staff turnover rate averaged 18.5 percent, with district-level turnover rates being the highest due to staff leaving for more urban areas. Staff in the district and health facility levels are usually nurses or pharmacists who have many primary responsibilities other than supply chain management (SCM). They are also usually not trained in SCM functions yet are expected to perform tasks such as completing requisition forms and managing inventory.

Overarching KPI stock management analysis across supply chain levels:

Pulling from the day-of-visit commodity stock data captured during the assessment, Figure 10 dissects stockout rate by product type, providing insight into the composition of stockouts by facility level.

Figure 10. Product category breakdown of stockouts experienced at each facility level during day of visit
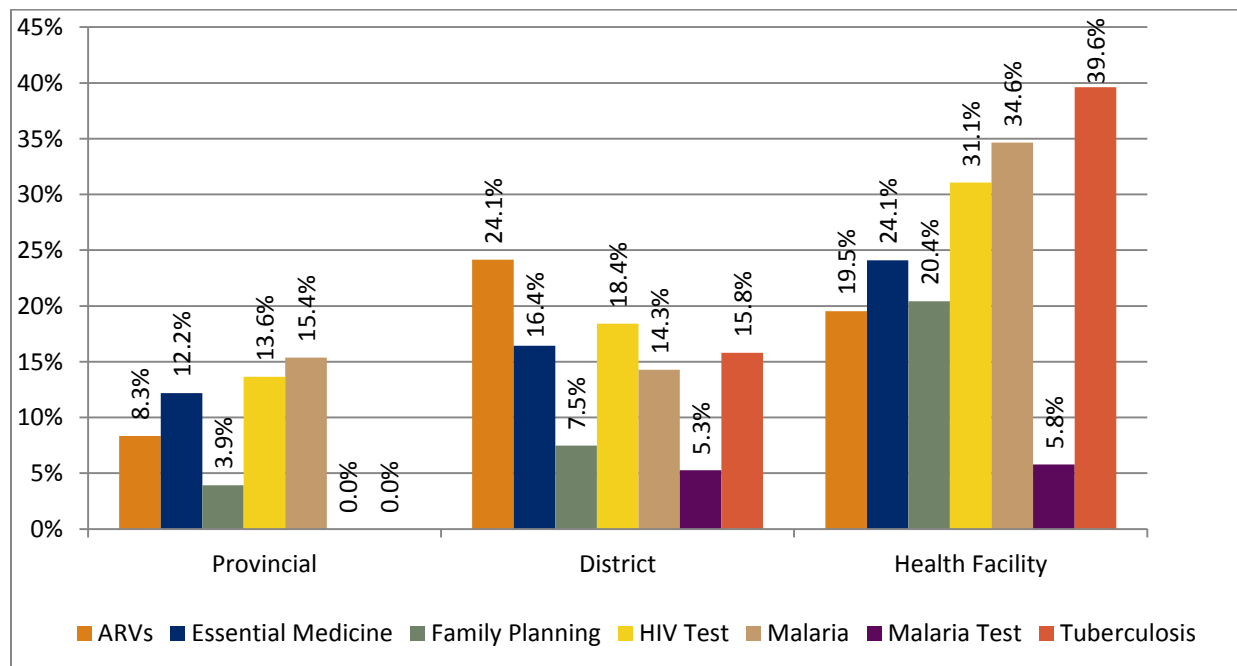
*Facilities sampled =103.
Note: Only the larger facilities (health center) carry TB products.

Stockout rates on the day of visit were greater at the lower levels of the supply chain and across most product areas except for ARVs, which are delivered by the provincial-level facilities directly to the health facilities. Lower-level stockout rates may be due to the practice of equitable disbursement, where warehouses collect and equitably divide resupply orders, regardless of the amounts requested in the requisition forms. Also, many health facilities do not fill out and submit requisition forms or fill them out incorrectly, which prevents district-level facilities from distributing adequate amounts of products. Lastly, even when health facilities do submit requisition forms, districts often lack resources to transport the product to the health facilities, relying on clinical partners to transport or on health facility staff to pick up.

Note that the TB program is a vertical program, run by the National TB Program and funded by the Global Fund. The fact that this product category has the highest incidence of stockouts at the facility level could be because it has not received the same amount of focused technical assistance from the supply chain partners that other product categories have received.

Pulling from historical tracer commodity stock data captured during the assessment, Figure 11 dissects stockout rate by product type, providing insight into stockout composition by facility type.

Figure 11. Product category breakdown of stockouts experienced at each facility level during the historical period (August–October 2014)
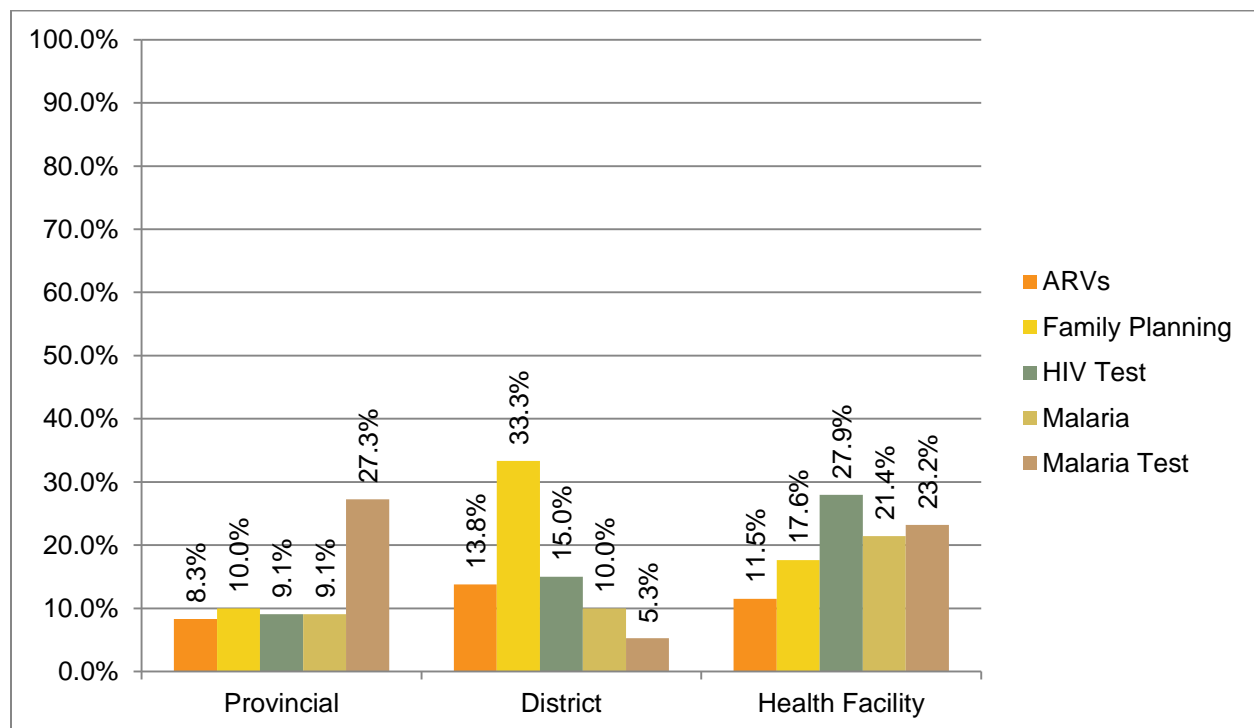
*Facilities sampled =103.

Comparing Figure 10 with Figure 11 shows that only eight of 32 total tracers were collected historically, increasing the opportunity for stockouts on the day of visit, rather than historically. Across most product areas, stockout rates increased down the supply chain, except for malaria tests, where a higher stockout rate was seen at the provincial level when compared with the district level. This higher stockout rate may be because most of the rapid diagnostic tests (RDTs) are distributed

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as kits and counted as such (not as RDTs) at the provincial level. Also, three of 11 provinces experienced a stockout of malaria test kits, which equates to a 27.3 percent facility stockout rate at the provincial level. Health units also have RDTs as part of their kits and do not report each of the products (such as RDTs) included in the kits. Higher stockout rates for ARVs and family planning were seen at the district level when compared with the health facility level. This is because ARVs are delivered by the provinces directly to the health facilities, bypassing the district level. ARVs are not part of district-level inventories. Lastly, given that family planning methods are full supply, they may not be given the same priority as some other products whose supply levels are currently experiencing challenges.

While these figures showed historical data for August through October 2014, Figure 12 shows stockout levels on the day of visit at the provincial, district, and health facility levels for each HIV/AIDS and TB product on the tracer list.

Figure 12. Percent of HIV/AIDS tracers stocked out day of visit
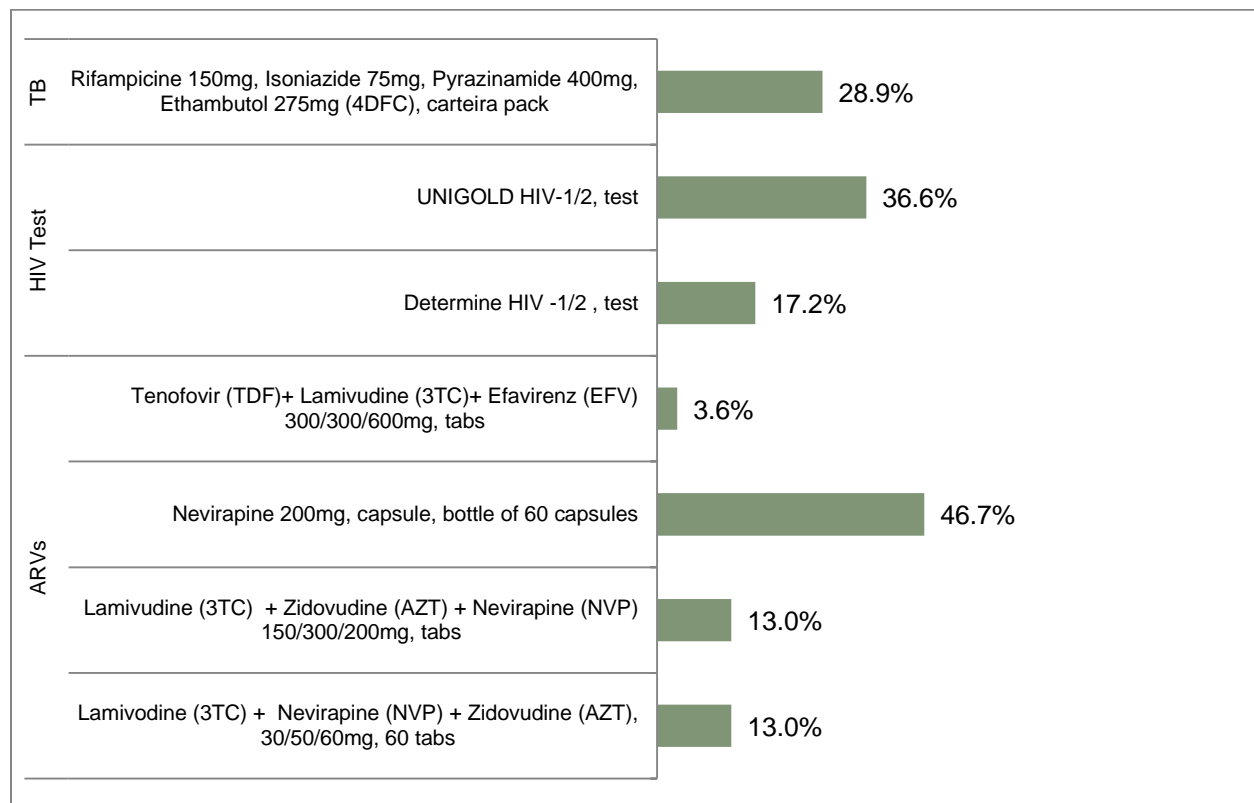
*Facilities sampled =103 (Facilities sampled = 75 for Nevirapine. During the assessment a regimen change was occurring and not all sites e carry this product.)
Note: Central level data not captured here.

Stockout levels of HIV/AIDS tests appear high; it is unknown whether the practice of pushing product to lower levels of the system has led to reduced buffer stock or other constraints that limit stock levels. This should be investigated in future HIV/AIDS test stock assessments.

Further analysis of the stockouts by tracer commodity identified a significant stockout of Nevirapine 200mg, used mostly in prevention of mother-to-child transmission (PMTCT), at 46.7 percent. Many more sites manage Nevirapine than other tracers because it is the main course of treatment in

PMTCT-only sites, increasing the opportunity for stockouts. However, transitioning to Option B or B+ will greatly diminish the need for Nevirapine in these sites.

UNIGOLD stockouts were due to several reasons:
- product was held an expired – The UNIGOLD sent to Niassa had a remaining short shelf life and expired before it could be distributed. The DPM opted then not to register it in the system.
- swapping of product – Beira Central Warehouse swapped UNIGOLD shipments between Sofala and Zambezia provinces, which resulted in a stockout in Zambezia.
- receiving less than requested – the Zambezia Province received less than requested.

Figure 13 shows stockout rates on the day of visit at the provincial, district, and health facility levels for two groups of selected tracer commodities: family planning and essential medicines.

Figure 13. Percent of essential medicines tracers stocked out day of visit
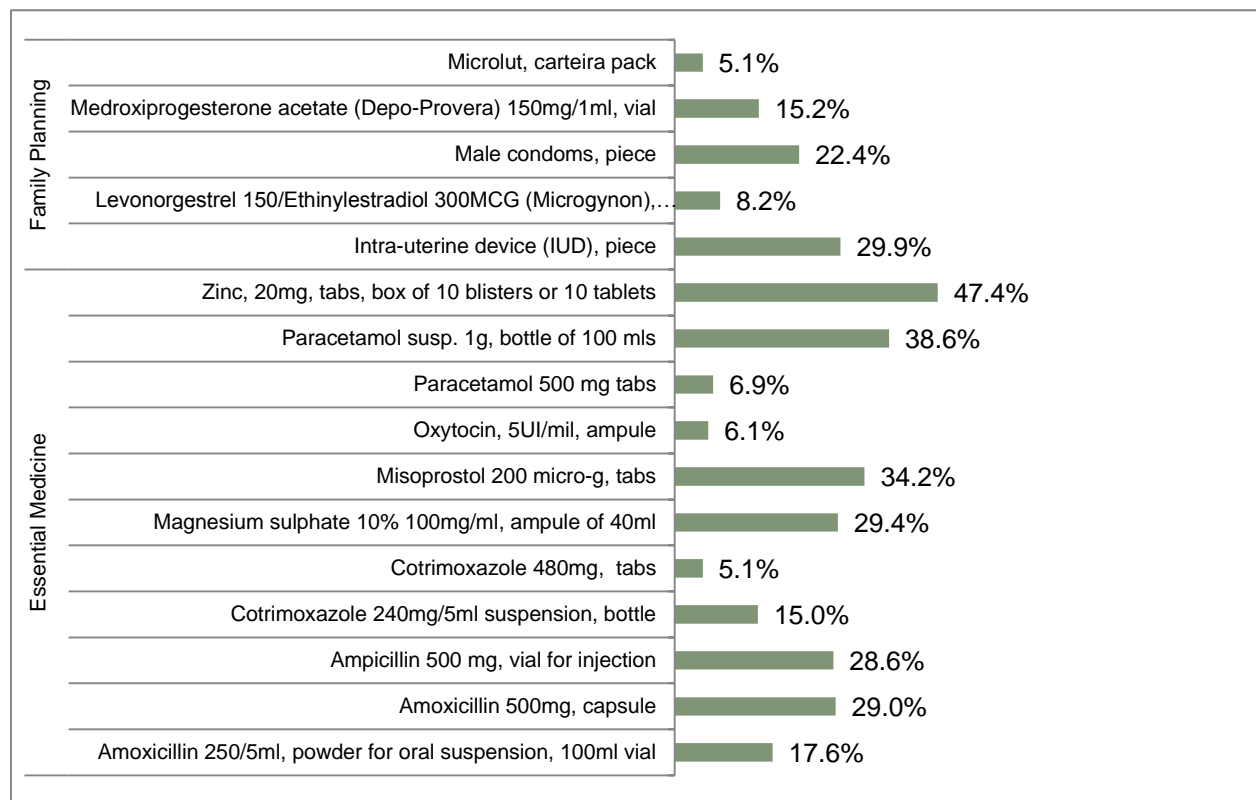
*Facilities sampled =103.

Stockouts are higher for tracers not receiving SCMS and USAID | DELIVER PROJECT support such as zinc, paracetamol suspension, amoxicillin, magnesium sulphate, misoprostol, and ampicillin, as shown in Figure 13. Many of these products have multiple uses and are in higher demand than other products that are not used as much. Male condoms are bulky and more difficult to transport and store in lower-level facilities, where storage space is limited.

Figure 14 shows stockout rates on day of visit at the provincial, district, and health facility levels for malaria products on the tracer commodity list. With the exception of Quinine, the USAID | DELIVER PROJECT procures and distributes all of the malaria products in Figure 14.

Figure 14. Percent of malaria tracers stocked out day of visit
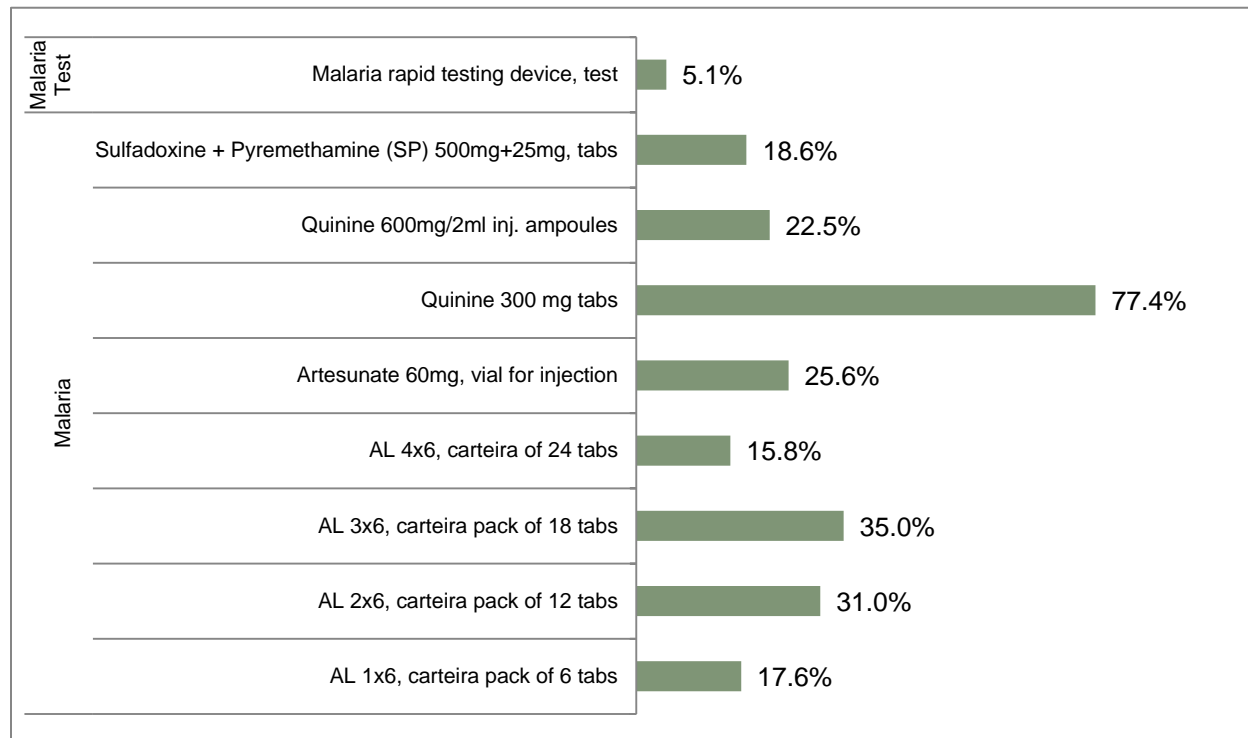
*Facilities sampled =103.

Two of the highest stockout rates are due to a worldwide stockout of quinine tabs and ampoules. Quinine injectable and ampoules are not supported by the projects; they were both procured by GOM. While the stockout levels for AL 3x6 are troubling, for there to be stockouts of AL there have to be stockouts of all four presentations (1x6, 2x6, 3x6, and 4x6). Since any presentation can be used on any patient due to dose uniformity within the drugs, the difference in presentation is simply quantity of pills within the box. Of the 103 sites and 70 health units sampled, only four were entirely stocked out of all AL commodities on the day of visit, making them unable to treat any malaria patients. Note that 68 of 70 sites manage AL 2x6, carteira pack of 12 tabs.

Figure 15. Average months of stock on hand by health facility and warehouse levels by type of product category
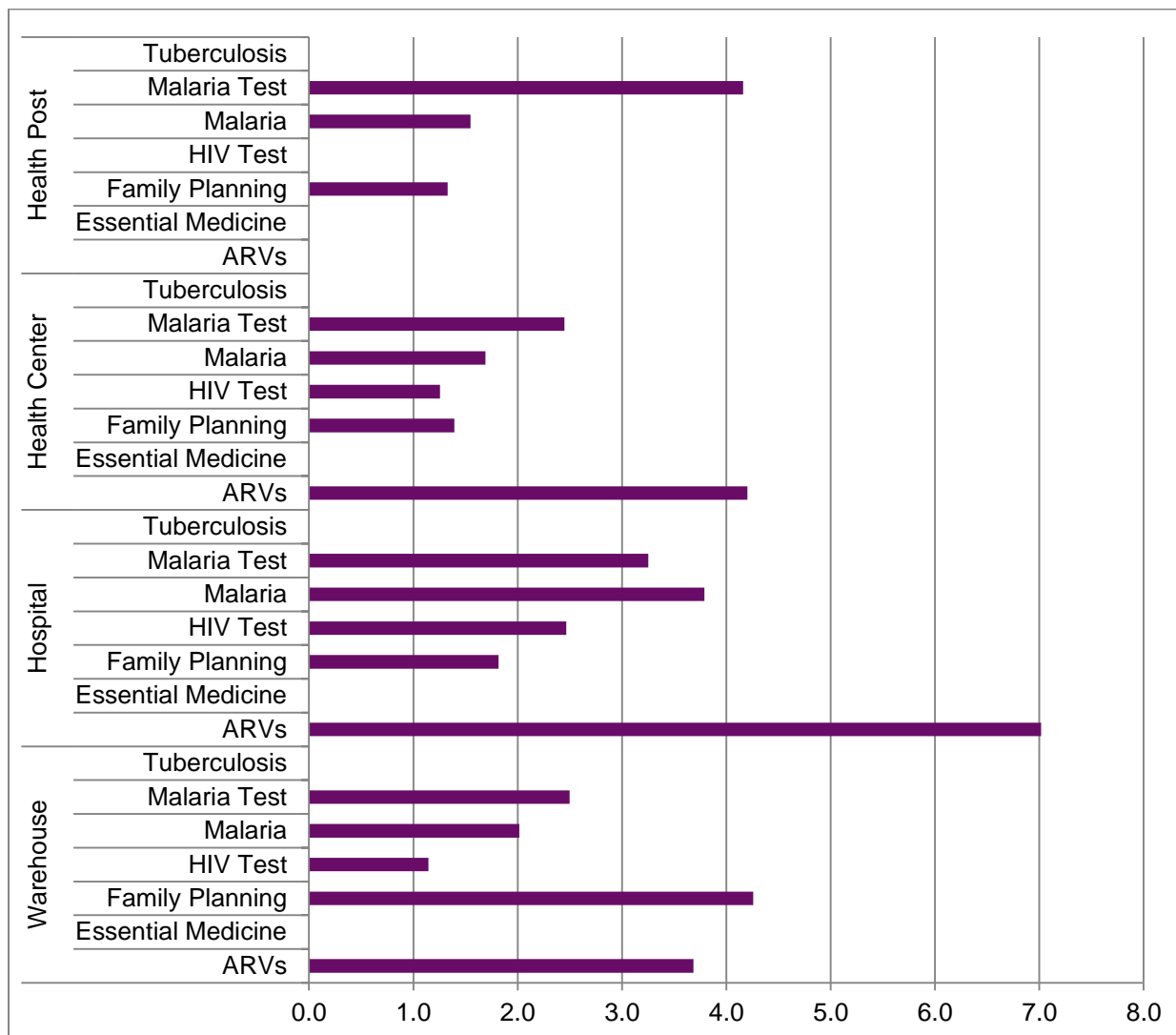
*Facilities sampled =103.

Note: This data comes from the historical data average of three months' stock on hand for the eight tracer commodities.

An in-depth analysis was undertaken to understand average months of stock on hand by facility type and by product category. Products that either did not have a stock card, or products where stock on hand was not available to be captured for the three-month period, do not have average month stock identified in Figure 15. This data shows current inventory management of essential medicines, tuberculosis, and health facility ARVs requires increased attention and technical support. Although facilities are expected to maintain a maximum of two months of stock (MOS) and a minimum of one MOS across all product categories, they often do not. Health centers and health posts are not maintaining the two-month maximum MOS, which would imply a reliance on the scheduled monthly resupply. As mentioned earlier, resupply, particularly in the lower levels, is affected by the practice of equitable disbursement, which does not necessarily correspond with the amounts requested in the requisition forms. Along with the lack of submission of requisition forms or the submission of incomplete or incorrect requisition forms, this leads lower-level facilities to have less

stock than needed. Lower-level facilities such as health posts and health facilities receive malaria tests through two routes: as part of the equitable disbursement mechanism and as part of the malaria kits. This sometimes results in stock-on-hand levels being higher than for other products.

At the same time, hospital stock levels are exceeding the two-month maximum at three MOS, most likely for two reasons. First, because of equitable disbursement practices, district-level facilities tend to prioritize distribution to hospitals over health facilities and health posts because of their high patient volume. Second, because of insufficient training, hospital staff may lack the skills to complete requisition forms correctly. Or, the staff completing the forms may not be the same as those who have completed the SOP 3rd edition training.

Enabler	Best practice	Observations in Mozambique
Management information systems **CMM score: 35.5%**	To successfully set the stage for good warehousing practices, an organized product tracking system is vital. At a central level, as products are received in a warehouse or storage facility, the best practice is to enter the data using software or a warehouse management system against a purchase order or shipping notification. At lower-level facilities, all items are tracked in software or at a minimum in an organized stock card or stock ledger system. Items received are validated against packing slips to ensure all products documented are indeed received. In mature health systems where technical infrastructure is available and the warehouse is fully automated, the WMS is connected to an ERP system.	Monthly reporting practices appear to be standardized at the lower levels, with 97.1 percent of the health facility level and 100 percent of the district level reporting monthly, while only 63.6 percent of the provincial level reported monthly. Over 90 percent of facilities are sending reports to the *Depósito*, defined as reporting to the *Depósito Distrital de Medicamentos* (DDMs), which are reporting to the DPMs, and the DPMs, which are reporting to CMAM. Reporting mechanisms are consistently applied across the supply chain. Use of stock-keeping records for tracer products is low and presumably lower for unsupported products. **Central** • CMAM uses WMS software. • Usually, the warehouse is unaware of arriving product. • Due to large quantities arriving at the same time and staff shortages, products remain in quarantine for longer than advisable. • When under pressure, activities are often not carried out according to existing warehouse SOPs or according to FEFO rules. • The WMS is not connected to an ERP. SCMS is currently developing a link between WMS and procurement software as well as to a central database (Central Tool), which combines all stock/distribution data/information and master data. **Provincial** • All provincial warehouses have SIMAM as the main tool for product

		management.
		• Due to electricity, internet, and staff shortages, product is managed manually. • All warehouse staff are trained in SIMAM. **District** • Some district warehouses have SIMAM as their main product management tool, while others are still using manual management and reports. • Due to electricity, internet, and staff shortages, product is managed manually. • Some staff are not trained. **Health facility** • SIMAM has been installed in some health facilities. • Health facilities use manual management and reports.
Infrastructure **CMM score: 34.3%**	Best-practice warehouse infrastructure includes ensuring the storage space is void of excess or obsolete products as well as evaluating and, if necessary, redesigning the layout of existing areas and/or the way in which products flow. Products are stored on properly labeled shelves and a pallet rack. A mature warehouse at a central level has a separate receiving and dispatch area, as well as designated operational areas. Within the warehouse, more mature processes include the use of powered materials handling equipment, with devices such as a lift truck or a powered pallet jack. A training program is in place for all staff using this equipment. Systems are implemented and maintained to optimize storage capacity within the facility. A generator and uninterruptible power supply are available to account for crossover time until the generator kicks in during power outages. Mature storage facilities implement and maintain health and safety (H&S) equipment, processes and procedures. Housekeeping cleaning standards are scheduled at least weekly, and a pest	**Central** • The central-level warehouses have adjustable pallet racking systems, but often items (particularly those that are bulky or heavy) are stored on pallets on the ground in designated locations. Block stacking is also practiced due to space constraints. • All CWs have floor plans with location management. This includes floor positions for block-stack and pallet positions (floor). • Due to space and HR constraints, management by location is often not followed and products are stored in aisles and other spaces not designated for storage. • Pallets are usually labeled, but during busy periods, labeling is delayed or forgotten. • Central-level warehouses are extremely full, obstructing the proper flow of product, people, and equipment. • Expired products often stay in the warehouse for longer periods, and it takes time to remove or destroy them. • Functional material handling equipment (motorized) is usually available in sufficient capacity. • Some of the warehouses have a

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| | control program is in place. Basic standards appear in SOPs and align with local/national/WHO standards for storing pharmaceuticals.

National/site hazardous chemical standards are reviewed and updated at least once a year. The standards reflect current hazards in use and include material safety data sheets, requirements for personal protective equipment (PPE), and procedures for hazardous disposal, spill, and fire.

Cooling and heating systems maintain a constant temperature and have up-to-date maintenance plans. Cold-storage infrastructure should be electronically monitored and have an alarm for temperature deviations. Back-up generators are in place should the power go out.

A mature security system includes a perimeter fence, controlled access guarded by security and logging all vehicles entering and exiting, staff identification cards, and cameras recording future playback. | generator, but there are problems with maintenance and fuel supply.
- No H&S SOPs are available. In general, PPE equipment, standards, and safety information/procedures are lacking.
- Some of the warehouses have insulation and cold chain storage facilities while others have neither.
- There are security guards but there is a lack of monitoring and alarm equipment. Also, security SOPs are not 100% adhered to. Cameras and closed-circuit television are usually installed, but monitoring is limited and the equipment is often faulty.

Provincial
- Most of the provincial warehouses don't have enough space to store products on pallets and shelves.
- Air conditioners are installed, but some lack a thermometer to control temperature.
- All provincial warehouses have security with guards and grids.
- Fire safety equipment is not available and accessible, and staff are not trained in its use.
- Some provincial warehouses lack closed-circuit television.

District
- District warehouses have insufficient space to store products, and some don't have enough pallets and shelves.
- Air conditioners are installed, but some do not have a thermometer to control temperature.
- All district warehouses have security with grids and doors.
- Fire safety equipment is not available and accessible, and staff is not trained in its use.

Health facility
- Health facilities have a small area to store products but no pallets. Most lack shelves and fire safety equipment. |

Warehousing and inventory management infrastructure facility information analysis:

The three critical practices of product security, removal of unusable stock from inventory, and use of FEFO for inventory management were well followed by more than 80 percent of the facilities. The high number of facilities that are either over or less than 80 percent full has negatively impacted acceptable storage capacity.

Tables 12, 13 and 14 provides results of the direct observation checklist, which is used to validate what the data collectors recorded from the CMM key informant interviews.

Table 12. Direct observation of storage conditions processes

No.	Storage conditions	Percentage of facilities
1	Warehouse is secured with a lock and key, but it is accessible during normal working hours; access is limited to authorized personnel.	87.7%
2	The facility makes it a practice to separate damaged and/or expired products from usable products and removes them from inventory.	86.8%
3	Products are stored and organized so that they are accessible for first-to-expire, first-out (FEFO) counting and general management.	82.1%
4	Products ready for distribution are arranged so that identification labels and expiry dates and/or manufacturing dates are visible.	70.8%
5	There is at least 30cm from the top of the highest stack/rack to the ceiling/roof of the building.	57.5%
6	Products are stored separately from insecticides and chemicals.	55.7%
7	Products are stacked no more than 2.5m high, if products are not in racking.	49.1%
8	Products are stacked at least 30cm away from the walls and other stacks, if products are stacked on pallets in block formation and not in racking or shelving.	28.3%
9	Product groups are allocated to specific storage zones separated by partitioning of any kind.	22.6%

Note: Red (0–60%) to yellow (61–80%) to green (81%+) indicates performance is increasing from low to high.
*Facilities sampled =106.

Acceptable storage capacity is critical for inventory management, as proper storage practices and processes are negatively impacted by lack of space at every supply chain level. Most of the time the central warehouses are unaware of arriving product, and this has greatly contributed to overfilling, particularly at the central level. Storage capacity is not the only constraint within the infrastructure and warehousing section; Figure 16 lists these other challenges. However, the data collected in the assessment highlights storage capacity as a critical concern to be addressed due to the systemic impact on the entire supply chain.

Figure 16. Percentage of storage facilities meeting acceptable storage capacity
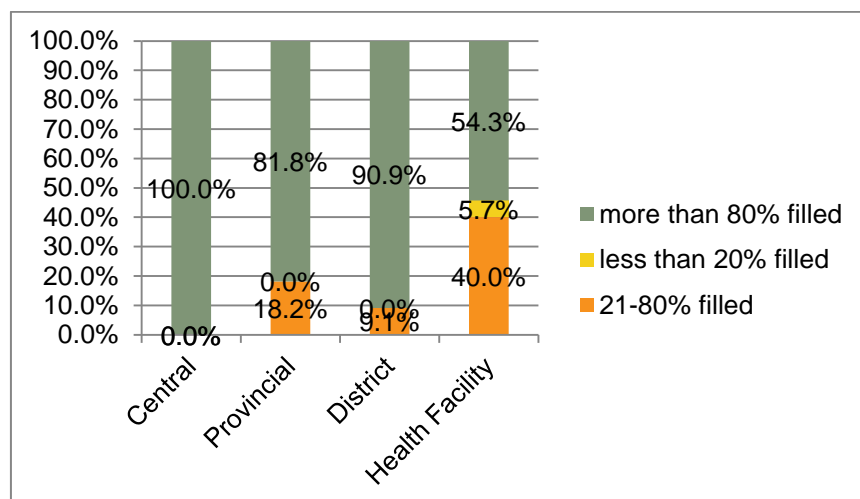
*Facilities sampled =106.

Most (80 percent) of the central-, provincial-, and district-level warehouses as well as more than half (54.3 percent) of the health facilities reported having more than 80 percent of their available space occupied with health commodities. According to best warehousing practices, having less than 20 percent of available space within a storage facility leads to warehouse operational problems, for example, not enough room to maneuver equipment such as forklifts. On the other hand, while central-level facilities are overstocked, health facilities find themselves with low levels of months of stock on hand and frequent stockouts due to not receiving products on time. Products for which there is no demand, such as Microgynon, are presently taking up warehouse space.

Table 13. Direct observation of storage conditions infrastructure and cold storage conditions processes

No.	Storage conditions (provincial, district, and health facility)	Percentage of facilities
1	Products are protected from direct sunlight.	90.6%
2	Cartons and products are in good condition and not crushed due to mishandling. If cartons are open, determine if products are wet or cracked due to heat/radiation (fluorescent lights for condoms, cartons right side up for Depo-Provera®).	88.7%
3	Cartons and products are protected from water and humidity.	80.2%
4	Warehouse is maintained in good condition (clean, all trash removed, sturdy shelves, organized boxes).	78.3%
5	Warehouse is visually free from harmful insects and rodents. (Check the storage area for traces of bats and/or rodents [droppings or insects].)	77.4%
6	Roof is maintained in good condition to avoid sunlight and water penetration.	73.6%
7	The current space and organization are sufficient for existing products and reasonable expansion (i.e., receipt of expected product deliveries for the foreseeable future).	27.4%
8	Transport vehicle gets loaded and unloaded under cover	22.6%
9	Products in the warehouse are stored at appropriate temperature according to	22.6%

No.	Storage conditions (provincial, district, and health facility)	Percentage of facilities
	product temperature specifications (less than 25 degrees centigrade).	
10	Dispatch bay is fully secure and weatherproof.	21.7%
11	For products stored above 2m, some type of access to equipment is provided (e.g., step ladders or step trolleys).	20.8%
12	Fire safety equipment is available and accessible (any item identified as being used to promote fire safety should be considered).	19.8%
13	Floor marking is in place to clearly define storage versus access space.	8.5%

Note: Red (0–60%) to yellow (61–80%) to green (81%+) indicates performance is increasing from low to high.
*Facilities sampled =106.

With only 22.6 percent of storage facilities meeting room temperature requirements, the lack of room temperature control is a significant challenge Note that this was the only KPI measured for cold chain conditions. There is little documentation about temperature tracking, and therefore little understanding of how high temperatures have reached and for how long. Table 14 shows the scores specifically for observations of the cold chain infrastructure.

Most of the storage facilities appear to be in working structural condition. Acceptable storage capacity is a constraint; only 34 percent of facilities have room to expand (see Table 6). Receipt and dispatch areas for checking incoming product and for preparing for delivery lack appropriate weatherproofing. Most concerning is the lack of access to fire safety equipment, with only 19.8 percent of facilities reporting access. This data comes from a direct observation form at the district and health facilities and is presented in Table 13.

Figure 17 shows the infrastructure capabilities across all supply chain levels.

Figure 17. NSCA CMM infrastructure capabilities across all supply chain levels

Category	Percentage
Vehicle temperature control management	22.3%
Building conditions	34.2%
Special handling infrastructure and capacity for controlled substance/ high-value product storage	35.4%
Safety equipment	23.2%
Special handling infrastructure and capacity for expired products	39.8%
Housekeeping	39.2%
Storage conditions and capacity	42.5%
Cold chain infrastructure and capacity (answer only if refrigerated items are stocked)	31.6%
Material handling equipment	22.3%
Building temperature control (skip if commodity temperature range does not require heating or cooling)	28.6%
Site structure and security	36.0%
Work safety	31.0%
Power	48.2%

Note: Facilities surveyed = 106

Across all the capabilities that make up infrastructure in warehousing and inventory management and transportation, maturity was well below 60 percent. Temperature control in the Zimpeto warehouse is low because there are no thermometers to control temperature and storerooms lack air conditioning units. CMAM does not have a formal transportation network in place, and vehicle availability to transport commodities to lower levels is a significant challenge. At this time, CMAM is responsible for transporting product to the provincial level, the provinces are responsible for transportation to the district, and the district is responsible for transportation to the health units. This last segment is creating a bottleneck. Although a VillageReach assessment recommended the outsourcing of transportation, MISAU prefers that CMAM purchase vehicles. However, funding has yet to be made available for this transaction. Lack of safety equipment and material handling equipment is also a concern.

Table 14. Direct observation of cold storage conditions infrastructure

No.	Cold chain storage conditions (provincial, district, and health facility)	Percentage of facilities
1	The warehouse has a functioning refrigerator(s) to store vaccines and/or HIV test kits (if required).	73.6%
2	Refrigerators are located away from any surrounding objects (approximately 45 cm).	57.5%
3	The temperature in the cold chain is between 0 and 8 degrees centigrade.	55.7%
4	The temperature chart is up-to-date. (To be up-to-date, an entry must be made for the day before the visit).	34.9%

Note: Red (0-60%) to yellow (61-80%) to green (81%+) indicates performance is increasing from low to high.
*Facilities sampled =106.

Only 73.6 percent of facilities have access to a functioning refrigerator, and only 57.5 percent of the cold chain storage was found to be at the appropriate temperature during the site visit, not surprising when considering the lack of continuous access to water and electricity.

Figure 18 shows availability of water and electricity at warehouses at each system level.

Figure 18. Access to electricity and water by supply chain level
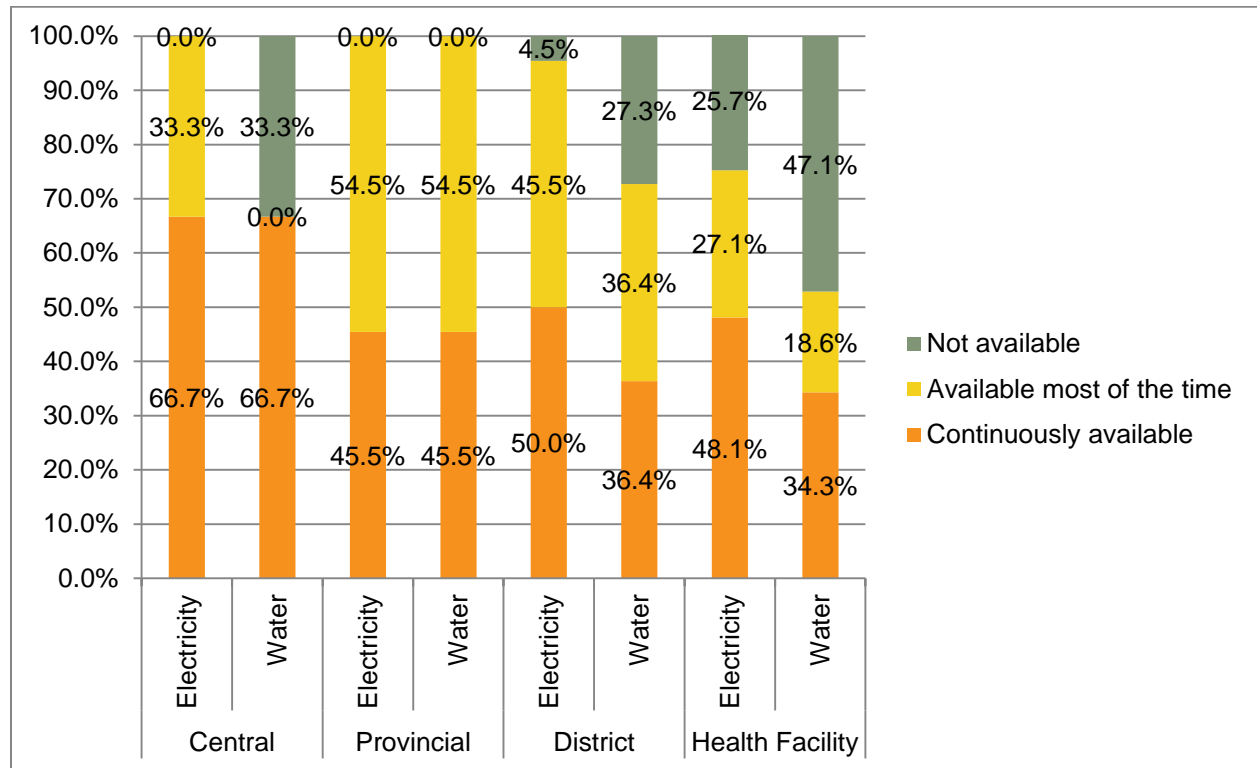
*Facilities sampled =106.

Water and electricity are basic requirements when running facilities. When the system is considered as a whole, less than half of all facilities have continuous access to water and electricity across all levels. Serious infrastructure gaps are seen at the health facility level, where 47.1 percent of facilities do not have access to water and 25.7 percent do not have access to electricity. With gaps in infrastructure, performance and maturity are challenged at the onset.

Enabler	Best practice	Observations in Mozambique
Strategic planning and oversight **CMM score: 40.2%**	Good warehousing and inventory management practices ensure multiple-year operational plans are aligned with national strategy and clear goals can be achieved. Operational plans include resource planning to address increases or fluctuations in volume as well as performance goals and metrics developed for all departments, which are tracked and reported. These processes are led by the MISAU with full ownership of the warehousing and inventory process and results.	**Central** • CMAM has developed a long-term strategic plan but the plan has not been operationalized nor budgeted. • Key warehousing KPIs are being collected and monitored. • Resource planning is not routinely done. **Provincial** • A warehouse-specific strategic plan is lacking. • PESS is in use. • Key warehousing KPIs are being collected and monitored. **District** • A strategic plan is lacking. **Health facility** • A strategic plan is lacking.
Human resources **CMM score: 44.0%**	Supply chain management (SCM) staff positions are designated within the organizational structure and filled by staff who have strong SCM core competencies. Core competency frameworks are clearly defined for all supply chain positions at all levels and consistently and fairly applied. SCM positions are recognized as a professional cadre of workers within the health system. A combination of off-site training tailored for management staff, and on the job (OTJ) in-country training and mentoring for operational staff, supported by supervision and performance management plans, can be effective in strengthening HR capacity in the warehousing and distribution technical area.	**Central** • Not enough staff have specific training in SCM. • SCM professionals are recognized as logisticians, but this is not a professional category recognized within the health care system (e.g., pharmacists). As a consequence, several supply chain functions are still performed by pharmacists and pharmacy technicians who are insufficient in number to fulfill these and their pharmacist duties. • Since Mozambique does not have an SCM degree program, USAID implementing partners provide SCM in-service training. • Staff training is mainly OTJ training. People are brought to the main central warehouse in Zimpeto from other locations to gain additional knowledge and skills ("*troca de experiencia,*" or experience exchange, program) in warehousing SOPs, forklift use, and the WMS. • CMAM does not have an internal training department. **Provincial** • Not enough staff have specific training in SCM. • Staff training is mainly OTJ training.

		District
		• Not enough staff have specific training in SCM.
		• Staff training is mainly OTJ training.
		Health facility
		• None of the staff have been trained in SCM.
		• Staff training is mainly OTJ training.

Warehousing and inventory management HR facility information analysis:

CMAM requires that at least one staff member from every facility be trained in the SOPs Manual, 3rd edition. To facilitate meeting this requirement, the projects conducted an initial nationwide training in 2012 and early 2013 and additional trainings around the country since then. Of all the levels, the provincial level has the highest percentage of facilities with at least one staff member who attended the training. This indicator measures whether or not an individual from each site has been trained. It does not capture follow-up training, dissemination of training throughout the site, or continued OTJ training. It also does not validate whether or not training a single individual at each site is sufficient for improving supply chain performance.

Figure 19 shows the percentage of facilities that meet the CMAM requirement to have at least one staff member trained in the SOPs manual.

Figure 19. Percentage of facilities with at least one supply chain staff trained in the SOPs Manual, 3rd edition, by system level
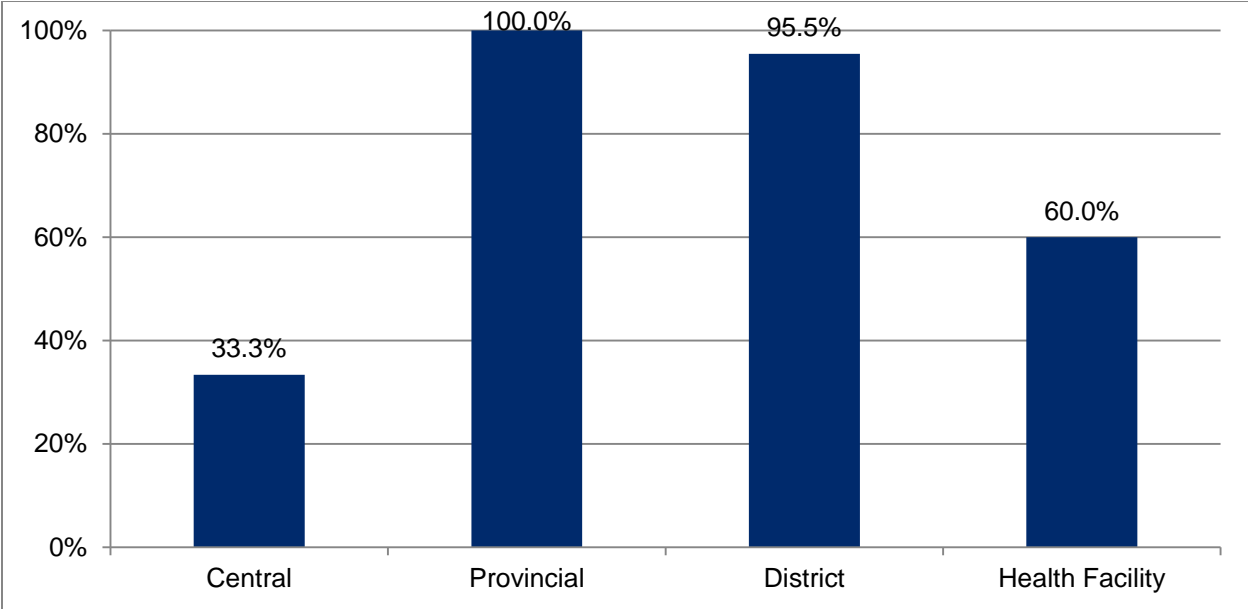
*Central Facilities sampled =3, provincial Facilities sampled =11, district Facilities sampled =22, and health facility Facilities sampled =70.

Figure 20 shows the percentage of staff from each supply chain system level who were trained in the SOPs Manual, 3rd edition.

Figure 20. Percent of supply chain staff trained in the SOPs Manual, 3rd edition, by system level
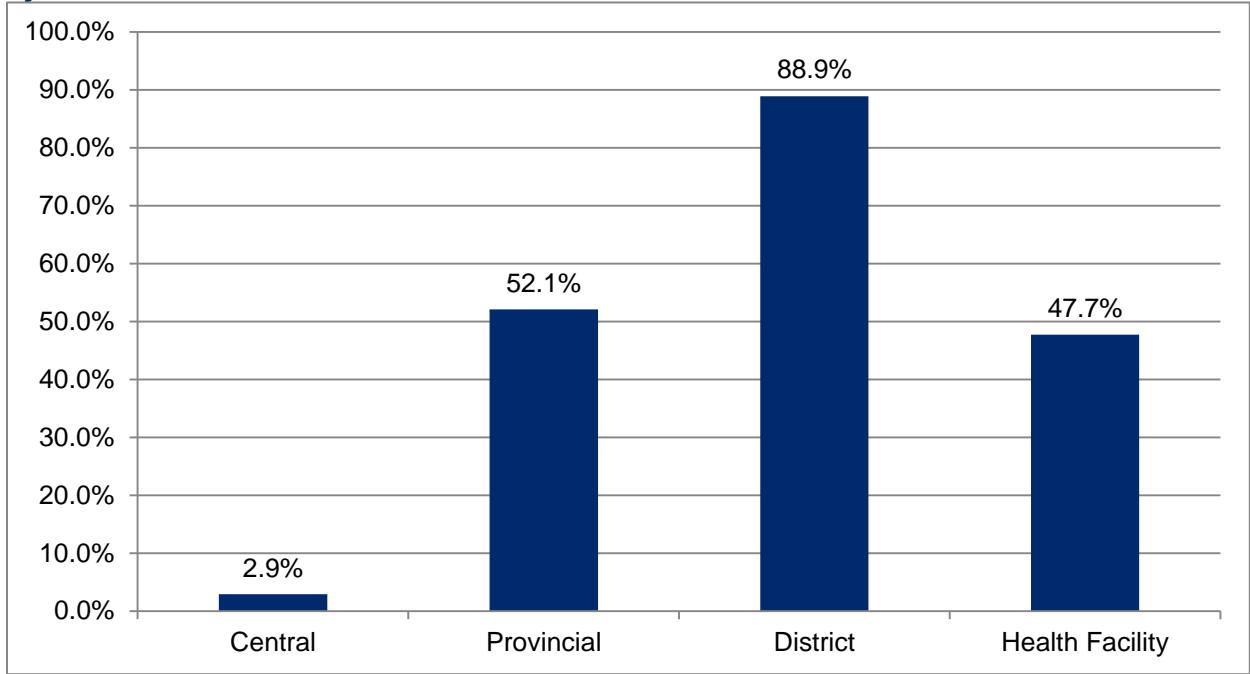
*Facilities sampled =106

Note: Two central-level staff trained were selected to serve as trainers for lower levels. Training in the SOPs Manual, 3rd edition, is not intended for central-level use.

When the number of facilities with at least one supply chain staff member trained in Figure 19 is compared with the percentage of supply chain staff trained across all levels of the system in Figure 20, only 2.9 percent of all central-level supply chain staff have received training in the SOPs Manual, 3rd edition. Since SOPs are for use by staff in provincial, district, and health facility levels, mostly staff in these levels were invited to participate. Note that the two central-level staff trained were selected to serve as trainers for lower-level staff.

As Figure 21 shows, data was also collected to assess staff turnover by supply chain level.

Figure 21. Staff turnover by supply chain level
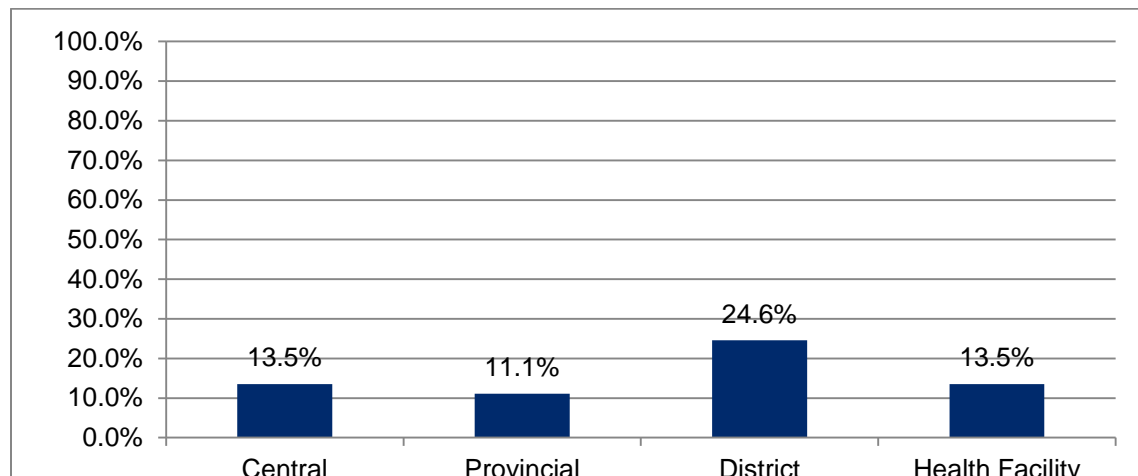
*Facilities sampled = 106.

Although the district level has the highest percentage of staff turnover, this is low on average across all supply chain levels. At the same time, the central level has experienced high turnover for the critical role of warehouse manager, as four different persons have occupied this position at the central warehouses of Adil and Zimpeto. This constant state of transition for the warehouse manager presents a significant operational challenge in these two warehouses. This also means that although the projects train new warehouse managers in warehousing SOPs, their turnover adds to the burden of project staff who need to train every newly hired warehouse manager.

Risk statement:
When SCMS assistance ends in June 2016, and unless current gaps are covered by additional MISAU staff, continuing partner support, or outsourcing of more supply chain functions, warehousing and inventory management activities may experience the following risks:

- Since SCMS is active in providing technical assistance for the WMS, once the projects end, CMAM will need to work with stakeholders to develop continued plans for managing the WMS. Currently, CMAM does not have the means to train new staff, pay for the WMS license, or update the hardware on its own. With the current turnover rates and lack of clearly identified processes for training and handover, continuity of correct use and maintenance of the system is at risk.

- CMAM has been financially unable to hire additional laborers to handle the kitting of Coartem and relies on SCMS and the USAID | DELIVER PROJECT to hire and manage temporary staff for this activity. Alternative plans will need to be developed in the short term to ensure the kitting can continue after the end of the SCMS and USAID | DELIVER PROJECT.

- Many of these storage conditions, particularly product separation from insecticides and chemicals, stacking more than 2.5m high, at least 30cm from walls and other stacks, and grouping, may deteriorate after the end of the projects if CMAM central-level staff or warehouse staff in other levels fail to follow the SOPs. Also, 75 percent of the central-level

warehouses are rented by SCMS and USAID |DELIVER PROJECT and when both projects end, arrangements will need to be made to ensure the continued rental of central warehouses. Furthermore, seconded staff from SCMS and USAID | DELIVER PROJECT, as well as other partners, aid in the day-to-day operations of the central-level warehouses. This is seen as a substantial risk, and if CMAM cannot adopt the rental space or hire knowledgeable staff to continue the operations of those warehouses, this score will decrease immediately.

CMAM relies on the donors and donor-supported projects to hire staff to assist with managing warehouses and analyzing LMIS data (see Table 1), especially at the central level (headquarters and warehouses). Although CMAM staff has been trained in the SOPs, procedures are often not followed step by step, and further supply chain training, outside of trainings provided by USAID implementing partners, are infrequent. Therefore, planning needs to take place to make sure key positions are filled in the near and long term, particularly with the upcoming end of the SCMS project.

Central warehouse staff relies on project staff while provincial warehouse staff relies on implementing partner staff to perform routine warehousing tasks such as ensuring stock accuracy, do housekeeping, and implement FEFO rules to avoid disorganization, block stacking, expiries, and stockouts. If project staff are not present, these tasks are often not completed even when warehouse staff have received training in warehouse SOPs. After the projects end, and unless other partners continue providing warehouse-based technical assistance, there is a risk that the level of SOP adherence will decrease.

Investments in staff training and donor-funded efforts to transfer knowledge and skills are often lost due to staff turnover within CMAM. Market availability of highly skilled and competent human resources is limited. These workers often leave the public health sector for the growing private sector or for nongovernmental organizations and implementing partners, where salaries are better. The lack of administrative autonomy within CMAM does not allow the department to create competitive conditions for retaining these highly skilled staff.

After 2016, there is a risk that the budget will not be available from MISAU to replace and/or pay the salaries of seconded staff for continuity of activities.

Key Challenges and Recommendations

Description of key challenges

- Infrastructure is insufficient.
- Qualified logistics staff is in short supply.
- Health and safety procedures and equipment are lacking.
- Warehouse SOPs and adherence to good warehousing practices (GWPs) are lacking.

Short-term intervention	Medium-term intervention	Long-term intervention
Process and tools - Assess warehouse H&S. - Create more storage conditions and cold chain area at the district and health facility levels. - At the district and health facility levels, designate a quarantine area for expired products. - At the district and health facility levels, designate a separate area for storing flammable products. Fire safety equipment and training in its use are also needed. **HR** - Retrain warehouse staff in WMS system and updated warehouse SOPs. - Hire staff instead of having donor-seconded staff. - Develop formal WMS training modules. **MIS** - Introduce inventory turnover KPIs to measure warehouse performance. - Spread implementation of radio frequencies to all central warehouses. **Oversight and strategic planning** - Use inventory turnover and stocked-according-to-plan	**Process and tools** - Develop H&S SOPs. - Further analysis of the impact on buffer stock related to the practice of pushing stock to lower levels. **HR** - Develop operational plan for HR. - Train staff in H&S. - Provide long-term senior technical assistance in all CW warehouses (embedded) to implement warehouse SOPs and GWPs and build up a professional cadre. **MIS** - Ensure that SIMAM is available in every district. **Oversight and strategic planning** - Develop an operational plan for infrastructure. - Use outcome of outsourcing cost and feasibility study to decide to best way forward.	**Process and tools** - Use appropriate counting procedures, supported by MACS. **HR** - Develop logistics cadre that can manage third-party logistics service providers. - Hire staff instead of having donor-seconded staff. **MIS** - Ensure that SIMAM is available in every health facility. **Oversight and strategic planning** - Construct warehousing infrastructure (central and regional level) and/or implement outsourcing plan. - Develop a strategic plan for infrastructure and HR.

indicators to select low-scoring products and improve forecasting, supply planning, and procurement for these products to improve product turnover rates. • Conduct a cost and outsourcing feasibility study for the central- and regional-level warehouses. • Assess the impact of central-level CA integration on the lower levels in the CA supply chain (provincial and district stores).		

3.7 Transportation

Transportation: CMM and KPI scores	
Capability maturity score	39.5%
KPIs	
No transportation-related KPIs were collected during the assessment period.	NA

Table 15. Transportation capability by enabler

Transportation	Average	Percentage
Process and tools	2.4	47.2%
Management information system	1.8	36.3%
Infrastructure	1.1	22.3%
Oversight	2.2	44.3%
Human resources	1.8	36.6%

Functional area	Central	Provincial	District
Transportation	49.1%	43.2%	37.1%

*Central Facilities sampled =1, provincial Facilities sampled =11, district Facilities sampled =22.

* Red typeface indicates poor maturity with a score of less than 60 percent.

Transportation: enablers and observations		
Transportation	The integrity of the distribution chain is a key best practice essential for ensuring patient access to commodities.	
Enabler	**Best practice**	**Observations in Mozambique**
Process and tools **CMM score: 47.2%**	Distribution planning is a key component of operating an efficient on-time delivery service. Transportation SOPs comply with national and local regulations. A person is assigned responsibility for policy management. All employees are required to read the SOPs, and their compliance is documented. SOPs are updated whenever procedures or system functionality are changed. Document control practices are in place to ensure dissemination to relevant personnel.	**Central** • CMAM uses distribution plans, and third-party vehicles are called upon when needed for transporting to lower levels in the supply chain (e.g., central to provincial). Third-party providers used by the central level include Sadula and Lalgy. The USAID | DELIVER PROJECT uses NTS – *Transportes y Serviços* and Movicargo to distribute ACTs and RDTs. • It is difficult for CMAM to manage third-party transport providers due to a lack of financial autonomy. Some transporters provide low-quality

		services in terms of timeliness and truck quality (e.g., use of open trucks due to lack of closed trucks). • No transportation SOPs are available. • No transportation KPIs were collected. **Provincial** • Some provinces use rental transport (e.g., Clinton Foundation vehicles), while others use DPS vehicles to supply to the district level. • Transportation SOPs are not available. • Transportation KPIs are not collected. **District** • From district to health facility levels the transportation is by Health District Directorate transport, and some health facility staff go to their district facility to collect products. • Transportation SOPs are not available. • Transportation KPIs were not collected.

Transportation processes and tools facility information analysis:

A range of transportation mechanisms is used for product delivery and pick-up across all supply chain levels (see Figures 24 and 25). Most transport takes place through formal mechanisms such as an MISAU delivery vehicle or a third-party partner-financed vehicle at the provincial and district levels. However, the availability of these transportation mechanisms drops significantly below the central level, with the health facility level using an MISAU vehicle not intended for health commodity delivery in 52.9 percent of facilities. The MISAU vehicles not intended for health commodities include ambulances or various vehicles used for supervision visits. A total of 27.1 percent of health facilities reported using other transportation methods to pick up from the district level, which include motorbikes and human resources (for facilities within walking distance of the district warehouse). Some health facilities receive product directly from the provincial level. Transportation costs and requirements are difficult to determine when considering the multiple methods combined with the informal mechanisms used for transporting product. Figures 23, 24, 25 reflect facility information indicators and do not impact the CMM scores. They provide further context to the qualitative data captured during the CMM key informant interviews.

Figure 22. Transportation to facilities by facility level
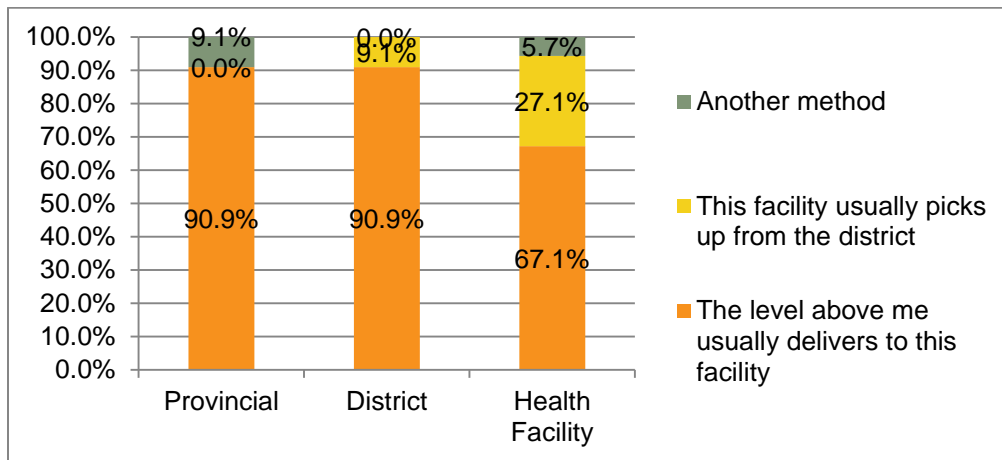
*Facilities sampled =103.

Note: The denominator includes all the sampled sites except for the three central level warehouses: 11 provincial warehouses, 22 district warehouses, and 70 health units, or *unidades sanitárias*.

The central level has a quarterly delivery schedule (see Figure 24). Below the central level (provincial and district levels), a monthly delivery schedule was reported, but fixed delivery schedules are not an established practice. Of all the provincial-level facilities, 54.5 percent reported having a fixed delivery schedule. This percentage decreases to 40.9 at the district level and to 14.3 percent at the health facility level. Without an established delivery schedule to measure against, transportation KPIs cannot be applied to measure performance and determine if delivery is a key barrier to product access or how to optimize frequency and routing.

Figure 23. Delivery schedule by facility level
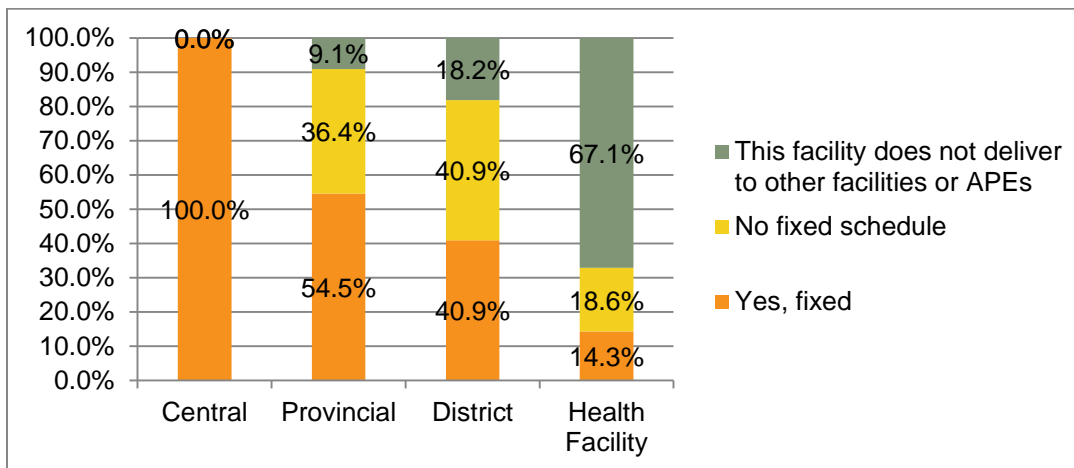
*Facilities sampled =106.

Note: The denominator includes all the sampled sites: three central-level warehouses: 11 provincial warehouses, 22 district warehouses, and 70 health units, or *unidades sanitárias*.

70

As Figure 25 demonstrates, transportation types vary by supply chain level. Most levels except for the central level rely on multiple forms of transportation to distribute commodities to the lower levels.

Figure 24. Transportation method by facility level
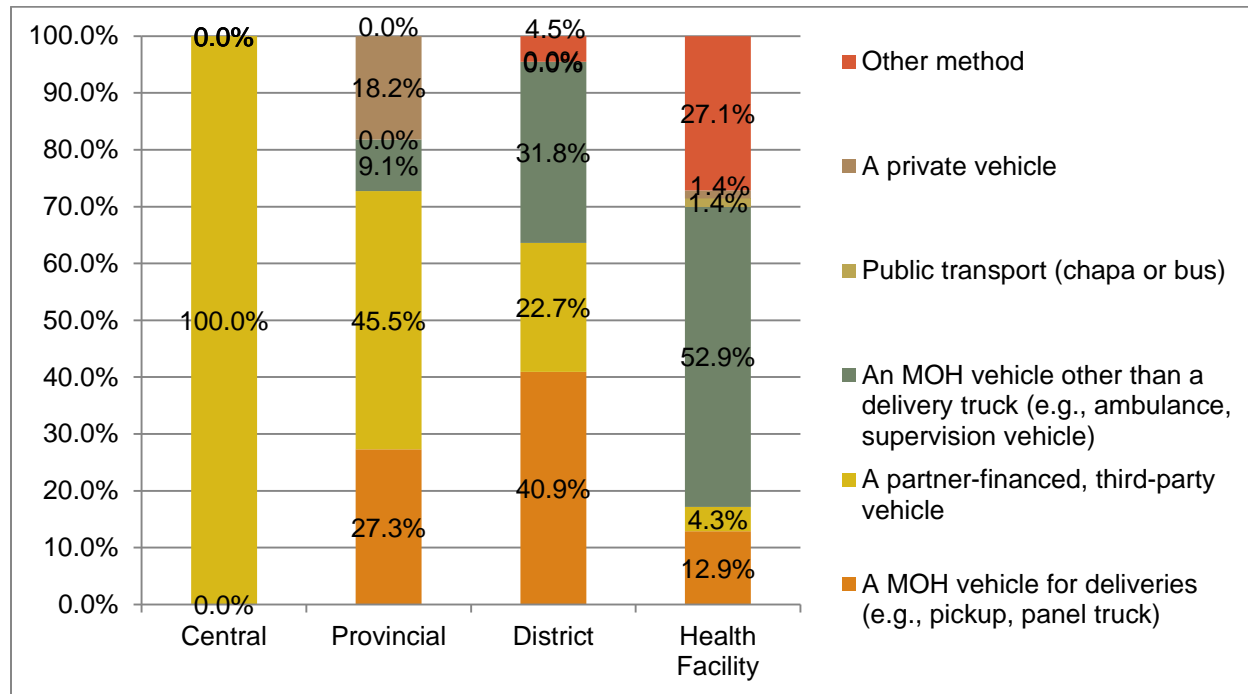
*Facilities sampled =106.

Note: The denominator includes all the sampled sites except for the three central-level warehouses: 11 provincial warehouses, 22 district warehouses, and 70 health units, or *unidades sanitárias*.

CMM	Best practice	Observations in Mozambique
Management information systems **CMM score: 36.3%**	Supply chain transportation data is visible in real time to all stakeholders, who are empowered and understand how to use this information to streamline processes and improve performance. Computers with suitable software are functional and available to everyone who needs them for collecting supply chain transportation data.	**Central** • No transport management software is available and no Excel spreadsheet is in use to manage or plan transportation to the end user. • Transport data is not visible. • Transport KPIs are not being collected or monitored. **Provincial** • Transport data is not visible. • Transport KPIs are not being collected or monitored. **District** • Transport data is not visible.

| Infrastructure CMM score: 22.3% | Vehicles used to distribute pharmaceutical products are suitable to maintain product stability and packaging integrity. Security protocols are established and monitored regularly to avoid product loss. Maintenance programs are in place to ensure vehicle availability and longevity. Distribution planning is used and regularly tracked, with adequate vehicle routing planned to achieve consistent delivery schedules. Cold chain packaging, equipment, and temperature monitoring are used for transporting cold chain products. | **Central**
• CMAM uses mainly third-party transport providers and owns only a small fleet of trucks and vehicles. No preventive maintenance system is in place, and breakdowns are reactively managed and based on fund availability.
• CMAM uses waybill "*guías de remessas*" but has challenges obtaining signed PODs and returning them to the central level to close the process and to prove delivery has taken place.
• Constant delivery schedules and route planning are not in place.
• Almost no cold chain packaging or temperature monitoring occurs during transport. **Provincial**
• The provincial level uses signed issue vouchers through SIMAM but has challenges obtaining signed PODs to close the process and ensure delivery has taken place.
• Constant delivery schedules and route planning are not in place.
• No cold chain packaging or temperature monitoring occurs during transport. **District**
• The district level uses issue vouchers either completed and signed electronically through SIMAM or by hand. Signed issue vouchers are returned to the district level to close the process and ensure delivery has taken place.
• No cold chain packaging or temperature monitoring takes place during transport. |
| **Strategic planning and oversight** **CMM score: 44.3%** | Professional logisticians are working collaboratively with procurement to manage transportation using some Ex Works procurement based on best-cost decisions. A defined entity within the government, traditionally the MISAU, is responsible for ensuring that the transportation of products follows an established process and results are monitored and evaluated. KPIs are established to monitor the transportation process and are | **Central**
• There is little communication between procurement and warehouse or transport managers.
• Most procurement is done with delivered duty paid and cost insurance and freight international commercial terms.
• No process is followed or SOPs established for transportation activities.
• No KPIs are in place for transportation so no benchmarking or costing is used. **Provincial**
• There is little communication between provincial and district levels or transport |

	benchmarked across transportation service providers. Action plans per KPIs are generated monthly.	managers. • Processes or SOPs have not been established for transportation activities. • There are no KPIs in place for transportation so no benchmarking or costing is used. **District** • The district and health levels have little communication. • Processes or SOPs have not been established for transportation activities. • There are no KPIs in place for transportation so no benchmarking or costing is used.
Human resources CMM score: 36.6%	Transportation management (SCM) staff positions are designated within the organizational structure and filled by staff with relevant licenses and training required for selected core competencies. Alternatively, transportation is outsourced to a selected vendor and performance tracked against a documented service-level agreement. A relevant oversight manager is identified to manage the transportation vendor and support client needs. Risk management and contingency planning roles and responsibilities are clearly defined, reviewed annually, updated, and actively tracked. SCM positions are recognized as a professional cadre of workers within the health system.	**Central** • There is no transportation department and only recently was a staff person hired to organize and plan transport. • Transport is mostly outsourced, but service-level agreements are not closely monitored. • Risk management or contingency planning roles are not defined or regularly updated. • CMAM and the National Health System lack a logistics (transportation) cadre. **Provincial** • No transportation department is in place. • Transport is mostly outsourced but service-level agreements are not closely monitored. • Risk management or contingency planning roles are not defined or regularly updated. • Logistics (transportation) is lacking. **District** • No transportation department is in place. • Logistics (transportation) is lacking.

Risk statement:

The projects distribute only selected products (such as RDTs and ARTs) from the central level to the provincial level down to the district level. After the projects end, there is a risk that CMAM will be unable to provide transportation for these products.

CMAM often relies on district-level facilities or on clinical partners to provide and/or cover transportation costs using third-party logistics (3PLs), particularly beyond the provincial level. *Direcção Provincial de Saúde* (DPS) vehicles assigned to the *Depósito Provincial de Medicamentos* (DPM)

should, in principle, carry out transport from the provinces to the districts.[30] However, due to difficulties ranging from insufficient or faulty vehicles to lack of fuel, the districts often collect products with their own vehicles, generally ambulances, when not in normal use.[31] The increase in the volume of loads to be transported, the change in transport frequency to monthly, and the possibility of obtaining vertical support to transport only certain types of products made transport management on a provincial level chaotic.[32] These difficulties and restrictions apply also to the final part of the journey between the districts and the innermost health units.[33]

After the end of the project, transportation will likely not be as reliable unless provincial-level facilities can continue to cover transportation to district levels and clinical implementing partners can cover transportation to the health facility level.

Key Challenges and Recommendations

Description of key challenges
• Infrastructure is poor and the service level of third-party transport providers is low quality. • CMAM does not have a transportation department to provide oversight. • The transportation fleet is insufficient. • Funds to procure more vehicles are lacking. • Preventive maintenance measures are lacking. • Transport management software is lacking.

Short-term intervention	Medium-term intervention	Long-term intervention
Process and tools • Create SOPs for transportation. • Develop adequate service-level agreements for transporters. • Develop a system to collect and measure transport KPIs. **HR** • Develop TORs for transport department/staff. **MIS** • Conduct a requirement analysis for transportation management software.	**Process and tools** • Develop preventive maintenance system/schedule for own fleet. • Conduct an assessment to determine the number of trucks required for an operational national transportation system. **HR** • Recruit transport specialists/staff to plan transport and monitor third-party transport providers. **MIS** • Develop or adapt transport management software.	**Process and tools** • Expand transportation fleet. **MIS** • Implement transport management software. **Oversight and strategic planning** • Develop a strategic plan for transport, especially from the district level to health facilities.

[30] Mozambique Strategic Plan for Pharmaceutical Logistics (PELF). 2014.

[31] Ibid

[32] Ibid

[33] ibid

Oversight and strategic planning • Execute a transportation cost and outsourcing feasibility study.	**Oversight and strategic planning** • Develop plan and budget for own fleet and third-party transport providers.	

4.0 Short-Term Recommendations

Below is a summary of the short-term recommendations for the categories product selection, forecasting and supply planning, procurement, warehousing and inventory management, transportation and HR capacity development. This list of recommendations was devised from findings in the NSCA as well from from the PELF.

Product Selection

Update Mozambique National Formulary of Essential Drugs to include all products listed in the NEML and STGs. Within these documents, include the corresponding product strengths and formulations and disseminate the updated documents nationwide. Within the NEML, use the VEN list to prioritize items that must be in "full supply" as some medicines are more essential than others.

Forecasting and Supply Planning

Improve the processes used to quantify products needed by the public health service. Collect consumption data on medicines and other products, to assess consumption at the health facility level. Consumption data can then be used by CMAM's quantification team to determine needs for each type of product. Complete ABC and VEN analyses to examine consumption and expenditure of commodities within health facilities. Use the results of the analysis to prioritize commodities for future supply planning (PELF, pg 28.).[34]

Finalize the development of the Central Tool, as the main electronic LMIS database, and thereafter develop modules to link data from current multiple electronic LMIS data streams (SIMAM, SIP, and MACS). Maintain the integrity of product description and/or pricing information across LMIS databases. Assure suitable software for forecasting and supply planning is available and linked with the Central Tool, and that all. CMAM staff is trained in the use of the forecast and supply plan tools.

Procurement

Sensitize MISAU and the Ministry of Finance aware of the limitations of the current Public Procurement Law and the need to reform the law to include a procurement process specific to pharmaceuticals and health products. Develop and implement specific procurement SOPs for pharmaceuticals within the framework of the current Public Procurement Law. Support implementation and daily use of CMAM's information management systems (SIP, SIF) and identify additional development needs. Analyze causes and consequences of frequent delays occurring in the

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[34] Republic of Mozambique. *Central de Medicamentos e Artigos Médicos*. Strategic Plan for Pharmaceutical Logistics (PELF). 2012.

importation process. Define appropriate responses to solve the importation issues (facilitate payment process or subcontract the importation and customs clearance process)[35] (PELF).

Warehousing and inventory management

Begin preparing the phased removal of the provincial level of the supply chain for medicines and surgical equipment and replace the current Provincial (DPM) and District (DDM) warehouses with *Depósitos Intermediarios* (Intermediary Warehouses).

Create more storage conditions and cold chain areas at the district and health facility levels. Equip and open Nampula Central Warehouse. Spread implementation of radio frequencies to all central warehouses (PELF, pg 12).[36]

Develop formal WMS training manuals, and retrain warehouse staff in WMS system and updated warehouse SOPs. Consolidate SIMAM in DPM and DDM with the warehouse management system (MACS) in the central warehouses (Maputo, Beira, and Nampula).

Introduce an inventory turnover KPI to measure warehouse performance. Use inventory turnover and stocked-according-to-plan indicators to select low-scoring products and improve forecasting, supply planning, and procurement for these products to improve product turnover rates. Adjust CMAM distribution system parameters (minimum, maximum, order frequency) for better supply chain efficiency and assist with decision making on when to order (pull) or distribute (push) and in which quantities to minimize stockouts and expiries at all levels. Finalize Central Tool integration (PELF, pg 31).[37]

Conduct a cost and outsourcing feasibility study for the central and regional level warehouses, to assess the impact of central-level CA integration on the lower levels in the CA supply chain (provincial and district stores).

Transportation

Create SOPs for transportation and develop TORs for transport department/staff. Develop adequate service-level agreements for transporters.

Conduct a requirement analysis for transportation management software. Develop a system to collect and measure transport KPIs such as frequency of deliveries and percentage of on-time delivery. Conduct a transport optimization study and execute a transportation cost and outsourcing feasibility study. The results from these studies can then be used to ensure speed of transport and that the cargo can be tracked and traced to its destination and at the lowest price possible (PELF, pg 35.)[38]

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[35] Ibid.

[36] Ibid.

[37] Ibid.

[38] Ibid.

HR capacity development

Advocate for the need to modify the approach to developing, recruiting, retaining, and motivating supply chain staff. Provide CMAM with the administrative autonomy to recruit, retain, and motivate staff and build staff capacity to improve SCM.

Introduce the concept and framework for a cadre of supply chain professionals and define the specific supply-chain-related competencies required of health workers. Develop a central-level staffing framework for CMAM's new administrative structure and begin preparing the framework for the logistics network that aligns with the PELF. Define the workforce plan according to supply chain requirements. The HR approach needs to be reformed at all levels, starting with the lower level. Develop clear and specific job descriptions for all positions in the supply chain to ensure that staff understand their responsibilities and perform their jobs accordingly. Develop in-service training strategy for the supply chain within the National Health Service, oriented toward priority needs (PELF, pg 14.)[39]

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[39] Ibid.

Annex 1

Tracer Commodities

No.	FNM	Products	Product type	Time frame
1	04B04	Misoprostol 200 µg, tabs	Essential medicine	Day of visit
2	04B05	Oxytocin, 5UI/mil, ampule	Essential medicine	Day of visit
3	04B07	Magnesium sulfate 10% 100mg/ml, ampule of 40ml	Essential medicine	Day of visit
4	04F09	Intra-uterine device (IUD), piece	Family planning	Day of visit
5	04F0XX	Male condoms, piece	Family planning	Day of visit
6	04FOYU	Microlut, carteira pack	Family planning	Day of visit
7	04FOYX	Levonorgestrel 150/Ethinylestradiol 300MCG (Microgynon), carteira pack of 28 tabs	Family planning	Day of visit
8	07A03	Paracetamol 500 mg tabs	Essential medicine	Day of visit
9	07A04	Paracetamol susp. 1g, bottle of 100 mls	Essential medicine	Day of visit
10	08A07	Amoxicillin 500mg, capsule	Essential medicine	Day of visit
11	08A08	Amoxicillin 250/5ml, powder for oral suspension, 100ml vial	Essential medicine	Day of visit
12	08A09	Ampicillin 500 mg, vial for injection	Essential medicine	Day of visit
13	08I01	Cotrimoxazole 480mg tabs	Essential medicine	Day of visit
14	08I03	Cotrimoxazole 240mg/5ml suspension, bottle	Essential medicine	Day of visit
15	08L08	Rifampicine 150mg, Isoniazide 75mg, Pyrazinamide 400mg, Ethambutol 275mg (4DFC), carteira pack	Tuberculosis	Day of visit
16	08O05	AL 1x6, carteira pack of 6 tabs	Malaria	Day of visit
17	08O05Y	AL 3x6, carteira pack of 18 tabs	Malaria	Day of visit

No.	FNM	Products	Product type	Time frame
18	08O05Z	AL 2x6, carteira pack of 12 tabs	Malaria	Day of visit
19	08O0XZ	Artesunate 60mg, vial for injection	Malaria	Day of visit
20	08O11	Quinine300 mg tabs	Malaria	Day of visit
21	08O12	Quinine 600mg/2ml inj. ampoules	Malaria	Day of visit
22	08O13	Sulfadoxine + Pyremethamine (SP) 500mg+25mg, tabs	Malaria	Day of visit
23	12C04	Zinc, 20 mg, tabs, box of 10 blisters of 10 tablets	Essential medicine	Day of visit
24	121	UNIGOLD® HIV-1/2, test	HIV test	Day of visit
25	04F07	Medroxiprogest-erone acetate (Depo-Provera®) 150mg/1ml, vial	Family planning	Day of visit, August 2014– October 2014
26	08O05X	AL 4x6, carteira of 24 tabs	Malaria	Day of visit, August 2014– October 2014
27	08S22	Nevirapine 200mg, capsule, bottle of 60 capsules	ARVs	Day of visit, August 2014– October 2014
28	ZEL124	Malaria rapid testing device, test	Malaria test	Day of visit, August 2014– October 2014
29	ZEL150	Determine® HIV -1/2, test	HIV test	Day of visit, August 2014– October 2014
30	08S42	Lamivudine (3TC) + Zidovudine (AZT) + Nevirapine (NVP) 150/300/200mg, tabs	ARVs	Day of visit, August 2014– October 2014
31	ZEL111	Lamivodine (3TC) + Nevirapine (NVP) + Zidovudine (AZT), 30/50/60mg, tabs	ARVs	Day of visit, August 2014– October 2014
32	08S18Y	Tenofovir (TDF)+ Lamivudine (3TC) + Efavirenz (EFV) 300/300/600mg, tabs	ARVs	Day of visit, August 2014– October 2014

Annex 2

Pilot Site List

Province	District	Health facility code/facility identifier	Facility name	Facility type	Level
Maputo Province	Matola	MAPP200	CS Tsalala	Health center 1	Health facility
		MAPP201	CS Liberdade	Health center 1	Health facility
		MAPP202	DPM Matola province	Warehouse	Provincial
Maputo Cidade	Maputo Cidade	MAPC300	CS Malangalene	Health center 1	Health facility
		MAPC301	CS Hulene	Health center 1	Health facility
		MPAC302	CS dos Pescadores	Health center 1	Health facility

Annex 3

Site List

Facility code	Facility name	Facility type	Supply chain level	Provincial	District	GPS-latitude	GPS-longitude
CAB01	Cabo Delgado	Warehouse	Provincial	Cabo Delgado		-12.9811022	40.5325325
CAB02	Balama	Warehouse	District	Cabo Delgado	Balama	-13.34795717	38.56610184
CAB03	Quissanga	Warehouse	District	Cabo Delgado	Quissanga	-12.43540647	40.48869576
CAB05	CS Mavala	Health center 1	Health facility	Cabo Delgado	Balama	-13.2260882	38.48074171
CAB06	CS Murripa	Health center 1	Health facility	Cabo Delgado	Balama	-13.46114363	38.69062448
CAB09	CS Nacoba (Expansao)	Health center 1	Health facility	Cabo Delgado	Quissanga	-12.6600382	40.42548792
CAB21	CS Bilibiza	Health center 1	Health facility	Cabo Delgado	Quissanga	-12.565033	40.285046
CAB23	CS Cagembe	Health center	Health facility	Cabo Delgado	Quissanga	-12.38257994	40.26248999
CAB24	CS Ntete	Health center	Health facility	Cabo Delgado	Balama	-13.27347332	38.63615736
GAZ01	Gaza	Warehouse	Provincial	Gaza		-25.04248688	33.64061583
GAZ02	Cidade de Xai-Xai	Warehouse	District	Gaza	Cidade De Xai-Xai	-25.0388716	33.6394173
GAZ02	Cidade de Xai-Xai	Warehouse	District	Gaza	Cidade De Xai-Xai	-25.0388716	33.6394173
GAZ03	Guija	Warehouse	District	Gaza	Guija	-24.4996653	33.0153583
GAZ04	HP Xai-Xai	Provincial hospital	Health facility	Gaza	Cidade De Xai-Xai	-25.06926103	33.65857305
GAZ05	CS Praia	Health center 1	Health facility	Gaza	Cidade De Xai-Xai	-25.11554564	33.72951622
GAZ06	PS Unidade Especial	Health post	Health facility	Gaza	Cidade De Xai-Xai	-25.04002101	33.71811859
GAZ07	CS Guija	Health center 1	Health facility	Gaza	Guija	-24.49954294	33.02054401

Facility code	Facility name	Facility type	Supply chain level	Provincial	District	GPS-latitude	GPS-longitude
GAZ08	PS Chinhacanine	Health post	Health facility	Gaza	Guija	-24.4009959	32.8956772
GAZ09	PS Sifo (Mubanguene)	Health post	Health facility	Gaza	Guija	-24.41506295	32.93875876
GAZ20	CS Xai-Xai	Health center 1	Health facility	Gaza	Cidade De Xai-Xai	-25.03845238	33.63928495
GAZ22	PS Chibabel	Health center	Health facility	Gaza	Guija	-24.5672631	33.19228434
INH01	Inhambane	Warehouse	Provincial	Inhambane		-23.86969501	35.3813134
INH02	Inhassoro	Warehouse	District	Inhambane	Inhassoro	-21.53924359	35.18907445
INH03	Panda	Warehouse	District	Inhambane	Panda	-24.06670783	34.72853967
INH04	CS Inhassoro	Health center 1	Health facility	Inhambane	Inhassoro	-21.53942401	35.18859057
INH06	CS Cometela	Health center 1	Health facility	Inhambane	Inhassoro	-21.8499705	34.48033433
INH07	CS Inhassume	Health center 1	Health facility	Inhambane	Panda	-24.23888084	34.85230316
INH09	CS Panda	Health center 1	Health facility	Inhambane	Panda	-24.06642599	34.72825276
INH20	CS Mangungumente	Health center 1	Health facility	Inhambane	Inhassoro	-21.71746477	35.09448107
INH21	CS Massalane	Health center 1	Health facility	Inhambane	Panda	-24.02809517	34.87724008
MAN01	Manica	Warehouse	Provincial	Manica		-19.10771932	33.47850697
MAN02	Gondola	Warehouse	District	Manica	Gondola	-19.07716862	33.64133801
MAN03	Guro	Warehouse	District	Manica	Guro	-17.41961181	33.34940655
MAN05	CS Marera	Health center 1	Health facility	Manica	Gondola	-19.2677034	33.48028972
MAN06	CS Josina Machel	Health center 1	Health facility	Manica	Gondola	-19.08758062	33.65163669
MAN07	CS Bunga	Health center 1	Health facility	Manica	Guro	-16.8245584	33.2736963
MAN09	CS Thanda	Health center 1	Health facility	Manica	Guro	-16.7077919	33.3163559
MAN20	CS Amatongas	Health center 1	Health facility	Manica	Gondola	-19.10011425	33.80986992
MAN21	CS Guro	Health center 1	Health facility	Manica	Guro	-17.4319478	33.3483144
MAN22	CS Chipindaumwe	Health center	Health facility	Manica	Gondola	-19.05229042	33.78514976
MAN23	CS Chivuli	Health center	Health facility	Manica	Guro	-17.04698412	33.69199254
MAPC01	Maputo Cidade	Warehouse	Provincial	Maputo Cidade		-25.9371409	32.575031
MAPC03	CS Albazine	Health center 1	Health facility	Maputo Cidade	Mavalane	-25.84218716	32.64099115
MAPC04	CS Mavalane	Health center 1	Health facility	Maputo Cidade	Mavalane	-25.93001685	32.58525912
MAPC08	Mavalane	Warehouse	District	Maputo Cidade	Mavalane	-25.9278947	32.5820207
MAPC09	Jose Macamo	Warehouse	District	Maputo Cidade	Jose Macamo	-25.9486844	32.54418888
MAPC20	CS 1 Junho	Health center 1	Health facility	Maputo Cidade	Mavalane	-25.9180478	32.6082496

Facility code	Facility name	Facility type	Supply chain level	Provincial	District	GPS-latitude	GPS-longitude
MAPC21	CS Jose Macamo	Health center 1	Health facility	Maputo Cidade	Jose Macamo	-25.94705768	32.54372612
MAPC23	CS Bagamoio	Health center	Health facility	Maputo Cidade	Jose Macamo	-25.89741225	32.57086043
MAPC27	CS Zimpeto	Health center	Health facility	Maputo Cidade	Jose Macamo	-25.8312155	32.57762396
MAPP01	Maputo Provincia	Warehouse	Provincial	Maputo Provincial		-25.9488992	32.4689768
MAPP02	Boane	Warehouse	District	Maputo Provincial	Boane	-26.04961651	32.32520085
MAPP03	Matutuine	Warehouse	District	Maputo Provincial	Matutuine	-26.3379801	32.6693621
MAPP06	CS Mulotana	Health center 1	Health facility	Maputo Provincial	Boane	-25.84106038	32.35529406
MAPP08	CS Zitundo	Health center 1	Health facility	Maputo Provincial	Matutuine	-26.7568704	32.8539626
MAPP20	CS Campoane	Health center 1	Health facility	Maputo Provincial	Boane	-26.01329793	32.41865027
MAPP22	CS Mahubo	Health center	Health facility	Maputo Provincial	Boane	-26.15894255	32.3466239
MAPP23	CS Ponta Douro	Health center	Health facility	Maputo Provincial	Matutuine	-26.8419165	32.8844106
MAPP24	CS Salamanga	Health center	Health facility	Maputo Provincial	Matutuine	-26.4798321	32.6589053
NAM01	Nampula	Warehouse	Provincial	Nampula		-15.12846032	39.26609661
NAM02	Mongicual	Warehouse	District	Nampula	Mongicual	-15.60073698	39.9451228
NAM03	Malema	Warehouse	District	Nampula	Malema	-14.95781458	37.40655941
NAM05	CS Quixaxe	Health center 1	Health facility	Nampula	Mongicual	-15.28716638	40.11419166
NAM06	CS Xa Momade	Health center 1	Health facility	Nampula	Mongicual	-15.66454066	40.33176047
NAM08	PS Cunvare	Health post	Health facility	Nampula	Malema	-14.84151693	37.14175707
NAM09	CS Nacata	Health center 1	Health facility	Nampula	Malema	-14.93734467	37.17657608
NAM20	CS Mutuali	Health center 1	Health facility	Nampula	Malema	-14.85059793	37.00372984
NAM21	CS Namige	Health center 1	Health facility	Nampula	Mongicual	-15.5686301	40.40889468
NIA01	Niassa	Warehouse	Provincial	Niassa		-13.3033375	35.2459615
NIA02	Majune	Warehouse	District	Niassa	Majune	-13.47551193	36.12135574

Facility code	Facility name	Facility type	Supply chain level	Provincial	District	GPS-latitude	GPS-longitude
NIA03	Metarica	Warehouse	District	Niassa	Metarica	-14.33223312	36.79705901
NIA04	PS Luambala	Health post	Health facility	Niassa	Majune	-13.42607332	36.19880713
NIA05	PS Mecualo	Health post	Health facility	Niassa	Majune	-13.36387658	36.06187239
NIA06	PS Riate	Health post	Health facility	Niassa	Majune	-13.50415997	36.43907807
NIA07	PS Muemela	Health post	Health facility	Niassa	Metarica	-14.46278843	36.8949837
NIA08	CS Metarica	Health center 1	Health facility	Niassa	Metarica	-14.3260406	36.8008488
NIA09	CS Mepuera	Health center 1	Health facility	Niassa	Metarica	-14.52197221	37.08257572
SOF01	Sofala	Warehouse	Provincial	Sofala		-19.85112912	34.87634037
SOF02	Chemba	Warehouse	District	Sofala	Chemba	-17.1625521	34.8929038
SOF03	Marromeu	Warehouse	District	Sofala	Marromeu	-18.29339467	35.95252745
SOF04	CS Mulima	Health center 1	Health facility	Sofala	Chemba	-17.3463935	34.62667122
SOF05	CS Chemba	Health center 1	Health facility	Sofala	Chemba	-17.16226195	34.89021317
SOF06	CS Cado	Health center 1	Health facility	Sofala	Chemba	-17.58270072	34.77482353
SOF07	HR Marromeu	Rural hospital	Health facility	Sofala	Marromeu	-18.29373476	35.95289256
SOF09	CS Malingapasse	Health center 1	Health facility	Sofala	Marromeu	-18.67510071	36.1045289
SOF21	CS Nensa	Health center 1	Health facility	Sofala	Marromeu	-18.18239245	35.73070977
TET01	Tete	Warehouse	Provincial	Tete		-16.14366776	33.60676778
TET02	Cidade de Tete	Warehouse	District	Tete	Cidade de Tete	-16.14161905	33.60911085
TET03	Tsangano	Warehouse	District	Tete	Tsangano	-15.16134123	34.56078107
TET04	HP Tete	Provincial hospital	Health facility	Tete	Cidade de Tete	-16.15432329	33.57925929
TET05	CS N. 2	Health center 1	Health facility	Tete	Cidade de Tete	-16.14316992	33.60878279
TET07	CS Fonte Boa	Health center 1	Health facility	Tete	Tsangano	-14.81194134	34.44713286
TET08	CS Ntengo Mbalahe	Health center 1	Health facility	Tete	Tsangano	-14.84879615	34.5244363
TET09	CS Chivano	Health center 1	Health facility	Tete	Tsangano	-14.9868404	34.33219182
TET22	CS Boroma	Health center	Health facility	Tete	Cidade de Tete	-16.05102363	33.43433677
ZAM01	Zambezia	Warehouse	Provincial	Zambezia		-17.86085045	36.87571169
ZAM02	Ile	Warehouse	District	Zambezia	Ile	-16.03807472	37.16774038
ZAM03	Namacurra	Warehouse	District	Zambezia	Namacurra	-17.49344695	37.0328225
ZAM05	PS Tebo	Health post	Health facility	Zambezia	Ile	-16.28102075	37.32146868
ZAM06	CS Ualasse	Health center 1	Health	Zambezia	Ile	-15.76196452	37.28472711

Facility code	Facility name	Facility type	Supply chain level	Provincial	District	GPS-latitude	GPS-longitude
			facility				
ZAM08	PS Naciaia	Health post	Health facility	Zambezia	Namacurra	-17.3205759	37.0504918
ZAM09	CS Mugubia	Health center 1	Health facility	Zambezia	Namacurra	-17.5753306	37.15881399
ZAM20	CS Chiraco	Health center 1	Health facility	Zambezia	Ile	-16.35856433	37.76716095
ZAM21	CS Macuze	Health center 1	Health facility		Namacurra	-17.71532971	37.19277293
NA	CMAM	Warehousing	Central				

Annex 4

Mozambique NSCA Dashboard

Mozambique National Supply Chain Assessment Dashboard

National Supply Chain Overall Results

Functional Area	CMM Score	KPI	KPI Score
Overarching	55.1%	Historical stockout rate (Central)	51.7%
		Historical stockout rate (Province, District, and Health Facility)	17.0%
		Day of visit stockout rate (Province, District, and Health Facility)	22.0%
		Stocked according to plan (Province, District, and Health Facility)	13.9%
		Stocked according to plan (Central)	19.5%
Product Selection	70.0%		
Forecasting and Supply Planning	63.5%		
Procurement	64.8%	% of product samples tested (post-market) passing quality testing	85.6%
Warehousing and Inventory Management	37.9%	% of stock cards up-to-date	61.7%
		Stock Accuracy (Province, District, and Health Facility)	57.2%
		% of total stock that expired in previous reporting period, quantity (Central)	0.4%
		% of storage facilities meeting acceptable storage capacity (Central, Province, District, and Health Facility)	34.0%
Transportation	39.5%		
Management Information	53.6%	% of stock cards matching SIMAM	85.3%
Human Resources	60.1%	Staff turnover rate (Province, District, and Health Facility)	18.5%
		% of facilities with at least one staff member who attended the Procedures Manual, 3rd edition training	70.8%

National Supply Chain KPIs

*Please note that Stock out rates, expiry and staff turnover inverted to refelect performance as high, medium, and low.
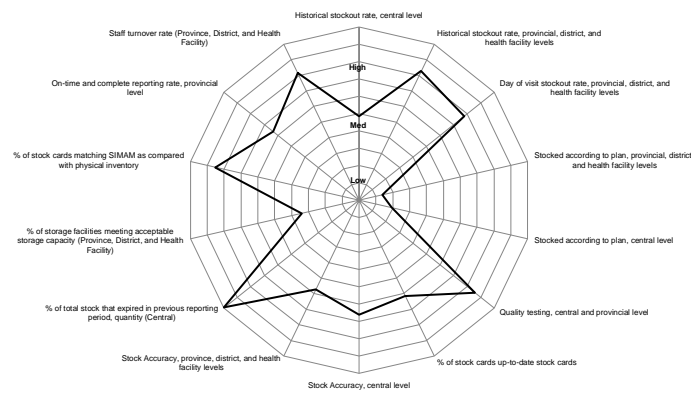
Supply Chain Capability and Performance
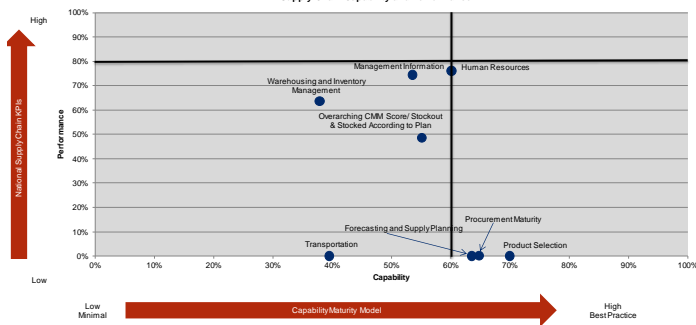
Capability Maturity by Supply Chain Level

Scores	Central	Provincial	District	Health Facility
Product Selection	70.0%			
Forecasting and Supply Planning	63.5%			
Procurement Maturity	64.8%			
Warehousing & Inventory Management	67.6%	51.2%	41.5%	12.3%
Transportation	49.1%	43.2%	37.1%	
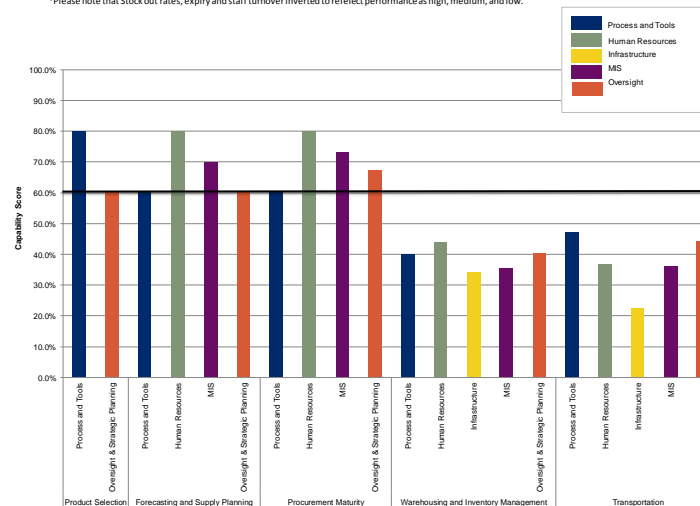
Annex 5

KPI Formulas Table

No.	KPI	Formulas
1	**Stockout rates**	*Number of tracer commodities stock observations experiencing a stockout of one or more tracers in the reporting period*
		Total number of tracer commodities stock observations
2	**Stocked according to plan**	*Number of tracer commodities stocked according to plan in the reporting period*
		Total number of tracer commodities
3	**Stock accuracy**	*Total quantity of product on stock card*
		Total quantity of the same product from physical inventory conducted during site visit
4	**Quality testing**	*Number of samples passing quality testing*
		Total number of samples tested
5	**Acceptable storage conditions**	*Total number of facilities self-reporting sufficient for volume of products that need to be stored/managed*
		Total number of facilities
6	**Up-to-date stock cards**	*Number of up-to-date stock cards*
		Total number of product
7	**Staff turnover**	*Number of staff leaving their posts in the reporting period*
		Total number of staff
8	**Percent of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training**	*Number of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training*
		Total number of facilities

Annex 6

KPI Information Table

Please note the sub-indicators and their calculations pertaining to each KPI listed in Annex 5. To understand the numerator and denominator for each sub-indicator, please apply the formulas listed for each KPI in Annex 5.

KPI	Specific KPI Sub-Indicator	Collection mechanism	"Facilities sampled ="	"Facilities sampled =" description	Score	Numerator /Denominator	Significant sample (Y/N)	Quantitative /qualitative	Data collection period	Source	System level	Comments
	Stockout rates (percent of tracer commodities experiencing a stockout during the reporting period)(national)	Stock data collection form	Facilities sampled =106	Facilities sampled =106 represents all facilities visited. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Is there access to the product or the person who manages it? (Yes)	16.6%	108/651	Yes	Quantitative	August– October 2014	Data collection and LMIS	All	
Stock-out Rate	Stockout rates (percent of tracer commodities experiencing a stockout during the reporting period) (central)	Stock data collection form	Facilities sampled =3	Facilities sampled =3 represents all facilities visited at the central level. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period	51.7%	31/60	Yes	Quantitative	May– October 2014	LMIS	Central	Stockout rate determined using product data extracted from the warehouse management system MACS. It is comprised

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												of 32 tracers over 6 months
	Stockout rates (percent of tracer commodities experiencing a stockout during the reporting period) (province, district, and health facility)	Stock data collection form	Facilities sampled =103	Facilities sampled =103 represents all facilities at the provincial, district, and health facility levels. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Is there access to the product or the person who manages it? (Yes)	17.0%	108/637	Yes	Quantitative	August–October 2014	Data collection	Provincial, district, health facility	Stockout rates determined by collecting data from stock cards for 8 of the 32 tracers and for a three-month period
	Stockout rates (percent of tracer commodities experiencing a stockout during the day of visit) (province, district, and health facility)	Stock data collection form	Facilities sampled =103	Facilities sampled =103 represents all facilities at the provincial, district, and health facility levels. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Is there access to the product or the person who manages it? (Yes) 4. Stockout day of visit (Yes and No)	22.0%	630/2864	Yes	Quantitative	Day of visit (November–December 2014)	Data collection	Provincial, district, health facility	This rate is based on the physical stock count

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	Stocked according to plan (national)	Stock data collection form	Facilities sampled =23	Facilities sampled =23 represents the number of facilities at <u>all levels of the system</u> that reported having an established maximum and minimum stock level. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Between maximum and minimum (Yes and No)	18.6%	24/129	No	Quantitative	August–October 2014	Data collection and LMIS	All	The LMIS system limitations include consumption reported only by quarter. Monthly consumption was determined by dividing the quarter consumption by 3. Three months of data and eight tracers were used to generate this indicator.
Stocked According to Plan	Stocked according to plan (central)	Stock data collection form	Facilities sampled =3	Facilities sampled =3 represents all facilities visited at the central level. Filters applied to this indicator include: 1. Is this product managed in this facility? Yes 2. Data collection period 3. Between maximum and minimum (Yes and No)	13.9%	5/36	Yes	Quantitative	May–October 2014	LMIS	Central	The LMIS system limitations include consumption reported only by quarter. Monthly consumption was determined by dividing the quarter consumption by 3. Six months of data and 25 tracers were used to generate this indicator.

	Stocked according to plan (province, district, and health facility)	Stock data collection form	Facilities sampled =20	Facilities sampled =20 represents the number of facilities at district, provincial, and health facility levels who reported having an established maximum and minimum stock level. Filters applied to this indicator include: 1. Is this product managed in this facility? Yes 2. Data collection period 3. Between maximum and minimum (Yes and No)	19.5%	23/118	No	Quantitative	August–October 2014	Data collection	Provincial, district, health facility	20 facilities reported a maximum and minimum to measure against. 3 months of data. Eight tracers were used to generate this indicator.
Stock Accuracy	Stock accuracy (central)	Annual stock-taking exercise	Facilities sampled =3	Facilities sampled =3 represents all facilities visited at the central level. No filters applied, data obtained from country PMP report.	66.2%	823/1243	Yes	Quantitative	2014	Country PMP reporting	Central	
Stock Accuracy	Stock accuracy (province, district, and health facility)	Stock data collection form	Facilities sampled =103	Facilities sampled =103 represents all facilities at the provincial, district, and health facility level. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Is there access to the product or the person who	57.2%	1638/2864	Yes	Quantitative	Day of visit (November–December 2014)	Data collection	Provincial, district, health facility	

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				manages it? (Yes) 4. Is there a stock card for this product? (Yes) 5. Is the stock card up to date for this product? (Yes)							
	Percent of stock cards up-to-date	Stock data collection form	Facilities sampled =103	Facilities sampled =103 represents all facilities at the provincial, district, and health facility level. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes) 2. Data collection period 3. Is there access to the product or the person who manages it? (Yes) 4. Is there a stock card for this product? (Yes) 5. Is the stock card up to date for this product? (Yes)	61.7%	1768/2864	Yes	Quantitative	Day of visit (November 2014—December 2014)	Data collection	Provincial, district, health facility	
Up to date Stock Cards	Percent of stock cards matching SIMAM	Stock data collection form	Facilities sampled =26	Facilities sampled =26 represents all the facilities that reported using SIMAM. Filters applied to this indicator include: 1. Is this product managed in this facility? (Yes)	85.3%	388/455	Yes	Quantitative	Day of visit (November—December 2014)	Data collection	Provincial, district, health facility	

				2. Data collection period 3. Is there access to the product or the person who manages it? (Yes) 4. Is SIMAM used at this facility? (Yes) 5. Is SIMAM up to date for this product? (Yes)								
Quality Testing	Percent of product samples tested (post-market) passing quality testing	LNCQM post-marketing surveillance report	Number of tests =514	Facilities sampled =514 represents the number of samples tested at the central and provincial level. No. filters applied, data obtained from USAID United States Pharmacopeial Convention (USP) LNCQM post-marketing surveillance report.	85.6%	440/514	No	Quantitative	2014	USAID USP	Central and provincial	Please note only 62.9% of all samples collected were analyzed.
	Percent of product samples tested (post-market) passing quality testing	LNCQM post-marketing surveillance report	Facilities sampled =107	Facilities sampled =107 represents the number of samples tested at the central level. No. filters applied, data obtained from USAID USP LNCQM post-marketing surveillance report.	72.9%	78/107	No	Quantitative	2014	USAID USP	Central	
	Percent of product samples tested (post-market) passing quality testing	LNCQM post-marketing surveillance report	Facilities sampled =407	Facilities sampled =407 represents the number of samples tested at the provincial level. No. filters applied, data obtained from USAID USP	88.9%	362/407	No	Quantitative	2014	USAID USP	Provincial	

				LNCQM post-marketing surveillance report.								
PMP	Percent of facilities submitting complete LMIS reports (performance work statement and PMP) within the agreed schedule to the central level	PMP	Facilities sampled =11	Facilities sampled =11 represents all of the facilities at the provincial level. No. filters applied, data obtained from the country PMP report.	63.6%	7/11	Yes	Quantitative	October–December 2014	PMP report	Provincial	
Expiry rate	Percent of total stock that expired in previous reporting period, quantity (central)	Expiry report	Facilities sampled =3	Facilities sampled =3 represents all facilities visited at the central level. No filters applied, data obtained from the MACS central warehouse expiries tracking report.	0.4%	3811087/10 38133316	Yes	Quantitative	January–October 2014	LMIS	Central	
Acceptable storage conditions	Percent of storage facilities meeting acceptable storage capacity	Direct observation form	Facilities sampled =106	Facilities sampled =106 represents all facilities visited. No. filters applied.	34.0%	36/106	Yes	Qualitative	Day of visit (November–December 2014)	Direct Observation	All	
Staff turnover rate	Staff turnover rate	Facility info. form	Facilities sampled =106	Facilities sampled =106 represents all facilities visited. No. filters applied.	18.5%	63/340	Yes	Qualitative	November 2013—November 2014	Key informant interview	All	
Percent of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training	Percent of facilities with at least one staff member who attended the SOPs Manual, 3rd edition training	Facility info. form	Facilities sampled =106	Facilities sampled =106 represents all facilities visited. No. filters applied.	70.8%	75/106	Yes	Qualitative	November 2013—November 2014	Key informant interview	All	

Annex 7

Data Collection Team List

SCMS	CMAM	Province	District	Health Facilities
Dan Lole	Natasha Mbeve (DNAM)	CABO DELGADO	BALAMA	CS Balama
				CS Mavala
				CS Murripa
			QUISSANGA	CS Quissanga
				PS Namaluco
				CS Nacoba (Expansao)
Isaura	Dra. Mliva	GAZA	CIDADE DE XAI-XAI	HP Xai-Xai
				CS Praia
				PS Unidade Especial
			GUIJA	CS Guija
				PS Chinhacanine
				PS Sifo (Mubanguene)
Deo		INHAMBANE	INHASSORO	CS Inhassoro
				CS Bazaruto
				CS Cometela
			PANDA	CS Inhassume
				CS Mawaiela
				CS Panda
Dionildes	Joaquim Madeira (AC Beira)	MANICA	GONDOLA	HD Gondola
				CS Marera
				CS Josina Machel

SCMS	CMAM	Province	District	Health Facilities
			GURO	CS Bunga
				CS Mungari
				CS Thanda
Nilza	Joao Grachane (CMAM)	MAPUTO CIDADE	n/a	HG Mavalane[40]
				CS Albazine
				CS Mavalane
			n/a	HG Jose Macamo[41]
				PS Magoanine Tendas
				Hospital Geral de Infulene
Emerson	Dr. Sureia	MAPUTO PROVINCIA	BOANE	CS Boane
				PS Matola-Rio
				CS Mulotana
			MATUTUINE	CS Matutuine
				CS Zitundo
				PS Manhangane
Nelia		NAMPULA	MONGICUAL	CS Liupo
				CS Quixaxe
				CS Xa Momade
			MALEMA	CS Malema
				PS Cunvare
				CS Nacata
Loide		NIASSA	MAJUNE	PS Luambala
				PS Mecualo
				PS Riate
			METARICA	PS Muemela

SCMS	CMAM	Province	District	Health Facilities
				CS Metarica
				CS Mepuera
Asmal		SOFALA	CHEMBA	CS Mulima
				CS Chemba
				CS Cado
			MARROMEU	HR Marromeu
				CS Marromeu
				CS Malingapasse
Victor	Natercia Macamo (SP/Mal.)	TETE	CIDADE DE TETE	HP Tete
				CS N. 2
				CS Mufa-Boroma
			TSANGANO	CS Fonte Boa
				CS Ntengo Mbalahe
				CS Chivano
Carlos		ZAMBEZIA	ILE	HD Ile
				PS Tebo
				CS Ualasse
			NAMACURRA	CS Namacurra
				PS Naciaia
				CS Mugubia

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