Analysis of the Angolan Public Health Supply Chain System: Report

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Analysis of the Angolan Public Health Supply Chain System

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Printed: April 2013

This report is made possible by the generous support of the American people through the US Agency for International Development (USAID), under the terms of cooperative agreement number AID-OAA-A-11-00021. The contents are the responsibility of Management Sciences for Health and do not necessarily reflect the views of USAID or the United States Government.

About SIAPS

The goal of the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program is to assure the availability of quality pharmaceutical products and effective pharmaceutical services to achieve desired health outcomes. Toward this end, the SIAPS result areas include improving governance, building capacity for pharmaceutical management and services, addressing information needed for decision-making in the pharmaceutical sector, strengthening financing strategies and mechanisms to improve access to medicines, and increasing quality pharmaceutical services.

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Addison, D., R. Miller, and W. Goredema. 2013. *Analysis of the Angolan Public Health Supply Chain System*. Report submitted to the US Agency for International Development by the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. Arlington, VA: Management Sciences for Health.

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CONTENTS

ACRONYMS AND ABBREVIATIONS

CECOMA	*Central de Compras de Medicamentos e meios medicos de Angola* (Central Procurement Agency for Medicines and Medical Supplies)
DNME	*Direcção Nacional de Medicamentos e Equipamentos* (National Directorate of Medicines and Equipment)
FP	family planning
INLS	*Instituto Nacional de Luta contra o Sida* (National HIV/AIDS Control Institute)
LMI	Logistics Management Institute
LMIS	logistics management information system
MCH	maternal and child health
MOH	Ministry of Health (*Ministério da Saúde-MINSA*)
MSH	Management Sciences for Health
NGO	nongovernmental organization
PNMEn	*Programa Nacional de Medicamentos Essenciais* (National Essential Medicines Program)
RFID	radio-frequency identifier
RH	reproductive health
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
SOP	standard operating procedure
SWOT	strengths, weaknesses, opportunities, threats
TA	technical assistance
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	US Agency for International Development

ACKNOWLEDGMENTS

The technical assistance team would like to thank the entire Angolan Ministry of Health (MOH) and its National Department of Medicines and Equipment (Direcção Nacional de Medicamentos e Equipamentos; DNME), National Program for Essential Medicines (Programa Nacional de Medicamentos Essenciais; PNME), National Malaria Control Program (Programa Nacional de Controlo da Malaria; PNCM), National HIV/AIDS Control Insitute (Instituto Nacional de Luta contra o Sida; INLS), and Central Procurement Agency for Medicines and Medical Supplies (Central de Compras de Medicamentos e meios medicos de Angola; CECOMA) for the opportunity to learn about their mission and the challenges facing the respective organizations. We hope the approach to this initial technical assistance and the resulting recommendations will be useful in informing important decisions for the program's future.

The team was greatly assisted by the entire SIAPS/Angola staff as well as Dinah Tjipura, the Country Portfolio Manager from SIAPS home office in Arlington, Virginia. Their astute understanding was invaluable. The team understood both the intent and personal desire to see productive outcomes on behalf of the people of Angola. Special thanks are also extended to Dr. Boaventura Moura, Director, DNME; Dr. Francisco Mateus, Director, CECOMA; and Dr. Adelino Manaças, Director of the PNME, for their gracious hospitality and support to our efforts.

We wish to express our sincere appreciation to the SIAPS Program, Management Sciences for Health, and the US Agency for International Development for providing leadership, technical support, and funding for this analysis.

EXECUTIVE SUMMARY

This Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program task had the following objectives—

1. The project aimed to understand the current status and future plans of the Angolan public health logistics network, with the Central Procurement Agency for Medicines and Medical Supplies (Central de Compras de Medicamentos e meios medicos de Angola; CECOMA) as its principal focus.

2. The team worked to identify weaknesses, gaps, strengths, opportunities, and potential threats in the system.

3. The team worked to develop system-strengthening interventions and a plan for their implementation.

4. The project staff worked to identify opportunities to build consensus among key supply chain stakeholders for the identified priorities and system-strengthening opportunities.

All these efforts were directed toward the identification of short-, medium-, and long-term opportunities to optimize CECOMA's operations and build capacity to strengthen the national supply chain system for the management of public health commodities and related supplies, especially pharmaceutical products.

Approach

The analysis was conducted by a team comprising Management Sciences for Health (MSH) Senior Technical Adviser Wonder Goredema and Danny Addison and Roger Miller from the Logistics Management Institute (LMI).

Data collection included holding a workshop in Luanda to discuss and collect data from a group of experienced and knowledgeable Ministry of Health (MOH) supply chain managers and working-level staff members from the national level and field posts around the country; face-to-face interviews with key supply chain stakeholders; and site visits to the CECOMA central warehouse in Luanda, to three provincial warehouses in Luanda, Uige, and Kwanza Sul provinces, and to municipal and national-level hospitals in the same three provinces. The site visits allowed the team to validate the observations and recommendations developed during the face-to-face interviews and supply chain workshop, review system-strengthening concepts with on-the-ground supply chain staff members, and collect information about the physical condition and capabilities of key parts of the Angolan public health supply chain. The team also reviewed relevant planning, historical, and analysis documents gathered during and before the visit.

Taken as a whole, this methodology allowed the team to develop findings reflecting the comprehensive analysis and subsequent improvement recommendations including local

stakeholder feedback on CECOMA operations. The findings and recommendations also reflect the team's logistics management information system (LMIS) assessment and gap analysis and LMIS priorities for CECOMA and other MOH stakeholders. They include a strategic vision, implementation plan, and monitoring indicators for improving CECOMA and the entire procurement and supply chain management system's performance and efficiency. Finally, the findings and recommendations reflect the comprehensive human resources capacity gap analysis and strategy for CECOMA.

Additional work will be needed to implement and adjust the recommendations as CECOMA physical plant, organization, and capacity continues to evolve.

Key Findings

The supply chain study team identified a number of broad, systemic issues that provide the overall context for the specific recommendations discussed in the next section. The findings discussed in the following paragraphs affect not just CECOMA, but also all supply chain stakeholders from CECOMA down to the smallest clinics and hospitals. The team's systemic findings include administrative, policy, management, and performance measurement issues. CECOMA-related findings cover key areas that need to be strengthened to enable CECOMA to be the leading national supply chain agency.

Administrative issues encompass weaknesses in infrastructure (facilities, storage equipment, and materials-handling equipment), human resources, and information systems. The MOH has plans to address these matters in the near future, and substantial near- to midterm improvement is expected. The team observed that human resources capacity development may well be the most significant administrative weakness in the Angolan pharmaceutical supply chain. Few of the working staff interviewed have received specialized capacity building or development training in the functions for which they are responsible, written procedures and guides are either completely missing or largely inadequate, and information systems to support them are either not available or incompletely understood and used.

Policy issues include a lack of written statutes, policies, guidelines, and standard operating procedures (SOPs), and a lack of written guidance on human resources capacity development and career management for medical supply specialists, warehouse workers, and other supply chain staff.

Management issues include a need for improved interorganizational communication and coordination between the "links" or elements of the medical supply chain, a need for supply chain visibility and predictability up and down the chain, and a need for collaborative planning of supply chain capacity and activity.

Finally, the supply chain study team identified a need for supply chain performance measurement and management. Currently no accepted metrics or standards exist by which to measure the performance of any supply chain stakeholders, which means that none of them can effectively plan, conduct, and subsequently improve supply chain operations.

These major findings concerning administrative, policy, management, and performance measurement issues lead directly to the recommendations described in the following paragraphs.

Recommendations

Performance-Based Logistics

CECOMA and its stakeholders (including the national programs and field customers it supports) should work to establish clear, jointly developed standards for supply chain performance and begin a transition to a customer-driven, demand-based medical supply chain. Coordination and communication among all stakeholders should be expanded, and the Interagency Coordinating Committee/Logistics working group's function should be expanded. The MOH should write a new communication plan for the pharmaceutical sector with the goal of identifying and implementing improved supply chain management practices across the entire ministry.

Human Resources Capacity Development

The MOH should undertake a comprehensive, systematic effort to develop logistics human capacity at all levels, including national, provincial, and municipal levels. This effort should include material suitable for presentation in both preservice and in-service modes. The development of the human resources capacity development material should move in parallel with an initiative to develop a career development strategy for pharmaceutical supply chain staff members at all levels.

Information Systems

The MOH should implement an appropriate system and tracking mechanisms to ensure optimal flow of commodities and data and improve availability of commodities throughout the supply chain system.

The MOH should develop appropriate indicators to monitor and evaluate performance and take appropriate system-strengthening measures at all levels of the supply chain.

It should document requirements for a nationally integrated, multinode automated information system to support the public health pharmaceutical supply chain. When appropriate, the MOH should identify and implement an appropriate IS solution nationwide.

Governance

The MOH should develop, disseminate, and implement written pharmacy supply chain policies and procedures. Concurrently, the ministry should finalize and disseminate an organizational governance framework and organograms, a staffing matrix, and organizational function and responsibility policies for CECOMA.

Storage

CECOMA has renovated and improved the old Angomedica warehouse as a modern, spacious temporary warehouse with optimal physical facilities, storage systems, and material-handling infrastructure. However, warehouse temperature and storage conditions for controlled or high-value products and inventory control practices are still suboptimal.

Physical facilities, storage conditions, and warehouse practices at provincial warehouses generally range from inadequate to suboptimal. The MOH and CECOMA should improve or design a medical warehouse layout to properly accommodate inbound operations, product storage, and outbound operations for optimal warehousing functions and maximum efficiency and space use. They should ensure the warehouse is divided into areas to support everyday work processes, such as general or bulk storage, loose or bin storage, vault or controlled substances, pilferables, or high economic value storage; cold-chain storage (refrigerated storage, freezer storage for vaccines); a separate storage area for hazardous materials; a cross-docking area; a shipping area; a receiving area; and a quality control and inspection area. They should develop separate documentation and work processes, if needed, for each area.

The MOH and CECOMA should ensure provincial and municipal health facilities have adequate storage space with optimal storage conditions to maintain quality of stored commodities.

They should review or develop SOPs for storage and inventory control of public health commodities

Distribution and Transportation

The MOH should work to improve planning and communications between transport nodes and organizations at all levels and should support a comprehensive analysis of appropriate transportation options, including exploration of options for enhanced use of local private sector entities to support fleet management, scheduling, route planning, and transportation of goods.

Quality Assurance and Surveillance

CECOMA and its supply chain partners need to improve the physical security of all warehouses, especially those at the provincial levels. The team observed few if any physical security measures in use at the provincial levels and inadequate physical security at all levels. In particular, CECOMA should strengthen physical handling and accountability for controlled substances, the medicine-receiving inspection process needs improvement, and product quality monitoring and reporting require improvement.

Just as key stakeholders generally acknowledge that procurement is a major issue, consensus also exists that once commodities are available at the central level, the distribution system in place from the central warehouse to the service delivery points functions well. In-country MSH technical staff will play a vital role in providing technical assistance (TA) to the MOH in supporting the system. The capacity of the MOH to manage storage and distribution of

pharmaceuticals and other medical commodities must be improved, particularly as demand for these commodities increases.

A major focus area for SIAPS/Angola will be supporting the MOH, in collaboration with relevant local partners and stakeholders, to develop capacity of the National Directorate of Medicines and Equipment (Direcção Nacional de Medicamentos e Equipamentos; DNME), National Essential Medicines Program (Programa Nacional de Medicamentos Essenciais; PNME), and CECOMA in terms of both strengthening systems and human resources capacity, to efficiently and effectively meet the needs of the national supply chain.

INTRODUCTION

In collaboration with SIAPS, the Angola MOH's DNME and CECOMA identified a need to conduct a comprehensive review of the supply chain management and LMIS, to understand Angola's current supply chain situation. The assessment, through a comprehensive qualitative analysis, identified gaps and developed an initial road map to address these gaps and improve system performance. The goal for this overall task for Angola is to improve and support the operationalization of CECOMA in the immediate term and to build capacity to strengthen the overall public sector procurement and supply chain management system in the long term. The expected result for these efforts is more efficient and effective CECOMA supply chain operations and a functional LMIS.

Just as key stakeholders generally acknowledge that procurement is a major issue, consensus also exists that once commodities are available at the central level, a proper distribution system should be in place to ensure timely, effective, and efficient distribution of commodities from the central warehouse or regional distribution points to the service delivery points. In-country MSH technical staff play a vital role in providing TA to the MOH in supporting the system. The capacity of the MOH to manage storage and distribution of pharmaceuticals and other medical commodities must be improved, particularly as demand for these commodities increases.

A major focus area for SIAPS/Angola will be supporting the MOH, in collaboration with relevant local partners and stakeholders, to develop DNME, PNME, and CECOMA capacity in terms of both human resources and infrastructure, to efficiently and effectively meet the needs of the national supply chain system. With this in mind, the US Agency for International development (USAID)-funded SIAPS Program, which is managed by MSH, proposes to work with CECOMA to consolidate its role and capacity in the logistical management of pharmaceuticals and its support to provincial and municipal hospitals. The TA also aims to leave a systemic solution to cover the Angolan pharmaceutical supply chain system, that is, quantifying and planning commodity needs, bringing commodities in country, receiving and managing their quality, and ensuring their appropriate storage and delivery to the service delivery level.

BACKGROUND

Angola continues to have stock-outs of essential medicines and related public health commodities, partly because of poor performance of the national procurement and supply chain system and LMIS. CECOMA is an MOH organization for procurement and supply chain management, charged with supporting the ministry's national programs, including the PNME. CECOMA was formed to separate procurement and supply chain support functions from the national regulatory function for medicines managed by the MOH's DNME, and to improve the efficiency and effectiveness of the procurement and distribution of public health commodities to health facilities countrywide.

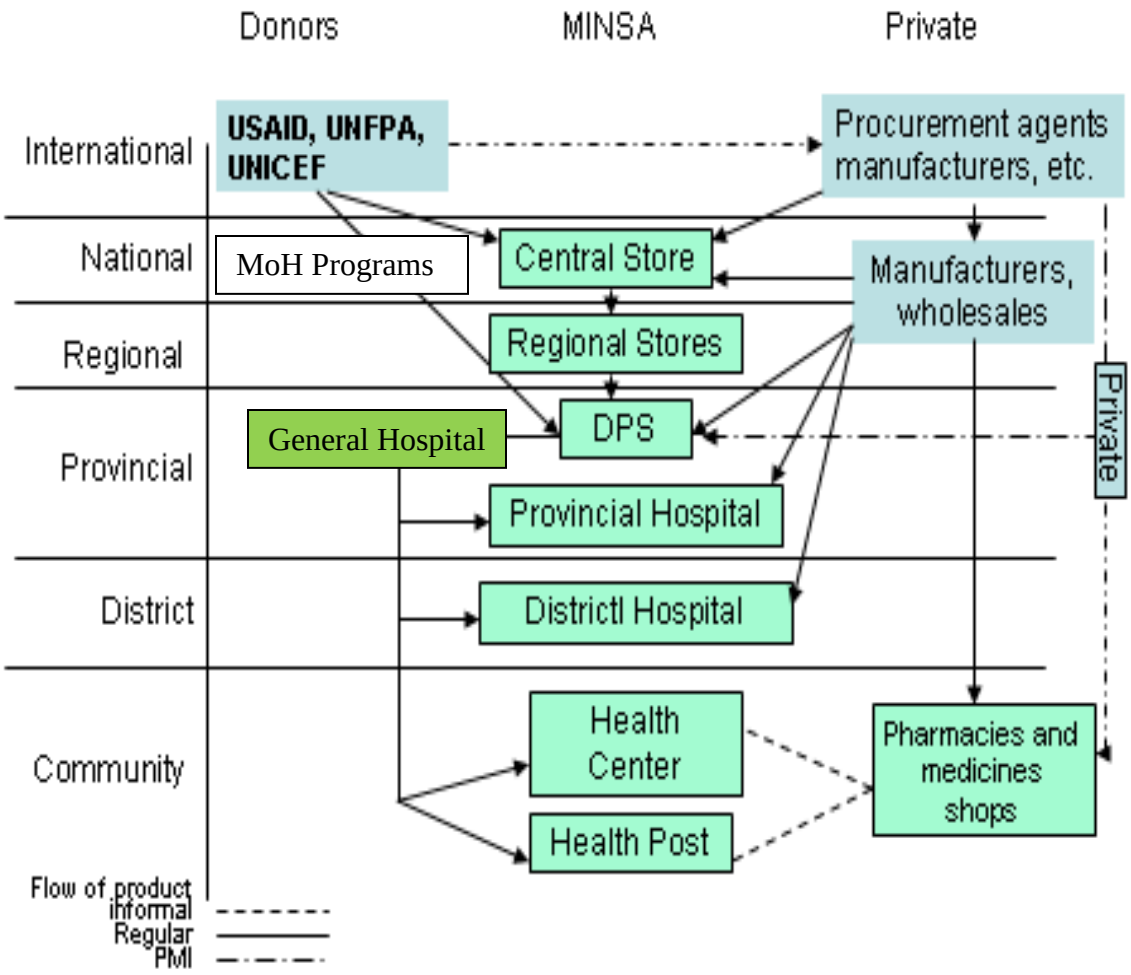
USAID/SIAPS and its predecessor programs, Strengthening Pharmaceutical Systems and Rational Pharmaceutical Management Plus, have collaborated since 2005 with other USAID implementing partners, nongovernmental organizations (NGOs), and other local partners in providing TA to the Angola MOH to implement pharmaceutical management strengthening interventions at the central and lower levels of the health care delivery system. In 2010, the Strengthening Pharmaceutical Systems Program assisted the MOH/DNME, the PNME, and the National HIV/AIDS Control Institute (Instituto Nacional de Luta contra o Sida; INLS) to conduct an assessment of HIV/AIDS supply chain management.[1] In response to requests from the MOH's DNME and CECOMA, and as part of this ongoing support, SIAPS is providing TA to strengthen CECOMA and the rest of the national supply chain system capacity, especially for HIV/AIDS; malaria; and family planning (FP), reproductive health (RH), and maternal and child health (MCH) commodities.

A team of three supply chain experts visited Angola to provide short-term TA to the MOH, to conduct a comprehensive analysis that would identify gaps and design policy options to improve system effectiveness and efficiency, and to improve availability of commodities across the public health pharmaceutical supply chain.

This short-term TA is part of an ongoing effort to strengthen the capacity in the Angolan public health pharmaceutical supply chain system, with the following specific objectives—

- Understanding the current status and future plans of the Angolan pharmaceutical supply chain logistics system, with CECOMA as its principal focus (see figure 1 for an illustration of the flow of health commodities among CECOMA and various stakeholders)

[1] M. Thumm and W. Goredema. 2011. *Rapid Assessment of the Supply Chain System for HIV/AIDS Commodities in Angola, August–October 2010: Report.* Submitted to the US Agency for International Development by the Strengthening Pharmaceutical Systems (SPS) Program. Arlington, VA: Management Sciences for Health.



Adapted from Connor, Catherine, Denise Averbug, and Maria Miralles. 2010. *Angola Health System Assessment 2010.* Bethesda, MD: Health Systems 20/20, Abt Associates Inc.

Figure 1. Flow of health commodities in Angola

- Identifying weaknesses, gaps, strengths, opportunities, and potential threats in the public health logistics system
- Developing system-strengthening interventions and a plan for their implementation
- Identifying opportunities to build consensus among key supply chain stakeholders for the priorities and system strengthening opportunities identified

All of these efforts were directed toward the identification of short-, medium-, and long-term opportunities to optimize CECOMA operations and build capacity to strengthen the national

supply chain system for the management of public health commodities and products, especially pharmacy products.

Approach

To accomplish these objectives, the team visited Angola from November 3 until December 1, 2012. A schedule of activities is located in annex A and a list of key persons met in annex B. The first part of the team was led by Wonder Goredema, senior technical adviser to the Center for Pharmaceutical Management at MSH, who began the groundwork necessary to plan and conduct the in-person visits, supply chain workshop, and site visits needed to achieve the project's overall objectives. The second part of the project, conducted November 12–December 1, 2012, added medical supply chain subject matter experts Danny Addison and Roger Miller from LMI.

Once all the three subject matter experts assembled in Angola, the team began its work, with substantial support from MSH's in-country staff. Face-to-face interviews with the directors of the DNME, CECOMA, and PNME and with key supply chain stakeholders began on November 15, and the discussions were held in Luanda on November 19–20 at the National Institute for Public Health. Site visits to the CECOMA central warehouse in northern Luanda; to provincial warehouses in Luanda, Uige, and Kwanza Sul provinces; and to national-level and municipal hospitals in the same three provinces were conducted throughout the time the team was in Angola.

Structured tools were used to collect data during the discussions. Following are the steps that were used in developing the tools—

- Development and adaptation of data collection tools
- Review of draft tools
- Selection of government counterpart to be interviewed during the assessment and study sites
- Orientation of local data collectors
- Refining and finalizing the tools
- Data collection (through questionnaires, workshop with supply chain staff, face-to-face interviews, and observation)
- Data collection and analysis
- Local debriefs and dissemination of preliminary results for inputs and concurrence of local counterparts

Workshop with MOH Supply Chain Staff

Special focus was placed on the early development of a program, an agenda, a facilitation strategy and tools, and identification of participants for the supply chain workshop that was held

in Luanda on November 19–20, 2013. Attached as annex C is a list of attendees and the organizations they represented.

The goal of the workshop was to—

- Collect qualitative data from key Angola supply chain system players
- Collect data for ongoing system-strengthening strategic planning

The workshop was officially opened by the PNME director, Dr. Adelino Manaças. This was followed by a panel discussion on the transition from the old Central Medical Store to the new CECOMA, and the strategic environment within which CECOMA now operates, based on information that the team had previously gathered during interviews with the head of the DNME and the director of CECOMA. Participants recognized that CECOMA has invested substantial resources in the physical improvements now visible in the main storage facility. Plans are also under way for the construction by 2014 of a new warehouse, at a different location in Luanda, that will be both much larger and much more accessible. In parallel with the warehouse construction project, the MOH plans to select a new information technology platform for CECOMA and its customers.

Also under way is a plan to build new regional warehouses at Benguela, Huila, and Malange. Construction of a new provincial warehouse had just been completed in Luanda, and plans exist to possibly construct additional new provincial warehouses in Hwambo and Uige and to continue at the rate of about 3 new provincial warehouses per year to achieve a long-range vision of a total of 18 regional warehouses. All this physical capacity should provide CECOMA with the ability to support all the major national programs (including the PNME, NMCP, the INLS, the FP/RH/MCH Program, and the expanded program on immunization.). This will involve a substantial expansion of the capacity of CECOMA and provincial health departments. Figure 2 highlights the core components of a functional pharmaceutical supply chain system that were defined and formed the foundation and focus of the discussions.

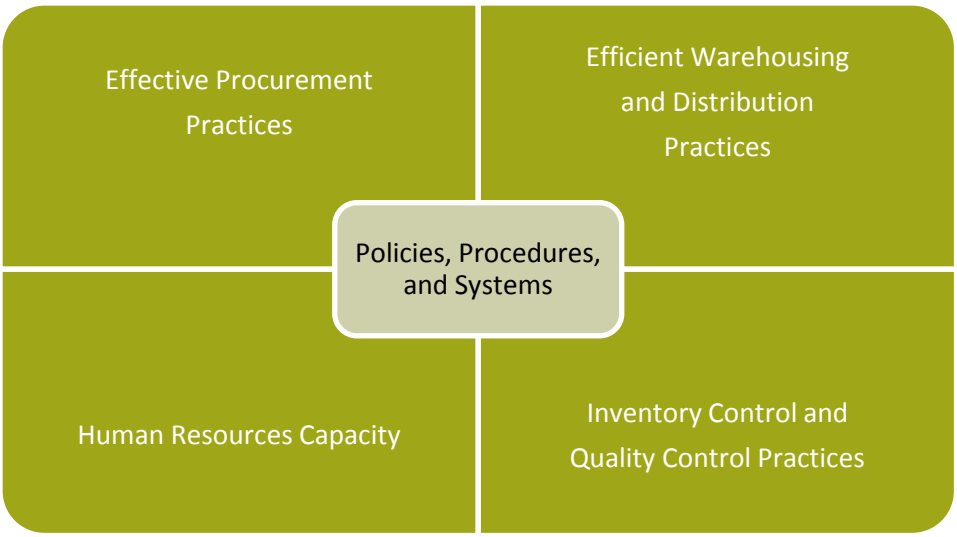


Figure 2. Core components of a functional pharmaceutical supply chain logistics system

After the panel discussion, the group summarized progress made during a two-day workshop held the previous summer. The group then self-selected individuals for participation in one of three facilitated subgroups, focusing on (a) LMIS and organizational issues; (b) product selection, forecasting, and procurement issues; and (c) inventory control procedures, warehousing and storage, and transportation and distribution issues. The key objectives of the breakout session were to (a) develop a graphic depiction of end-to-end Angolan medical supply chain, including organizations and responsibilities, product flows, and information; (b) analyze strengths, weaknesses, opportunities, and risks for each focus area, with an examination of policy, procedures, and human resources development; and (c) recommend short-, medium-, and long-term improvements to the Angolan pharmaceutical supply chain system.

Work continued in the subgroups until mid-morning on November 20, when the plenary group reassembled and subgroup rapporteurs presented the results. The "strengths, weaknesses, opportunities, threats" (SWOT) format was used to capture the groups' major findings. The three groups also completed questionnaires, adapted from the Logistics System Assessment Tool,[2] for use in this analysis and for the SIAPS country program's ongoing system-strengthening strategic planning.

Subgroup 1 summarized the strengths of the LMIS topic area as resting primarily on the ability to procure good information systems to support them. Weaknesses included the current lack of a functioning system, the lack of availability of a system to capture and store data about the work they are doing, and a lack of properly trained personnel to run and maintain the future system. Opportunities were characterized as the potential for improved flow of materials at all levels and the establishment of a robust system to manage logistics information. Threats were seen as organizational bureaucracy, a lack of financial resources, and a lack of trained personnel. Subgroup 1described its vision for an integrated LMIS that would support municipal hospitals, provincial warehouses, and a CECOMA that uses a resupply system that would be based primarily on actual customer demands rather than predetermined forecasts that are subsequently "pushed" to customers.

Subgroup 2 summarized the strengths of the planning, forecasting, and acquisition topic area as resting primarily on the existence of a robust acquisition system; the availability of adaptable management models usable in the ministry's domain; the existence of a capacity-building program; the existence of a not-yet-approved essential medicines list; and the establishment of schools of public health for capacity building and development of the required numbers of health workers. Weaknesses in this area included frequent stock-outs at all levels, a lack of management tools and instruments, and a lack of capacity building and development, particularly in skills that are especially scarce already. Other weaknesses include the lack of a national essential medicines list, a lack of supervisory activity at all levels, the problem of buying medicines that are not on an the approved medicines list, and the absence of adequate information flows between different levels. Opportunities included the option of municipalization (i.e., decentralization) of logistics functions from the national to the municipal levels and the opportunity to put Project CECOMA into action. Threats were felt to be conflicts of interest and a 100 percent dependence on external markets. Subgroup 2 offered several recommendations as well. First, members stressed the

[2] USAID | DELIVER PROJECT, Task Order 1. 2009. *Logistics System Assessment Tool (LSAT)*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1

necessity of reinforcing partnerships with internal entities such as DNME and CECOMA as well as with external entities such as local development partners, including MSH, other USAID implementing partners, and other NGOs. Second, the group recommended that financial resources be secured and made available for building pharmaceutical management capacity of health facility staff and midlevel supervisors. Third, the group felt a need for appropriate pharmaceutical management tools and techniques to be made available.

Subgroup 3 summarized the strengths of the inventory management, warehousing, distribution, and transportation functions. Strengths included the existence of fairly strong program-led distribution plans, the recent establishment of CECOMA, and the existence of good plans for the construction of new regional warehouses. Weaknesses include lack of capacity building; inadequate or lack of effective two-way communication; poor or lack of staff capacity in specialized logistics functions; lack of a logistics strategic plan; and lack of adequate space with the appropriate configuration, equipment, and control measures to store medicines and other public health commodities. Opportunities were characterized by the group as the chance to create a new, more effective, multilevel supply chain logistics system and the opportunity for CECOMA to respond to the provinces' actual needs. Threats included the possibility that these opportunities would not be realized or would be only partially realized.

Face-to-Face Interviews

Face-to-face interviews s generally lasted between one and two hours and involved the administration of a set of structured interview questions. The interviews were conducted with key government, donor, and NGO representatives. These included, among others, Dr. Boaventura Moura, the director of the DNME; Dr. Francisco Mateus, the director of CECOMA; Dr. Adelino Manaças, head of the PNME; Mr. Mikhail Tiounine, NMCP logistician; Dr. Ines Leopoldo, head of the RH/FP/MCH department; and representatives of the United Nations Development Programme (UNDP), the United Nations Population Fund (UNFPA), and the United Nations Children's Fund (UNICEF). The interview process also involved review of relevant planning, historical, and analysis documents gathered during the interviews. Document reviews included the most recent National Medicines Policy, organograms, broader assessments of the overall Angolan public health system, and other policies, procedures, and historical records.

Site Visits

In Luanda the study team visited the CECOMA warehouse, the Josina Machel National Hospital Pharmacy Department, and Luanda Provincial Warehouse.

The team then divided into two groups to conduct site visits outside Luanda. The first group went north to the province and city of Uige. While in Uige, the group visited a provincial warehouse, a municipal hospital, and a municipal warehouse. The group also visited a second municipal hospital in the city of Quitexe. The second group traveled south to the city of Sumbe in Kwanza Sul province. Like the first group, the second group visited a provincial warehouse, a municipal hospital, and a municipal warehouse. The group also visited the Provincial Health

Office and interviewed the Provincial Chief of Administration/HR/Finance, and several provincial program supervisors.

Photo courtesy Uige Provincial Health Department

Figure 3. Dispensing medicines at the Municipal Hospital in Quitexe, Uige Province

Site visits allowed the team to validate the observations and recommendations developed during the supply chain workshop and during interviews with key informants, to review system-strengthening concepts with on-the-ground supply chain staff members, and to collect information about the physical condition and capabilities of key parts of the Angolan public health supply chain. During the site visits, the team also reviewed recently developed plans for future capacity improvements, such as the plan to build a new central store facility into which CECOMA will relocate by about 2014.

Taken as a whole, this methodology allowed the team to develop findings reflecting the comprehensive analysis and subsequent improvement recommendations, including local stakeholder feedback on CECOMA operations, as well as the broader national pharmaceutical supply chain system.

The findings and recommendations cover CECOMA operations, LMIS gap analysis, priorities for CECOMA and other MOH stakeholders, strategic vision, strengthening plan, and performance indicators for improving CECOMA and the entire national supply chain system. Finally, the findings and recommendations reflect a comprehensive human resources capacity gap analysis and strategy for CECOMA and the Angolan pharmaceutical supply chain in general. The national pharmaceutical supply chain strategy should include a renewed focus on strengthening capacity and support for the "last mile" portion of the chain.

Additional work will be needed to implement and adjust the recommendations as CECOMA and stakeholder physical plant, organization, and capacity continue to evolve.

FINDINGS

The supply chain analysis team identified a number of broad, systemic issues that provide the overall context for the specific recommendations discussed in the next section. The findings discussed in the following paragraphs affect not just CECOMA but all supply chain stakeholders from CECOMA down to the smallest health facilities. The systemic findings cover administrative, policy, management, and performance measurement issues.

Administrative issues encompass weaknesses in infrastructure (facilities, storage equipment, and materials-handling equipment), human resources, and information systems. The MOH has plans to address these matters in the near future, and substantial near- to mid-term improvement is anticipated as a result. The team observed that human resources capacity development may well be the most significant administrative weakness in the Angolan supply chain. Few of the working staff interviewed have received specialized capacity building or development in the functions they are responsible for, written procedures and guides are either completely missing or largely inadequate, and information systems to support them are either not available or incompletely understood and used.

Policy issues include a lack of written statutes, policies, guidelines, and SOPs, and a lack of written guidance on human resources capacity development and career management for pharmaceutical supply specialists, warehouse workers, and other supply chain staff.

Management issues include a need for improved interorganizational communication and coordination between the "links" or elements of the pharmaceutical supply chain, a need for supply chain visibility and predictability up and down the chain, and a need for collaborative planning of supply chain capacity and activity.

The team identified a widely felt need for improved warehouse management capability, practices, and systems at all levels. Gaps were identified in warehousing work flow, product and location identification processes and systems, warehouse operations and security, use of advanced logistics technologies, receiving and issue processes, and quality assurance and surveillance practices. Specific warehouse management issues are detailed in the SWOT analysis that follows and in the team's recommendations.

In the team's interviewees and from workshop participants, the team also heard about the need for improved information management at all levels of the supply chain, particularly between CECOMA and its stakeholders. CECOMA does not have an up-to-date product catalogue. The potential of information management and technology to transform supply chain performance is not well known to most of those the team talked with. Although the need will vary from one level to another—CECOMA will need a more robust, full-featured LMIS than what will be used at the provincial or regional levels—all levels lack modern information technology and the human capacity to use it. CECOMA should also revise, update, and disseminate a product catalogue.

Finally, the supply chain study team identified a need for supply chain performance measurement and management. Currently no accepted metrics or standards exist by which to measure the performance of any supply chain stakeholders. The national LMIS is not working optimally; data are supposed to be collected at health facility level and be submitted to national level through the provincial level, where there appears to be bottleneck (data not flowing to national level). No analysis and feedback of analyzed information to lower levels takes place; the system appears to be complicated, it has too many complex forms rather than simple, user-friendly forms, and it does not appear to be perceived useful to the users. This gap means that the supply chain stakeholders cannot effectively plan, conduct, and subsequently improve their supply chain operations.

See table 1 for a summary of systemic supply chain management findings.

Table 1. Systemic Supply Chain Management Findings

Administrative issues	Policy framework	Supply chain management issues	Supply chain performance measurement and management issues
• Infrastructure • Space, equipment, materials/tools • Human resources: number, qualifications, and development of staff skills and abilities • Information systems and procedures	• New CECOMA statues, policies, guidelines/SOPs • Human resources capacity Development • Update product catalogue	• Interorganizational communication and coordination • Supply chain visibility and predictability at and between levels • Collaborative Planning	• No national supply chain performance measures identified and agreed upon by CECOMA and stakeholders • No systems in place to collect, report, and analyze performance measures

SWOT Analysis Review

Table 2 contains a comprehensive review, using a SWOT analysis for each of the visited operational levels that provides logistics support to the country's pharmaceutical supply chain program. Each of the primary focus areas was further analyzed by operational categories that were either previously provided or identified during the visits as essential or affecting the operations.

Table 2. SWOT Analysis of Findings—CECOMA and Stakeholders, Angola

Systemic area	Strength	Weakness	Opportunity	Threat
CECOMA operations				
Personnel	Long-term staff with some younger new staff Vacant or realigned key positions	On-the-job capacity building or development as sole means of skills validation or development Key staff (supply officer, administrative officer, and store keeper) skills missing to manage operations	Formalize capacity building for new and long-term employees Return and/or fill vacant essential leadership positions	Skill levels depart or fail to develop within organization Organization workload and missing essential skills negatively affect outcomes
Stock locator management system	None	No standard method of identifying stock locations within the warehouse	Improve accuracy, reduce warehouse denials, and reduce stock-outs in CECOMA warehouse	Limits functionality—unable to optimize flow
Procedures for receiving, order processing, put away, dispatch	Current processes not documented, inadequate	No written documentation for any warehouse operations procedures	Improve accuracy and volume—reduce manual processes	Capacity overload—no documentation to guide operations, train staff, maintain continuity
Product identification system	None	No uniform method of identifying products	Improve accuracy, reduce mishandling, and reduce product loss	Lack of uniform product numbering system threatens accuracy and viability of CECOMA receiving, storage, and issue processes, quality assurance, and surveillance

Systemic area	Strength	Weakness	Opportunity	Threat
General warehouse environment and layout	Good foundation upon which to build—old Angomedica warehouse renovated and improved into a modern, spacious temporary warehouse with optimal physical facilities, storage rack systems, and materials-handling infrastructure	Need to analyze warehouse design and plans for maximum space use; develop process flows, policies, and procedures for optimal product receipt, storage, and shipment; and develop appropriate tracking and inventory systems	Management willing and ready to implement improvements	Lack of organizational capacity to design and implement improvements
Transportation infrastructure	Air and ground networks exist	Currently congested—requires policy and future capital investment	Increase access and delivery of goods—incentivize transports	Decreased access and movement—future gridlock and failed movement of medical materials
Fleet management	Inventory exists for use	Poor maintenance and repair	Decentralize decision authority—increase reliability	Reduce useful life of investments and capability to transport
Route planning	Visibly in practice	Limited capacity to plan and monitor	Develop enterprise capability	Workload and demand outpace execution
Distribution planning	Visibly in practice	Limited to monthly or quarterly deliveries	Maximize ordering accuracy and distribution methods	Demand for materials exceeds distribution capability
High-value and controlled-substance storage and handling methods	None	Controlled substances not received, packed, or shipped using separate handling and shipping areas	Improve control of controlled substances; reduce loss due to theft or mishandling	Controlled substances subject to risk of diversion, misuse, or theft
Security and housekeeping	Capability works—for now	Limited and poorly maintained	Expand visibility and coverage	Loose current capacity—staff unable to manage volume and flow
Procurement forecasting cycle	Cycle provides short-term results—large quantities	Procurement forecasting lacking and negatively affects logistics execution	Adopt effective forecasting over longer cycle—smooth out flow of material	Stock-outs and shortages will increase with increase in demand and supply chain will fall behind

Systemic area	Strength	Weakness	Opportunity	Threat
Stock control policy, e.g., min-max, MOS, ABC analysis or VEN	None	No policies or procedures available	Management willing and ready to improve	Lack of organizational capacity to improve
Product catalogue	Available	Not up to date	Management willing and ready to improve	Lack of organizational capacity to improve
LMIS				
Use of LMIS or other information systems	None	CECOMA and its stakeholders have only rudimentary automation for warehousing, receiving, shipping, and quality control purposes	Now is the time (before CECOMA moves to its new facility) to acquire and implement a new, integrated LMIS	Only limited time is available to implement a new LMIS before moving to the new facility
Human resources capacity to use a new LMIS	None	Human resources capacity to use new LMIS does not yet exist and requires development	Now is the time to develop human resources capacity to use a new, integrated LMIS	Time is limited
Strategic vision and implementation plan				
Written strategic vision or implementation plan	DNME and CECOMA director have a clear vision for CECOMA's future The door is wide open to development of a new strategic vision and implementation plan	Limited staff experience to develop and implement a strategic plan	DNME and CECOMA should collaborate on a written strategic vision and implementation plan, which should then be reviewed and approved by other CECOMA stakeholders	Strategic vision and implementation plan must be completed before construction of the new CECOMA warehouse facility
LMIS	System functionality not present	Limited deployment No staff capacity building or development other than Assessoires Cubano	Increase deployment, capacity building, development, and capability	Limited impact of strategic initiative, investment, and results
Networks	Internet and Wi-Fi exist locally	Network capacity and implementation limited	Provide broadband modem throughout the facility	LMIS functionality remains limited

Systemic area	Strength	Weakness	Opportunity	Threat
Communication	Exists by phone and face to face	CECOMA and customers limited by lack of communication and transportation	Internet exchange and conferencing	Loss of time and resources to coordinate and manage
Reporting	None	Automated and manual functionality and interface for reporting is lacking	Develop reporting and network functionality in LMIS	Workload and staff limitations will outpace benefits of management reporting
Human resources capacity development				
Human resources capacity	Individuals are enthusiastic, competent, and motivated	No processes, procedures, or policy are in place to maintain a competent work force in CECOMA No written documents exist to provide comprehensive capacity building or development functions for the staff	The opportunity exists to develop a comprehensive program to improve the capacity of staff members to move to the next step as CECOMA plans for the future Introduction of automated systems will require the staff to become fully trained and capable to operate the LMIS system of the future	Delaying the implementation of the actions required to increase this capacity will put CECOMA further and further behind and make more difficult the transition to new skill sets required to meet the increasing demand of the people of Angola
Staff capacity building and development on logistics functions	There was some evidence of limited capacity building and development for staff and managers	Combination of aging and new staff	Develop formalized program for initial and refresher capacity building and development for managers and staff at all levels	Loss of skills because of staff departure or no understanding of relationship of tasks and functions with the supply chain
Policy congruence	Current policies promote short-term success based on strong foundation	Policy approach limited—requires long-lens perspective	Review policy impacts to optimize short to mid term	Overall logistics functions and execution become outpaced by demand

Consolidated Observations

The following consolidated observations were developed from the opportunities identified during the SWOT analysis. Since this initial assessment focused on capturing an overarching view of the logistics support provided by CECOMA, the observations developed from the analysis of each support level address only those systemic strengths and weaknesses that affect both current and future operations.

- New CECOMA structure and system has potential for improved support (in place and operational).
- New CECOMA warehouse renovation provides improved storage and materials-handling capacity.
- New CECOMA warehouse construction provides opportunity for significant improvement in the Angolan pharmacy supply chain.
- LMIS at all levels currently have only marginal startup functionality and need strategic direction and human capacity development to optimize the use of information technology.
- No approved essential medicines list exists.
- Consistent shortages of pharmaceutical products occur at all levels.
- There is need to improve capacity building and development initiatives for supervisors and key warehouse positions.
- Central warehouse staff and facility are not organized or adequately capacitated or equipped to undertake receiving tasks.
- A master storage locator system (i.e., warehouse, aisle, rack, and bin location codes to locate stock) is not used.
- No medical product master identification system is used to uniformly identify products stocked and managed by CECOMA or other storage locations.
- Daily maintenance of stock is impossible at CECOMA and provincial warehouse locations.
- An aged internal fleet cannot meet current or future workload.
- Older facilities require significant maintenance and repairs.
- Inadequate physical security procedures and capability exist at all locations.
- No written policies and procedures exist for receiving, storage, location management, physical security, stock maintenance, quality assurance, stock issue, and stock rotation procedures.
- Linkage is incomplete between procurement–warehousing–distribution.

RECOMMENDATIONS

Because of the short duration of this initial analysis, preliminary recommendations were briefed to the USAID Angola Health Team and key MOH officials, including the DNME and PNME directors. The CECOMA director was not available for the debrief with the MOH because of competing commitments. Both USAID and MOH teams provided constructive feedback and perspectives on the activity. Recommendations were developed from the analysis of observations made during key informant interviews and site visits.

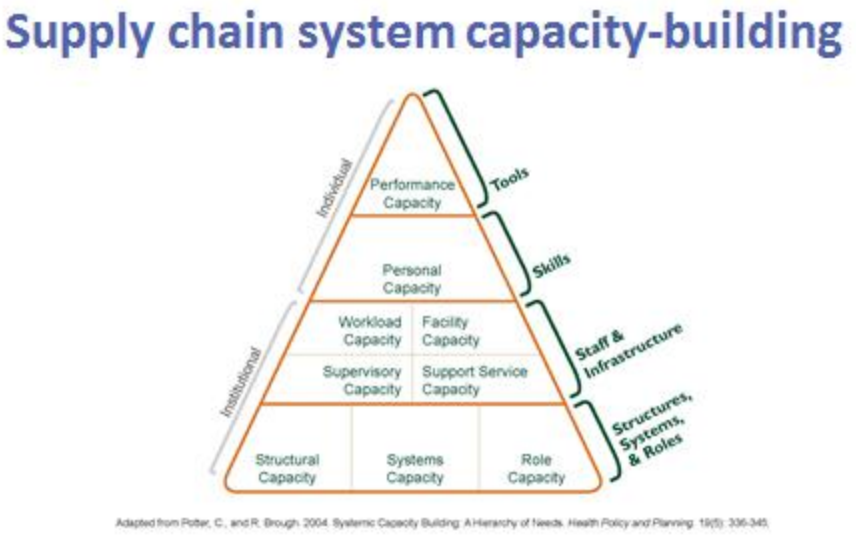
Performance-Based Logistics

CECOMA and its stakeholders (including the national MOH programs and field customers it supports) should work to establish clear, jointly developed standards for supply chain performance and begin a transition to a customer-driven, demand-based medical supply chain. Coordination and communication among all stakeholders should be expanded, and the Inter-Agency Coordination Committee for Municipal Revitalization's Logistics Working Group should be used more for discussing and developing solutions to improve performance of the supply chain logistics systems. A new MOH communication plan for the public health pharmaceutical supply chain should be developed, with the goal of identifying and implementing improved supply chain management practices across the entire MOH. A good starting point will be a roundtable among CECOMA, the DNME, PNME, provincial health departments and provincial warehouses to discuss and make sure everyone is on the same page with regard to future direction and strategic management of the Angolan pharmaceutical supply chain. The Inter-Agency Coordination Committee for Municipal Revitalization for logistics could also be used as a coordination mechanism for this.

Human Resources Capacity Development

The MOH and CECOMA should undertake a comprehensive, systematic effort to develop logistics human capacity at all levels, including national, provincial, and municipal levels. This effort should address both preservice and in-service capacity building. Materials and approaches for in-service capacity building should reflect the existing rudimentary condition of human capacity at each level of the system. The development of the human resources capacity development material should move in parallel with an initiative to develop a career development strategy for pharmaceutical supply chain staff members at all levels.

Human resources capacity development is the single greatest shortfall in the current pharmacy supply chain across Angola. The lack of written procedures, combined with a workforce lacking experience in modern pharmaceutical supply chain management practices, means that medical warehouse and health facility staffs across the nation are in critical need of basic skills development in all major functions. Effective capacity building should address both institutional and individual needs, as depicted in the MSH/Center for Pharmaceutical Management's capacity-building framework in figure 4.



Source: Center for Pharmaceutical Management (CPM). 2011. *Center for Pharmaceutical Management: Technical Frameworks, Approaches, and Results*. Arlington, VA: Management Sciences for Health.

Figure 4. MSH/CPM integrated model for capacity building

Information Systems

The MOH and CECOMA should implement an appropriate system and tracking mechanisms to ensure optimal flow of commodities and data and improve availability of commodities throughout the supply chain system. They should develop appropriate indicators to monitor and evaluate performance and take appropriate system-strengthening measures at all levels of the supply chain.

CECOMA should document requirements for a nationally integrated, multinode LMIS to support its supply chain system. Once an effective manual system is developed, field-tested, and implemented, the MOH should identify potential information system solutions and vendors; acquire the preferred solution(s); capacitate system users and managers; and implement the solution(s) nationwide. A good warehouse management system would improve most of the inbound, product storage, and outbound operational functions described in the "Storage" section below. Information requirements are not the same for all stakeholders in the Angolan pharmaceutical supply chain, and plans should include a robust, integrated, full-featured LMIS at CECOMA, along with less full-featured LMIS capabilities elsewhere. Regardless of the scope of the information system requirement, all of the systems should interface or integrate with each other, so that customers at the "last mile" of the supply chain are informed and aware of supply status, needs, and shortfalls at the other end—and vice versa.

Governance

The MOH should develop, disseminate, and implement written pharmacy supply chain policies and procedures. Concurrently, the MOH should finalize and disseminate an organizational governance framework and organograms, a staffing matrix, and organizational function and responsibility policies for CECOMA. The CECOMA organizational chart should be revised to reflect increased responsibility and functionality of the organization, and to address MOH governance, a board of directors or managing board that includes stakeholders, executive director, and key administrative and technical departments such as general services, supply chain operations, planning and statistics, and regional warehouses, and possibly vertical program units.

The increased responsibilities and technical functionality of the organization require a framework within which human resources capacity development, the new LMIS, and new written procedures can be created and implemented.

Warehouse Operations and Storage

CECOMA has a good foundation upon which to build: the old Angomedica warehouse has been significantly renovated and improved into a modern, spacious temporary warehouse with optimal physical facilities, storage-rack systems, and materials-handling infrastructure. However, warehouse temperature and secure storage conditions for controlled or high-value products and inventory control practices are still suboptimal. Physical facilities, storage conditions, and warehouse practices at provincial warehouses generally range from inadequate to suboptimal. Warehouse design and plans for maximum space use need to be analyzed so that CECOMA can develop process flows, policies, and procedures for the management of all phases of product receipt, storage, and shipment and develop tracking and inventory systems to maximize visibility of all products within the national supply chain system.

A good pharmaceutical warehouse is designed to optimize warehousing functions and achieve maximum efficiency and space use. A warehouse is typically divided into areas to support everyday work processes. These areas include general or bulk storage; loose or bin storage; vault for controlled substances, pilferables, or high-economic-value storage; cold-chain storage (refrigerated storage, freezer storage for vaccines); a separate storage area for hazardous materials; cross-docking area; shipping area; receiving area; and quality control and inspection area. Separate documentation and work processes may need to be developed for each area. Designing a new facility starts with analyzing current and projected data on the activities in each of these areas, including the receiving, shipping, and inventory levels. These data should be augmented by other considerations such as process flows, materials-handling equipment, type and styles of racking equipment, special handling requirements, and personnel.

A good warehouse layout must accommodate three primary functions—

- Inbound operations (including receiving and returns)
- Product storage (including quality control and surveillance)
- Outbound operations (including picking and staging)

These three primary functions require planning and analysis based on historical and projected unit and cubic footage or weight. Figure 5 illustrates these functions along with a number of subfunctions and documentation requirements they require.

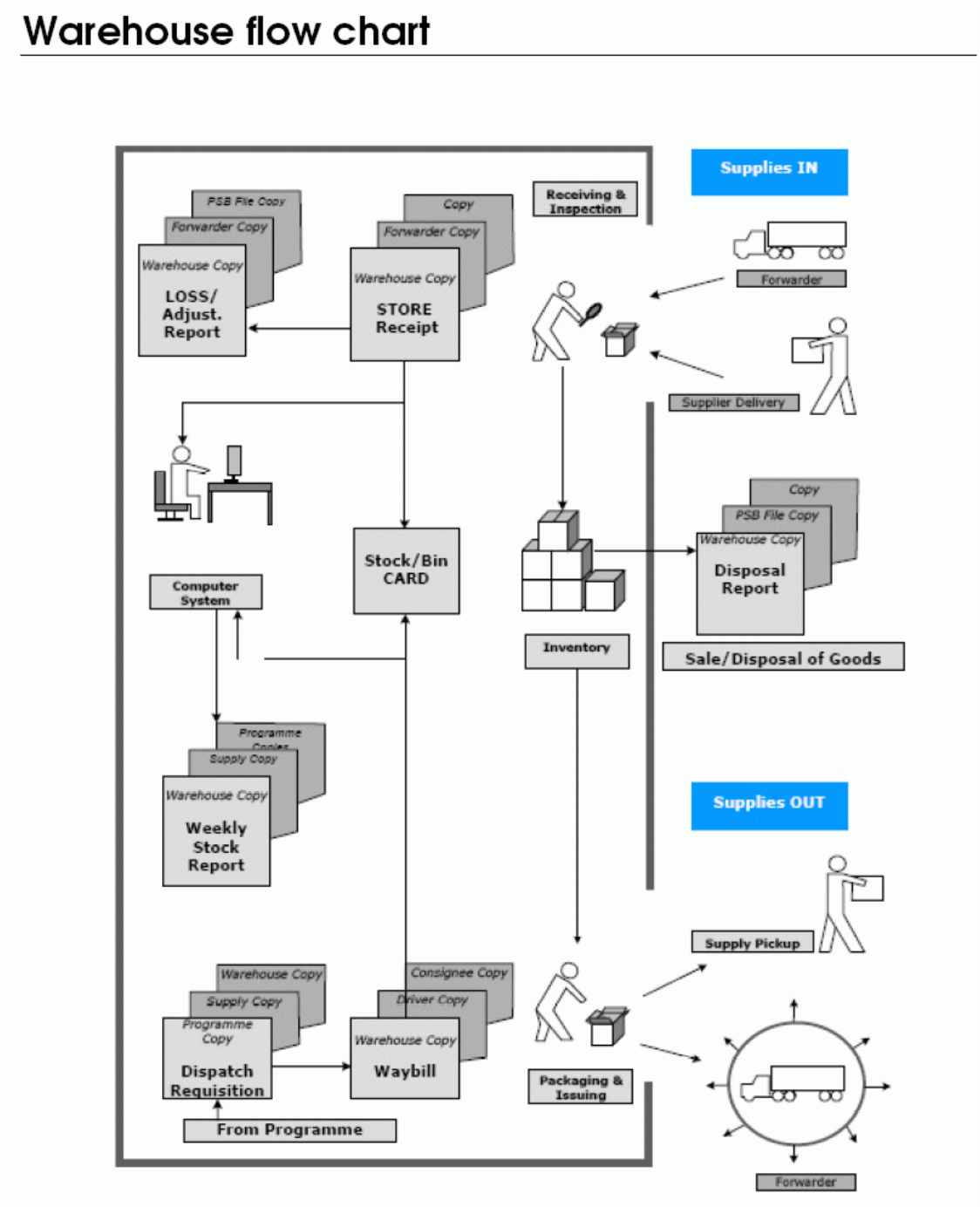


Figure 5. A notional warehouse work flow

Inbound Operations

The inbound operations portion of a warehouse's work flow is the portion in which items are offloaded from the transport carrier; taken into the warehouse; matched with paper or electronic order, purchase orders, or other documentation to confirm that the right item and quantity has been received; inspected for quality and condition; assigned an identification number (if necessary); relabeled (if necessary); assigned a storage location; and placed in the storage location.

Product Storage

An important first step to setting up and operating a pharmaceuticals warehouse is to clearly and accurately identify the products it will store. Most warehouse operations use a product numbering system with a unique identification code for each different product. A well-designed product numbering system should be linked to a product catalog (paper- or computer-based) with information about the product's strength, dosage form, and route of administration. Figure 6 illustrates one commonly used product numbering system.

Figure 6. A product numbering system helps identify and manage each unique product

As the use of automated warehouse management systems becomes more common, most operators also make use of machine-readable (able to scan) bar-code symbols to enable the automated management of products as they are received, stored, issued, and quality controlled. These machine-readable codes (like the one illustrated in figure 7) enable quick, accurate, traceable management of products as they flow through the warehouse work flow illustrated previously. The illustration is just one example of the technologies available to support automatic product identification; other technologies include radio-frequency identification, near-field communication technology, and mesh network tagging and reading technology.

Figure 7. Bar codes and other symbols enable accurate, fast identification of products

Once the products are identified and (possibly) tagged with an automated identifier, a warehouse location management system needs to be developed. For each storage location in a warehouse, a unique identification code, such as the one illustrated in figure 8, needs to be assigned and entered into the manual or automated locator system. The location identification codes should uniquely identify each storage row, aisle position, level, and (if applicable) bin location in the warehouse. Warehouse locations can be assigned for long-term storage locations as well as receiving and shipping locations, again to enable the tracking of inventory as it moves through the warehouse work flow.

Figure 8. Warehouse location identifiers and shelf labels can enhance warehouse management

Warehouse security is an integral part of warehouse management. The physical security of a facility to ensure controlled entry and access to products is a basic rule of good warehouse management practices—and usually the single biggest step that can be taken to control the loss of physical inventory. Most modern warehouse operations involve the use of some form of surveillance system, such as the ones illustrated in figure 9. These systems both reduce the incidence of theft and other losses and provide a record of what happened, if losses do occur.

Figure 9. Warehouse surveillance systems reduce inventory losses

For pharmaceutical warehouses, a secure but open storage area must be supplemented by a separate, more secure area for receiving, storing, and issuing high-value items, narcotics, and other products that are particularly susceptible to theft or misuse. This "cage" area may also have separate surveillance and alarm systems, and only persons who are approved for access should be allowed to access it. The cage area, as illustrated in figure 10, should be large enough so that products can be received, inspected, stored, inventoried, and packed for shipment to maintain complete security over the products in it.

Figure 10. A separate security area will reduce losses on theft-susceptible products

Separate areas are also needed for storing pharmaceuticals in less-than-caseload (also called "unit pack" or "unit of issue") sizes. Small bottles and packages of pharmaceuticals are also susceptible to theft or mishandling, and storing them in a separate "bin issue" area (with separate location identification codes) will help minimize losses. As with the security area above, access to the bin issue area should be limited to those personnel who actually work there, and sporadic

security checks of personnel leaving the area should be considered. The bin issue concept is illustrated in the photograph in figure 11.

Figure 11. A secure bin issue area will also help minimize losses

As the use of the warehouse management module or component of the LMIS improves, other advanced logistics technologies may be used to further automate and streamline warehouse operations. For example, best-in-class warehouses in the commercial sector increasingly rely on radio-frequency identification (RFID) systems to control products as they flow through the warehouse operation. A variety of approaches, capabilities, vendors, and technology are used to do this, but all rely on remote sensing and accounting for inventory wherever it is in a facility—and increasingly, throughout the supply chain. Figure 12 illustrates a network of "readers" installed in a warehouse to remotely scan for and sense tagged products. RFID technology further reduces product losses, improves the accuracy of warehouse location identification systems, reduces stock-outs, and improves inventory accounting and management.

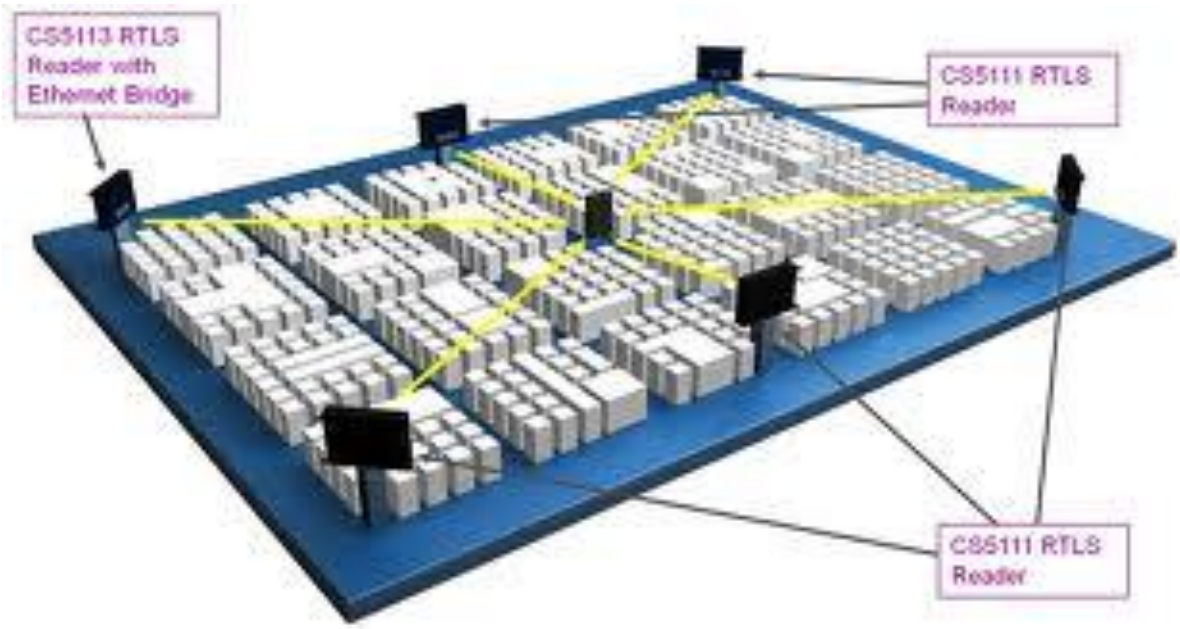


Figure 12. Warehouse-level view of an RFID system

Once an RFID system is linked to the warehouse management information system, the RFID information can be used to guide the location of newly received products, the picking of products for shipment, and other warehouse management activities. The RFID technology thus improves the accuracy and completeness of warehouse actions.

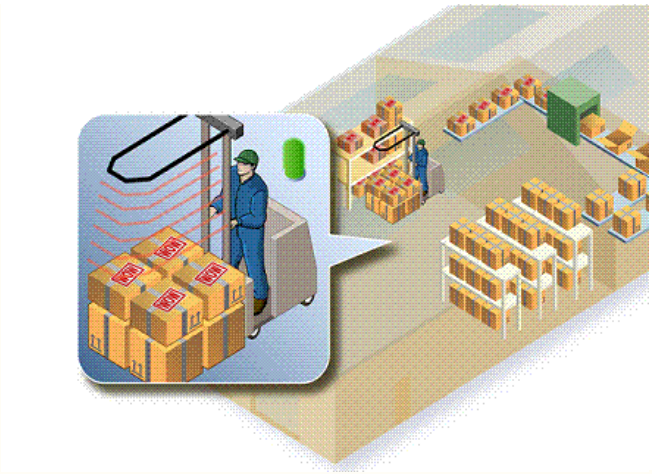


Figure 13. RFID technology can improve warehouse activity accuracy and completeness

CECOMA should review or develop SOPs for storage and inventory control of public health commodities

Outbound Operations

The outbound operations portion of a warehouse's work flow is the portion in which items are removed from their storage locations, checked to determine quality and condition, moved to a shipment staging area, inspected to determine that the correct product and quantity were selected for the right customer, packed and prepared for shipment; and loaded onto the outbound shipping container. The MOH should ensure provincial and municipal health facilities have adequate storage space with optimal storage conditions to maintain quality of stored commodities.

As an illustration, process flows in the Guyana MOH's central warehouse, the Materials Management Unit , can be found in the Guyana Supply Chain Management System Technical Brief.[3]

In conclusion, warehouse management is an increasingly technical and carefully managed function. Without effective warehouse management, no actual supply chain can be created, configured, and managed. CECOMA and the MOH should give careful and detailed consideration to the principles and practices outlined above and incorporate them into plans for the future enhancement of Angola's pharmaceutical supply chain.

Distribution and Transportation

The MOH should work to improve planning and communications between transport nodes and organizations at all levels and should support a comprehensive analysis of appropriate transportation options, including exploration of options for enhanced use of local private sector entities to support fleet management, scheduling, route planning, and transportation of commodities.

Quality Assurance and Surveillance

CECOMA and its supply chain partners need to improve the physical security of all warehouses, especially those at the provincial levels. The team observed few if any physical security measures in use at the provincial levels and inadequate physical security at all levels. In particular, physical handling and accountability for controlled substances requires improvement, the medicines receiving inspection process needs improvement, and product quality monitoring and reporting should be strengthened. In addition, a need exists to develop and maintain a program for effective warehouse temperature control.

Some of the findings and recommendations of this analysis are consistent with findings and recommendations of the 2010 assessment of HIV/AIDS supply chain management.[4]

[3] Guyana Supply Chain Management System (SCMS) Technical Brief, August 2010.
[4] Thumm, M., and W. Goredema. 2011. *Rapid Assessment of the Supply Chain System for HIV/AIDS Commodities in Angola: August–October 2010: Report.* Submitted to the US Agency for International Development by the Strengthening Pharmaceutical Systems (SPS) Program. Arlington, VA: Management Sciences for Health.

NEXT STEPS

Action Plan for Implementation of Recommendations

A comprehensive coordinated and agreed-upon action plan will be a critical component of any efforts on the part of CECOMA or the MOH to effect enterprise-level changes. This action plan will have efforts that need to be synchronized at all levels of the supply chain. Action in one area will have resultant effects at different levels, each with the goal of maximizing capacity and ensuring an efficient and effective supply focused on delivering pharmaceutical commodities to those individuals at the service delivery point locations, who in turn supply the client or customer with the items that they require. Next steps could include a stakeholders' meeting to present and seek consensus on the assessment findings and recommendations and agree on appropriate implementation priorities.

Table 3 highlights at the strategic and enterprise level an assessment work plan that can serve as a basis for implementation of actions to maximize current capacity. The assessment recommendations are organized into three levels as follows–

- Short term: considered as having the most immediate impact with little or no resources required outside the program.
- Midterm: involve issues that have direct operational impact but may require support from both the MOH and external NGOs for funding.
- Long term: considered the most difficult and those that would affect the program strategically. Two of the three recommendations would require the MOH to secure support and funding for continued construction of regional stores and the initiation of construction designs for both central and regional warehouses.

Table 3. Assessment Work Plan

Recommendation	Tasks	Recommended level
Performance-based logistics	Create written SOPs for basic supply chain management procedures	Short term
	Develop supply chain performance metrics	Short to mid term
	Develop mutually negotiated performance-based supply chain support agreements between CECOMA and its key stakeholders and customers	Long term
Human resources capacity development	Assess initial human resources capacity development needs and develop and publish a comprehensive human resources capacity development plan, including career development plans for supervisors and line staff (e.g., warehouse workers, stock control specialists)	Short term
	Implement human resources capacity development plan	Mid term
	Implement career development plans for supervisors and line staff	Long term
Information systems	Implement and train operators for a basic LMIS at CECOMA, provincial, and municipal hospital warehouse locations	Short term
	Implement appropriate full-featured LMIS capabilities all the way to the “last mile” of the supply chain	Mid term
	Acquire an integrated, enterprise-level LMIS that links CECOMA with all customers nationwide	Mid term
	Implement and train operators at all pharmaceutical store locations on the integrated, enterprise-level LMIS	Long term
Governance	Draft and publish written procedures for stock control, warehouse management, distribution and transportation management, quality assurance and surveillance, and performance measurement through CECOMA with assistance from DNME	Short term
	Establish a CECOMA governance body that includes representation of customers, MOH program managers, and other CECOMA stakeholders	Mid term
	Implement written procedures (supported by the enterprise-level LMIS) for pharmaceutical supply chain procedures at all Angola stores locations through CECOMA	Long term

Recommendation	Tasks	Recommended level
Storage	Analyze warehouse design and plans for maximum space use	Short term
	Develop process flows, policies, and procedures for the management of all phases of product receipt, storage, and shipment	Short to mid term
	Develop tracking and inventory systems to maximize visibility of all products within the Angolan pharmaceutical supply chain	Long term
Distribution and transportation	Develop a written distribution and transportation plan including node locations, schedules, and fleet management objectives	Short term
	Develop a comprehensive distribution and transportation plan including fleet requirements and capacities and monthly and annual movement plans	Short to mid term
	Assess and implement public-private partnership options to make optimal use of commercial transportation capabilities	Long term
Quality assurance and surveillance	Develop basic quality assurance written procedures to manage stock quantities, expiration date surveillance, receiving quality assurance procedures, and reporting, notification, and product suspension procedures	Short term
	Implement sound, consistent, traceable quality assurance practices as part of an enterprise-level LMIS	Mid term
	Develop a broad-based human resources capacity development program for quality assurance practices for all staff at all stores locations	Mid term
	Implement a nationwide practice to ensure continuous, ubiquitous tracking, visibility, and management of all quality assurance issues for all pharmaceutical products	Long term
	Conduct broad-based human resources capacity development to ensure supervisors and line workers at all stores locations are able to manage quality assurance effectively	Long term

CONCLUSION

This qualitative study has provided a framework for actions that are required to propel the MOH, the DNME, the PNME, CECOMA and their customers into a world-class pharmaceutical supply chain system. Individuals at all levels of the system are motivated and enthusiastic about implementing change throughout the supply chain enterprise. Detailed plans must be developed and implemented, policies and procedures need to be written, and critical infrastructure decisions must be made by senior MOH and CECOMA leadership. Ongoing efforts to strengthen CECOMA and the Angolan pharmaceutical supply chain must be continued.

ANNEX A. SCHEDULE OF ACTIVITIES

Date/Day	Time	Contact Person/Activity	Designation/Location
November 12, Monday	1000–1200H	*In brief with DNME* Dr. Boaventura Moura	DNME Director DNME office
November 13, Tuesday	0900–1000H	*In brief with CECOMA* Dr. Francisco Mateus	CECOMA Director Kilamba Kiaxi
November 14, Wednesday		Arriving/briefing and preassessment preparations	
November 15, Thursday	0930–1030H	Estevão Chilala/John Granda	MOH RH-FP/ Pathfinder National Directorate of Public Health (NDPH)
	1100–1230H	Mikhail Tiounine	NMCP Logistician NDPH
	1100–1230H	Dona Marcelina/Edilson*	INLS Logisticians INLS
	1400H onward	Dr. Boaventura Moura	DNME Director DNME, Maculosso
November 16, Friday	1000H onward	CECOMA visit Interview with Sebastião Suana*, Filipini Matos**, Isabel da Silva***	*Logistician in-charge of Malaria/HIV-AIDS **Logistician in-charge of reproductive health/TB-leprosy ***Cuban Technical Adviser Kilamba Kiaxi
November 17, Saturday	0900–1700H	Customization/finalization of interview tools	Skyna/Continental Hotel
November 18, Sunday	0900–1700H		
November 19, 20 Monday and Tuesday	0900–1700H	Supply chain workshop in Luanda	National Institute of Public Health
November 21, Wednesday	0900–1000H	Dr. Adelino Manaças	PNME Director PNME Maianga
	1230–1330H	Meron Semungue/ Nzoi Lusaia	UNFPA, UN Building, Marginal
	1330–1430H	Mr. Cooper	UNDP, UN Building, Marginal
	1430–1530H	TBD	UNICEF, UN Building, Marginal
November 22, Thursday	1000–1100H	Marcos Niculão	Logistician, TB/Lepra
	1300–1400H	João Manuel	Pharmacist, Josina Machel Hospital
November 23, Friday	1030–1100H	Domingas Canhanga	USAID/Angola Activity Manager for SIAPS
	1200–1300H	Visit to Luanda provincial warehouse	Luanda province
November 25, Sunday		Travel	Depart to Uige/Kwanza Sul

Date/Day	Time	Contact Person/Activity	Designation/Location
November 26, Monday	Open	Visit to provincial warehouse, provincial finance and planning unit, interview with provincial supervisors (HIV/AIDS and Reproductive Health) and one health unit	Uige
	Open	Visit to provincial warehouse, provincial finance and planning unit, interview with provincial supervisors (HIV/AIDS and Reproductive Health) and one health unit	Kwanza Sul
November 27, Tuesday	1000–1100H	Dr. Constancio João	Deputy CECOMA Director
November 28, Wednesday		Continue analysis/draft de-briefing PPT presentation for USAID	SIAPS Office
	1400H	Dr. Helga Freitas	National Coordinator Municipalization Project
November 29, Thursday	1400H	Preliminary results meeting with DNME/CECOMA*/PNME	DNME
November 30, Friday	0900–0930H	Wrap up/Debriefing with USAID/Angola Mission	US Embassy
December 1, Saturday		Departure	

ANNEX B. KEY PERSONS MET

Name	Title	Organization/affiliation
Patrick Gaparayi,	Senior Technical Adviser	Center for Pharmaceutical Management/USAID-SIAPS Project Management Sciences for Health, Angola
Raquel Barrientos	Technical Adviser	USAID/SIAPS, Angola Management Sciences for Health
Michael Ofeke	Technical Advisor	USAID/SIAPS, Angola Management Sciences for Health
Dr. Boaventura Moura	Director	DNME
Dr. Francisco Mateus	Director	CECOMA
Mikhail Tiounine	Logistician	PNCM
Estevao Chilala	Logistician	MOH RF-FP/Pathfinder National Directorate of Public Health
John Granda	Logistician	MOH RF-FP/Pathfinder National Directorate of Public Health
Dr, Adelino Manaças	Director	PNME
Dr. Ana Leitao	Reproductive Health Specialist	UNFPA
Dr. Eduardo Juarez	Program Specialist	UNFPA
Dr. Kakam	Operations Manager	UNFPA
Mr. Cooper	Logistician	UNDP
Mario Manuel	Supply Assistant	UNICEF
Joao Jose	Logistics Assistant	UNICEF
Joao Manuel	Chief Pharmacist	Josina Machel Hospital
Domingas Canhanga/Rachel Jean-Baptiste/Gisele Guimaraes	USAID Mission Team	USAID Mission/US Embassy
Marcos Jose Niculao	Logistician	TB/Leprosy
Kirenia M. Morales	Technical Consultant	TB/Leprosy
Mario Manuel	Supply Assistant	United Nations Children's Fund
Dr Constancio Joao	Deputy Director	CECOMA
Dr. Helga Freitas	National Coordinator	Municipal Revitalization Project
Dr. Henrique Lopes Silvestre	Chief of Administration/Finance	Kwanza Sul Provincial Health Directorate
Antero Carlito Paulo	Provincial TB/Leprosy Supervisor	Kwanza Sul Provincial Health Directorate
Maria Domingos Cambundo	Provincial RH/FP Supervisor	Kwanza Sul Provincial Health Directorate
Domingos Moureira	Provincial HIV/AIDS Supervisor	Kwanza Sul Provincial Health Directorate
Felix Espalhado	Provincial PNME Supervisor	Kwanza Sul Provincial Health Directorate
Taily Jimerez Goroia	Assessor Cubana	Kwanza Sul Provincial Warehouse

Name	Title	Organization/affiliation
Claudete Saubutombo	Pharmacist	Kwanza Sul Municipal Hospital
Jose Furanda	Provincial RH/FP Supervisor	Uige Provincial Health Directorate
David Zaeh	Provincial PNME Supervisor	Uige Provincial Health Directorate
Mario Martinez	Provincial Health Officer	Uige Provincial Health Directorate
M, Ferando	Provincial TB/Leprosy Supervisor	Uige Provincial Health Directorate
Pedro Lohen	Supervisor EPI Program	Uige Provincial Health Directorate
Pedro Cogi Zua	Chief of Medical Assistance	Uige Provincial Health Directorate
Orestes Morales	Technical Adviser Cubana	Uige Provincial Health Directorate
Simon Baptista	Pharmacists	Health Facility
Miguel Cambungo	Logistician	Health Facility

ANNEX C. SUPPLY CHAIN WORKSHOP ATTENDEES

#	Province/Program	Name	Designation
1	Moxico	Lucas Chahuili Futy	Warehouse Manager
2	Huila	Antonio Gaspar	Warehouse Manager
3	Huambo	Cornelio Messamessa	Warehouse Manager
4	Luanda	Katia Carvalho	Warehouse Manager
5	Huambo	Amandio Natito	Malaria Provincial Supervisor
6	Kwanza Sul	Felix Espalhado	PNME Provincial Supervisor
7	Benguela	Jose Geromino de Mota Santa Maria	PNME Provincial Supervisor
8	Luanda	Nelson Tchipilica	PNME Provincial Supervisor
9	Cabinda	Luis da Purificação Sambo	PNME Provincial Supervisor
10	Luanda	Pedro Teca	PNME Supervisor/Trainer
11	Luanda	André Sucami	PNME Logistician
12	Luanda	Sebastião Suana	Logistician, CECOMA (Malaria/Essential Medicines)
13	Luanda	Mikhail Tiounine	Logistician, NMCP (GF)
14	Luanda	Manzambi Ferreira	Logistician, NMCP (GOA)
15	Luanda	Dr. Adelino Manaças	Director, PNME
16	MSH	Raquel Barrientos	Angola
17	MSH	Michael Ofeke	Angola
18	MSH	Wonder Goredema	Arlington, Virginia, USA
19	LMI	Roger Miller	McLean, Virginia, USA
20	LMI	Danny Addison	McLean, Virginia, USA
21	APV	Renato Costa	Interpreter