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MOZAMBIQUE: FINAL COUNTRY REPORT

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DELIVER
No Product? No Program. Logistics for Health

MOZAMBIQUE: FINAL COUNTRY REPORT

DELIVER

DELIVER, a six-year worldwide technical assistance support contract, is funded by the U.S. Agency for International Development (USAID).

Implemented by John Snow, Inc. (JSI), (contract no. HRN-C-00-00-00010-00) and subcontractors (Manoff Group, Program for Appropriate Technology in Health [PATH], and Crown Agents Consultancy, Inc.), DELIVER strengthens the supply chains of health and family planning programs in developing countries to ensure the availability of critical health products for customers. DELIVER also provides technical management of USAID's central contraceptive management information system.

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Abstract

DELIVER activities in Mozambique focused on building capacity within the *Central de Medicamentos e Artigos Medicos* (CMAM) and the Ministry of Health. Specifically, the project's efforts aimed to strengthen Mozambique's public-sector forecasting, procurement, and storage and distribution of essential drugs, contraceptives, and HIV/AIDS commodities.

Specific activities and achievements under DELIVER included managing the development and implementation of a complex integrated drug management software system customized for Mozambique's public health sector; carrying out the procurement and importation of antiretroviral drugs for the national treatment program in 2006; coordinating with the CMAM and others on improved health services delivery, product quality, and commodity security; and conducting a requirements analysis for the construction of a central warehouse to serve the northern region of the country.

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ACRONYMS

AIDS	acquired immunodeficiency syndrome
ART	antiretroviral therapy
ARV	antiretroviral
CA	cooperating agency
CMAM	*Central de Medicamentos e Artigos Medicos* (Center for Medicines and Medical Supplies)
CPR	contraceptive procurement rate
CPT	contraceptive procurement table
DBA	database administrator
DHS	Demographic and Health Survey
EC	emergency contraceptive
FP	family planning
HIV	human immunodeficiency virus
ISC	information systems coordinator
ISS	information systems specialist
IT	information technology
IUD	intrauterine device
MLC	Mushonga Logistics Consultants
MOH	Ministry of Health
PC	personal computer
PEPFAR	President's Emergency Plan for AIDS Relief
POA	*Plano Operacional Anual* (Annual Operational Plan)
PRB	Population Reference Bureau
PSI	Population Services International
RH	reproductive health
RLA	resident logistics advisor
SCMS	Supply Chain Management Systems (project)
SDP	service delivery point
SIGM	*Sistema Integrado de Gestão de Medicamentos* (Integrated Medicines Logistics Management Information System)
UAT	user acceptance testing

UNFPA	United Nations Population Fund
USAID	U. S. Agency for International Development

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The Mozambique Country Team thanks our local staff for their dedication, significant contributions, and ongoing efforts: Armenio da Silva, Arnold Handal, Gulamo Gafur, and Marilyn Noguera.

EXECUTIVE SUMMARY

BACKGROUND

DELIVER activities in Mozambique focused on building capacity within the *Central de Medicamentos e Artigos Medicos* (CMAM [Center for Medicines and Medical Supplies]) and the Ministry of Health (MOH). Specifically, the project's efforts aimed to strengthen Mozambique's public-sector forecasting, procurement, and storage and distribution of essential drugs, contraceptives, and HIV/AIDS commodities. DELIVER worked in Mozambique from July 2001 - March 2007.

Currently, the CMAM manages an integrated logistics system that includes the distribution of medicines and medical supplies to health facilities through a three-kit system, a pull system for essential drugs and medical supplies, and a push system for antiretroviral (ARV) drugs to 43,000 patients on treatment at over 150 sites throughout the country (as of December, 2006).

ACTIVITIES AND ACHIEVEMENTS

Specific activities and achievements under DELIVER included—

- Managing from conception the development and implementation of a complex integrated drug management software system customized for Mozambique's public health sector (*Sistema Integrado de Gestão de Medicamentos*, or SIGM). This required definition of specifications and scope of work based on client needs; competitive bidding and awarding of a contract; management of subcontractors; review, analysis, and verification of progress on the scope of work; training of users; capacity building for CMAM technical staff and leadership; and post-implementation monitoring and support.
- Carrying out the procurement and importation of ARVs for the national treatment program in 2006.
- Coordinating with CMAM, other Mozambican government entities, international donors, multilaterals, and various cooperating agencies (CAs) and organizations on improved health services delivery, product quality, and commodity security. Related DELIVER activities included preparing contraceptive procurement tables (CPTs) and arranging to test condoms warehoused by Medimoc.
- Providing technical support to CMAM´s information technology department, including technical support for defining specifications and managing inventory of hardware and software, troubleshooting, and training.
- Conducting a requirements analysis in the northern city of Nacala for the construction of a central warehouse to serve the northern region of the country.

USAID will continue to support CMAM with logistics technical assistance through the Supply Chain Management System (SCMS) project funded by the President's Emergency Plan for AIDS Relief (PEPFAR). CMAM will also receive support for non-HIV/AIDS logistics through the USAID | DELIVER PROJECT.

LESSONS AND RECOMMENDATIONS

Accordingly, the following lessons and recommendations will be helpful to CMAM and the MOH, as well as to donors, other partners, and staff of future logistics technical assistance projects.

DEVOTE HUMAN RESOURCES TO THE SIGM

To ensure the implementation, institutionalization, and the sustainability of the SIGM, the CMAM must devote sufficient human resources—in number and skill— to develop a new generation of SIGM experts. Specifically, CMAM should—

- Appoint a full-time deputy director at CMAM for SIGM implementation and monitoring.
- Ensure full availability and continuity of key CMAM and warehouse technical staff during activities related to needs assessment, specifications, development, and implementation of Release 2 and 3 of SIGM software.
- Create a permanent CMAM SIGM provincial implementation team to be trained and become specialized in the provincial-level implementation activities that will take place in 2007.

IMPROVE UNDERSTANDING AND USE OF MANAGEMENT INFORMATION

For the SIGM to succeed, managers and policymakers at CMAM and the MOH need to become aware of the availability and potential use of the information to be produced by the SIGM. Specifically, the CMAM and MOH should—

- Develop an SIGM management information guide.
- Facilitate a logistics management information orientation seminar for program managers and senior staff of the MOH.

ENHANCE PROCUREMENT PLANNING AND COORDINATION FOR CONTRACEPTIVES, ARVS, AND OTHER PRODUCTS

Many ARV manufacturers are unable to comply with contractual delivery dates for one or two shipments per year; therefore, CMAM should—

- Plan for smaller and more frequent consignments to provide more flexibility in procurement.
- Keep the supplier aware of impending stock availability problems for the program.

The strict informational requirements and multiple steps in the importation process require close monitoring of expected shipments so as to resolve problems and ensure timely arrival of expected products. CMAM should—

- Plan for proactive communication between CMAM planning and procurement staff as well as with the donor agency procurement staff or procurement agency to prevent and resolve problems that arise in the process.

The CPT exercise enabled a review of distribution, expected shipments, future needs, and coordination of financial resources to plan for improved contraceptive security in 2007 and 2008. The Reproductive Health Working Group, formed in a moment of crisis, should—

- Continue to meet at least quarterly, if not monthly, to monitor the contraceptive and condom pipeline and resolve issues in a timely manner.
- Become more formalized and appoint a member as the permanent facilitator to ensure regular meetings and preparation of the agenda and minutes.

PROGRAM BACKGROUND

COUNTRY CONTEXT

Mozambique is considered to be one of the poorest countries in the world. Like other developing countries, Mozambique needs to continue to focus on improving key measures of its population's health and well-being. In 2003–2005, its per capita income was $290. Currently, Mozambique's human immunodeficiency virus (HIV) prevalence is 16.2 percent, and infant mortality is 101 per 1,000 live births. However, according to the World Bank, "Mozambique has made substantial progress in fighting poverty and improving human development. Sustained economic growth and increased spending in the social sectors contributed to a 16 percent decline in poverty in the six years from 1997, reaching 54 percent in 2003" (World Bank 2006). In addition, Mozambique's Poverty Reduction Strategy Paper/Action Plan for the Reduction of Absolute Poverty includes action in the health sector.

One of the key challenges faced by Mozambique is the rising morbidity and mortality from HIV and the AIDS. The national HIV prevalence among adults ages 15–49 is estimated at 16.2 percent in the period 2003–2005. Of a country population just under 20 million, the Joint United Nations Programme on HIV/AIDS reports that approximately 1.8 million Mozambicans are living with HIV. In January 2006, the national antiretroviral therapy (ART) program in Mozambique had 18,675 patients on ART. In June 2006, approximately 24,000 patients at 45 sites were on ART. The Ministry of Health (MOH) reached 43,000 patients on treatment at a total of 150 sites by the end of 2006.

As shown by reproductive health indicators, the 2003 Demographic and Health Survey reports that 11.7 percent of married women use modern methods of family planning, while 18.4 percent still have an unmet need. The total fertility rate remains high, at 5.5 children per woman, on average.

Numerous multilateral and bilateral partners contribute financial and other resources to those of the Government of Mozambique to strengthen the delivery of health services to the population. The availability of health commodities where and when they are needed is a crucial part of ensuring that improved health service delivery can contribute to improving the life of the Mozambican population, as evidenced by improved social and economic indicators.

KEY PLAYERS AND ROLES

The *Central de Medicamentos e Artigos Medicos* (CMAM) is the Ministry of Health (MOH) unit responsible for the central-level logistics functions of forecasting, procurement, and storage and distribution of all medicines and consumables for the MOH. The CMAM subcontracts such functions as procurement, importation, central-level warehousing, and transport to the 10 provinces and key hospitals throughout the country to Medimoc, a private company.

The CMAM manages an integrated logistics system that includes (a) the distribution of medicines, including contraceptives, and medical supplies to health facilities through a three-kit system, (b) a pull system for essential drugs and medical supplies, and (c) a push system for antiretroviral (ARV) drugs to the 45 (as of July 2006) sites providing ART throughout the country. Condoms and contraceptives are part of this system.

Essential drug kits and the pull system supply a public health services network comprised of hospitals, health centers, and community health workers located in 10 provinces divided into 128 health districts. The ARV supply chain currently extends to approximately 45 sites that provide ART services to approximately 20,000 people living with AIDS.

KEY CHALLENGES

Mozambique is a large country with many remote locations. Access to quality and timely logistics data at the central level is a challenge. Improved logistics data are the key to improving the effectiveness and efficiency of the medicines supply chain that services the public sector health facilities in Mozambique.

The MOH is undergoing a series of human resource reforms, which has resulted in high levels of staff turnover at the CMAM. Previously, CMAM was staffed primarily with contractors on competitive private-sector salaries. Human resource reforms throughout the MOH have replaced most of these people with civil servants, with the goal of having a more sustainable employee base. CMAM positions, ranging from the director down to the driver, have been filled with new staff in the last year of the DELIVER project. Many of the newly recruited staff have very little to no experience working in supply chain management of medicines, and some even lack basic computer skills. The constant change in staff at CMAM has been a challenge to implementing project activities and will continue to pose a threat to program sustainability.

Furthermore, a software development project with the level of functionality required by CMAM is complex to develop and implement in any environment. Changes in key staff at CMAM over the life of project activities involving the *Sistema Integrado de Gestão de Medicamentos* (SIGM) have required additional time and human and financial resources from the DELIVER project to keep the project advancing toward established objectives. In some cases, this has meant a reprioritization of workplan activities and funds in favor of the SIGM project.

GOALS AND OBJECTIVES

DELIVER OBJECTIVES

DELIVER project activities in Mozambique were complementary to those of the Mozambique Contraceptive Logistics Project, a USAID bilateral project implemented by John Snow, Inc. (JSI), from July 2002 to June 2004 (Rosche 2004). Following the end of that project, USAID funded DELIVER to continue logistics technical assistance support to the CMAM.

The goal of DELIVER activities was to build the capacity within CMAM and the MOH to strengthen the forecasting, procurement, and storage and distribution of essential drugs, contraceptives, and HIV/AIDS commodities in Mozambique.

It was expected that the achievement of the project goals would lead to increased availability of essential drugs, contraceptives, and HIV/AIDS commodities at service delivery points. However, given the period of time required to complete the development and implementation of logistics system strengthening, it is too soon to properly evaluate the project's impact as measured by increased availability of health commodities at service delivery points.

RELATIONSHIP TO USAID AND CLIENT OBJECTIVES

DELIVER project activities were in support of two USAID Strategic Objectives (SOs):

1. USAID Strategic Objective #8: Increased Use of Child Survival and Reproductive Health Services in Target Areas
2. USAID Strategic Objective #9: HIV Transmission Reduced and Impact of the AIDS Epidemic Mitigated.

Given the cross-cutting national systems building of our activities, DELIVER received funding from both SO 8 and SO 9.

The CMAM prioritizes its objectives and activities in an annual operational plan (*Plano Operacional Anual* [POA]). The DELIVER workplan activities were in support of the following CMAM POA objectives:

1. improved information for management through implementing the integrated logistics management system
2. availability of medicines and medical supplies for the national heath system.

DELIVER'S ROLE IN RELATION TO OTHER ORGANIZATIONS

Though DELIVER's primary relationship was with its counterpart, the Mozambican MOH unit called CMAM, the project also collaborated with donors, other CAs, and U.S. and Mozambican government agencies, as well as other key organizations.

DELIVER staff members were fortunate to be housed in a small office located in the CMAM building. Such integration into CMAM allowed project staff to support and build CMAM´s technical and leadership capabilities in health commodity logistics. As such, project staff members were mainly known as technical assistance providers and were part of the CMAM team.

In addition, DELIVER participated in USAID and Centers for Disease Control meetings for partners supporting both SO 8 and 9. Through this forum, DELIVER shared information and collaborated with various USAID-funded partners in an effort to support the MOH with activities related to improved service delivery of maternal and child health services, as well as prevention, care, and treatment of HIV/AIDS.

Furthermore, DELIVER was an active member of the Condom Working Group. This group included regular members from the National AIDS Program, National AIDS Council, Reproductive Health (RH) Program, CMAM, Mozambican Ministry of Defense, Population Services International (PSI), and USAID. Project staff also participated in the RH Working Group, which brought together staff from the RH Program, CMAM, the United Nations Population Fund (UNFPA), and USAID.

DESCRIPTION OF STRATEGIES

DELIVER pursued three main technical assistance strategies:

- *Improved access to quality logistics management information.* Through the development and implementation of an integrated drug management system, which is called SIGM (*Sistema Integrado de Gestão de Medicamentos*), CMAM will have greatly improved access to timely and quality logistics management information. Given the longer-than-expected software development period necessary for SIGM, DELIVER was able to implement SIGM only at the central level. The central-level sites included the CMAM and Medimoc headquarters, two central warehouses in Maputo, and one warehouse in Beira. The SIGM will be implemented at 10 provincial warehouses and three central and general hospitals with support from the future Supply Chain Management Systems (SCMS) project.
- *Procurement of antiretroviral drugs.* To ensure availability of HIV/AIDS medications, DELIVER procured and managed the importation process for ARV medicines, on behalf of USAID, to support the MOH's national ART program.
- *Improved coordination for RH commodity security.* To improve commodity security, DELIVER promoted the use of logistics information to facilitate coordination among RH Program and condom stakeholders. Also, as part of this strategy, the project conducted a number of activities related to condom quality, such as sampling and quality assurance testing.

In addition, DELIVER conducted activities in response to technical assistance requests from CMAM that included—

- providing technical support to CMAM´s information technology (IT) department
- conducting a requirements analysis for the construction of a central warehouse to serve the northern part of the country in Nacala.

SUMMARY OF DELIVER FUNDING AND STAFFING

From 2001 to 2006, JSI received a total of $4,857,000 for DELIVER activities implemented in Mozambique through March, 2007. Of this, $2,232,000 was field support, and $2,625,000 was PEPFAR funding. Of the PEPFAR funds, $987,000 funded technical assistance and $1,638,000 was for procurement of commodities (ARVs).

The $3,219,000 spent on technical assistance funded a number of activities, most notably, the development of five manuals documenting updated Standard Operating Procedures for logistics management of Via Classica medicines and Essential Drug Kits, improving access to quality logistics management information through the development and implementation of the Sistema Integrado de Gestão de Medicamentos (SIGM), _improving forecasting and coordination of logistics for RH commodity security (CPTs), conducting the Nacala Warehouse Requirements Analysis, and on

antiretroviral drugs procurement and tracking of importation process. These funds also covered the costs associated with a larger staff presence and headquarters support of a project office for 16 months of the last two years of activities. Those costs have been allocated across primary activities. Approximate expenditures for each area is outlined in the table below.

Table 1. Approximate DELIVER Expenditures

Technical Assistance Activity	Funding	Timing
Contraceptive and condom forecasting and coordination of logistics for improved contraceptive security.	$250,000	2002 - 2006
Standard Operating Procedure Manuals (5) for Via Classica and Essential Drug Kits Logistics Management	$91,450	2003-2004
Support CMAM to design, develop, and implement the SIGM at Central Level and Maputo Provincial Warehouse	$2,762,550	2002-2007
Requirements Analysis for Nacala Warehouse	$85,000	2006
Procurement of Antiretroviral drugs ($1,606,647.12 actual drugs)	$1,668,000	2006
Total	$4,857,000	

Staffing of DELIVER in Mozambique has evolved to adjust to the technical assistance activities and support needs of the CMAM. To oversee the activities related to the SIGM, DELIVER provided, in December 2004, an information systems specialist (ISS) consultant to work with CMAM and the JSI logistics project. In May 2005, after the departure of CMAM´s SIGM coordinator, the ISS was hired to lead the SIGM activity as the information systems coordinator (ISC). In August 2005, DELIVER placed a resident logistics advisor (RLA) to lead a team of three technical project staff. This team engaged in expanded project activities supporting CMAM with implementation of the SIGM, managing procurement of ARVs, and providing other technical assistance activities related to contraceptive security. In February 2006, DELIVER hired two former CMAM internal audit staff as SIGM implementation consultants, and, in April 2006, an operations manager joined the DELIVER team to support implementation activities and project closeout.

Though not on DELIVER staff, JSI´s South African subcontractor, GijimaAst, was responsible for SIGM software development and implementation at the central level. GijimaAst had two subcontractors: South Africa-based Mushonga Logistics Consultants (MLC), and Virconn, a local Mozambican IT firm. MLC filled a critical technical assistance role in development and implementation of SIGM software and, in particular, the post-implementation support. Virconn provided Portuguese language training and implementation support to SIGM activities as well as to the future SIGM help desk.

PROGRAM RESULTS

ELEMENT I: IMPROVED LOGISTICS SYSTEM

DEVELOPMENT OF STANDARD OPERATING PROCEDURES FOR VIA CLASSICA AND ESSENTIAL DRUG KIT SYSTEM LOGISTICS MANAGEMENT

In collaboration with the Contraceptive Logistics Project, DELIVER assisted CMAM with drafting the Second Edition of five manuals containing the Standard Operating Procedures (SOPs) for logistics management of essential drugs in the "pull" system (Via Classica) and in the "push" system of Essential Drug Kits A, B, and C. Different manuals were developed for each of five types of facilities conducting logistics management activities: Health Centers, Intermediary Stores (District Level), Provincial Warehouses, Central and Provincial Hospitals, and Wards.

The Contraceptive Logistics Project supported CMAM to rollout the training to 1,694 staff at all levels of the system. These SOPs became the basis for specifications for the SIGM software.

DEVELOPMENT OF THE SIGM

The CMAM identified a need for an integrated automated logistics information system in 2001. USAID agreed to fund the development of the system envisioned by CMAM through the DELIVER project. This system, called the SIGM, integrates the central-level logistics functions of forecasting, procurement, and storage and distribution with the central warehouses' stock management. Its functionality allows provincial warehouses and hospitals to link to the same database through the telecommunications infrastructure available in Mozambique. DELIVER´s support of the SIGM software development since the latter part of 2002 has included the following activities:

- Development of specifications and scope of work for a competitively bid contract with a software development firm.
- Issuance of expressions of interest to potentially qualified firms with software development experience and prequalification of eight firms.
- Refinement of the scope of work and development of Use Cases.
- Issuance of a Request for Proposal to eight prequalified firms.
- Invitation of four firms in January 2004 to give a presentation of their proposals and to answer questions from key CMAM staff and Washington-based DELIVER staff.
- Selection of the winning contractor (GijimaAst) by a committee of three CMAM and three JSI staff (representing JSI bilateral projects and DELIVER/Washington) and contracting in June 2004 of the selected firm by JSI following approval by USAID/Washington.
- Completion since June 2004 of numerous prototype reviews of various SIGM modules and functionality. The reviews enabled CMAM and DELIVER to analyze, comment upon, and accept that the software solution being developed corresponded to the needs and specifications outlined in the Use Cases. The reviews culminated in the user acceptance testing (UAT) of the procurement, distribution, and warehousing (I-log) modules in December 2005 and the user access and planning module in February 2006. Though the SIGM was originally envisioned to include a financial module, CMAM

chose to postpone the development of this module in late 2005. Human resource capacity constraints did not allow CMAM to define requirements and develop the module at that time.

- Analysis of the management information needs and operational requirements of the users of the SIGM resulting in an analysis and recommendation for 123 reports and operational documents to be produced by the SIGM system.

IMPLEMENTATION OF THE SIGM AT THE CENTRAL LEVEL

The UAT was the culminating event of the development phase of the SIGM, and it resulted in a transition to the implementation phase. Implementation of the SIGM required an immediate acceleration of activities and a steep increase in human and financial resources. Much coordination and logistics support was required to conduct implementation activities at multiple locations in Maputo and Beira. For each site, activities included—

- participation of SIGM module users in a two-week training workshop in Maputo
- verification at each site of infrastructure and operational equipment necessary to install and operate SIGM
- verification and cleaning of product lists and codes
- completion of physical inventory by lot and expiry date at each central warehouse
- preparation of historic distribution and stock-on-hand data for loading into the SIGM database
- timely receipt and capture of quarterly orders from provincial warehouses and hospitals into the SIGM for CMAM and warehouses to use SIGM for distribution
- entering of data for existing procurement contract orders into the SIGM to enable warehouses to receive products onto system ledgers when consignments arrive from the port at the central warehouses
- SIGM on-the-job-training and on-site support during implementation activities and second- and third-quarter distribution cycles from central warehouses to provinces
- post-implementation monitoring and support including reinforcement of CMAM policies, processes and procedures through the SIGM, SIGM data integrity monitoring, and resolving issues remaining from implementation related to the system and incorrect user actions that occurred during and after implementation.

By the end of DELIVER, the SIGM was successfully implemented at the three central warehouses managed by Medimoc, Medimoc headquarters, and CMAM headquarters, and had been used by the CMAM and the central warehouses for conducting the second- and third-quarter requisition cycles as well as monthly distribution of ARVs.

PROVINCIAL WAREHOUSE PILOT IMPLEMENTATION

The SIGM was implemented at the provincial medical warehouse in Matola, Maputo Province. Because it was the first implementation at this type of warehouse, the pilot included a review of the warehouse business processes, minor software updates, and testing of the implementation process and of a post-implementation monitoring and evaluation tool.

PROCUREMENT OF EQUIPMENT FOR SIGM IMPLEMENTATION

To support SIGM implementation, DELIVER provided CMAM with a personal computer (PC) to be used as a server at the Beira central warehouse, two SQL Server 2005 Enterprise Edition per processor licenses in English, and one Crystal Reports XI Professional Edition software license. In addition, 10 PCs were

procured for use during training workshops and deployment to the provinces during SIGM implementation. These computers will be transferred to the SCMS project for implementation of the SIGM at the provincial level.

SIGM SOFTWARE RELEASE 2

Over the course of system development and implementation activities, CMAM made a number of requests for SIGM functionality that were not originally included in the *Use Cases* or in the original contract between JSI and GijimaAst. In August 2006, JSI issued a contract modification to GijimaAst which enabled inclusion of the required functionality in Release 2. User acceptance tests were performed in September 2006, Release 2 was installed in October 2006, and fixes from provincial-level testing were completed in January 2007. By the end of the project, Release 2.1b was installed and running at CMAM.

In March 2007, the source code and build process for the newest software version were verified in South Africa. The source code and relevant documentation were then provided to lawyers for safekeeping in an escrow account. In the event that GijimaAst ever goes out of business or is otherwise unable to service the software, the source code will be released to JSI/CMAM so that further development of the SIGM can continue. During verification the step-by-step guide for the build process was followed and confirmed as correct. The source code was also verified, and an application was built and tested to compare the system being used in Mozambique with the newly built application. The applications proved to be the same; the source code accurately produced SIGM version 2.1b. This source code and all dependent off-the-shelf component/libraries were copied to CDs to be placed in the escrow account.

Functionality changes have been identified for Release 3, to be developed under the future SCMS project.

SUPPORT TO CMAM IT DEPARTMENT

DELIVER´s information systems coordinator worked as a member of the CMAM IT department, created to support the SIGM. Through the ISC, DELIVER supported CMAM by mentoring and training the newly hired SIGM database manager and network and server administrator, and helping with routine functions, such as ensuring operations of networks and servers for telecommunications and the SIGM. The ISC also helped the IT department to prepare its annual budget and workplan, in addition to providing advice to CMAM regarding specifications and contracts for purchasing of hardware and telecommunications contracts for the SIGM. Following the departure of the network and server administrator from CMAM, DELIVER paid for a network and server administration service contract to maintain the operations of the IT infrastructure at CMAM.

NACALA WAREHOUSE STUDY

The MOH identified the lack of a centralized warehouse in the north of Mozambique to be a chief bottleneck in the efficient distribution of essential medicines and medical supplies to the provinces in this area of the country. Specific provinces included Niassa, Cabo Delgado, Nampula, and Zambézia. DELIVER provided two warehousing experts and a local architect to conduct a requirements analysis for the construction of a warehouse for storing medicines and consumable medical supplies in the port city of Nacala. The final report of this technical assistance presents the volumetric analysis, storage and materials-handling specifications, architectural warehouse specifications, a proposed layout, and a cost estimate for a new warehouse. The report can serve as a precursor to the development of an executive project that would provide sufficient detail to allow prospective bidders to bid on the construction of a warehouse in Nacala.

CONDOM QUALITY ASSURANCE

The very poor warehousing conditions provided by the space being used to store condoms at the central level in Maputo have been of great concern for some time. In particular, demand for the public sector condoms is lower than forecasted, and condoms are often exposed for long periods of time to extreme

heat conditions. DELIVER assisted the CMAM in preparing a sampling strategy to test the quality and determine the usability of the consignments of condoms warehoused by Medimoc. Those lots that did not pass quality assurance testing were quarantined for removal from warehouses by Medimoc.

In addition, DELIVER worked with the members of the Condom Working Group to develop terms of reference for developing a Condoms Quality Assurance Plan for Mozambique, which received approval from the Minister of Health. Timing constraints resulted in this technical assistance not being implemented under DELIVER. This technical assistance should be considered for inclusion in the activities of the USAID | DELIVER PROJECT.

ELEMENT II: IMPROVED HUMAN CAPACITY IN LOGISTICS

The SIGM is a tool that should enable staff responsible for logistics management functions at the central and provincial levels to greatly improve their performance in carrying out many of their responsibilities. The significant staff turnover at the CMAM has made it difficult to achieve improved human capacity in logistics, because to a large extent, the new staff lack many of the basic and specialized skills needed to do their jobs. The capacity of the new staff will need to be developed further.

Fortuitously, the finalization of the SIGM software development phase and the implementation of the SIGM coincided with many of the new staff starting their jobs. SIGM implementation activities have provided an opportunity for many of the new CMAM staff to be oriented and trained in using this tool they will need to do their jobs.

SIGM TRAINING WORKSHOPS

As a kickoff for SIGM implementation activities, DELIVER trained a total of 37 CMAM and Medimoc headquarters and warehouse staff. The training included a series of three two-week workshops focusing on the various modules of the SIGM software, all of which the users would need to know to perform their functions using this system. Maputo provincial warehouse staff and three DELIVER project staff also participated in this activity. Five months after the completion of these training workshops, an additional course was planned for new staff who had arrived at CMAM as well as for others who were not previously available. Twenty-two CMAM and Medimoc staff participated in the additional training course as well as 10 new finance and administration staff at CMAM who needed orientation to the SIGM.

A SIGM user´s guide was developed and provided to participants of the training to be used as a SIGM reference.

ON-THE-JOB TRAINING AND MENTORING IN THE USE OF THE SIGM

During and following implementation of the SIGM software at the central-level sites, DELIVER provided on-the-job-training, mentoring, and follow-up to SIGM users and CMAM SIGM coordinators in correct use of the system, resolving data and procedural issues, and reinforcing the correct use of the system for CMAM logistics management processes.

CODIFICATION WORKSHOP

To formalize the procedures for coding new items, suppliers, and clients, and document these processes in a codification manual, DELIVER subcontracted the MLC to conduct a codification workshop. Participants came from the clinical laboratories, the *Centro de Abastecimentos*[1], and the CMAM. The manual serves as a guide for CMAM staff responsible for any future codification maintenance required by the SIGM. A codification committee was created to act as a forum for resolving future issues related to product codification.

1. An MOH institution that manages a second supply chain for medical equipment and some consumable medical supplies such as syringes, etc. (not medicines).

MENTORING SIGM LEADERSHIP AT CMAM

By the last year of the DELIVER project, CMAM had lost a majority of the key staff who had provided leadership since the initiation of the SIGM project. It became necessary for CMAM to identify new staff to become responsible for SIGM leadership within the institution. A new CMAM employee from the Procurement Department and the head of the Internal Audit Department were appointed co-coordinators for the SIGM in April 2006. DELIVER staff have worked closely with the new coordinators to help clarify and define respective roles and responsibilities and integrate them into project decision-making activities. Perhaps most important, DELIVER has worked to build the coordinators' understanding of the SIGM and their capacity to provide leadership within CMAM for the successful implementation, use, and institutionalization of the SIGM software by users at the central level.

CMAM DATABASE ADMINISTRATOR TRAINING

DELIVER sponsored the participation of CMAM´s database administrator (DBA) to participate in web-based and classroom training in writing queries, implementation, and management of an SQL 2005 database at a software training center in Johannesburg, South Africa.

HELP DESK

DELIVER subcontracted GijimaAst to provide a Portuguese language help desk for users of the SIGM (through Virconn with backup support of GijimaAst software development staff, when required). DELIVER will fund the help desk through December 2006, and it is expected to be continued through funding to the future SCMS project.

ELEMENT III: IMPROVED RESOURCE MOBILIZATION FOR CONTRACEPTIVE SECURITY

BACKGROUND

Historically, a large majority of RH supplies for family planning and prevention of sexually transmitted infections and HIV/AIDS in the public sector has been donated in-kind to Mozambique by USAID and UNFPA. Occasionally, organizations such as PSI would also donate products. In the third and fourth quarters of 2005, the public sector experienced stockouts of all oral contraceptives and injectables at the central level. This major shortage was caused primarily by a lack of long-term planning, coordination, and information sharing. Emergency shipments from USAID and UNFPA in the first half of 2006 were requested. Arrival of some oral contraceptives was delayed because a UNFPA container fell into the port of Maputo . Other contributing factors included poor communication upon the arrival of the replacement shipment and unavailability of USAID supplies on such short notice.

CONTRACEPTIVE PROCUREMENT TABLES

In December 2005, DELIVER worked with CMAM, UNFPA, and the RH Program to prepare a forecast of RH commodities. In addition, DELIVER assisted with assessing the stock situation and placing emergency orders for early 2006 and began the process of longer term planning and coordination of financial resources for improved contraceptive security. The RH Working Group included staff from the RH Program, CMAM, USAID, UNFPA, and DELIVER. With members of this group, DELIVER collected data to finalize 2006 contraceptive procurement tables (CPTs) in March and prepared an update in July 2006 once donors could confirm their support. The July 2006 update included the phase-in of MOH-funded procurement of $500,000 in funding for procurement of contraceptive needs in late 2007.

By July 2006, the CPTs included confirmed shipments for UNFPA, USAID, and the MOH through the end of 2007, including likely shipments needed in 2008, so that the three sources of funding could mobilize financial resources to cover those needs. Future annual forecast updates will be done in January of each year, and a July CPT update will provide the opportunity for better supply chain monitoring.

These updates will result in more reliably available contraceptives to support the service delivery goals of the RH Program.

ELEMENT IV: IMPROVED ADOPTION OF ADVANCES IN LOGISTICS

The SIGM software incorporates numerous best practices that will advance logistics management in Mozambique.

For instance, the SIGM uses information technology to integrate numerous sites and logistics functions. This integration means that data are entered once, used many times, and by many people, decreasing the chance of errors and increasing accountability through checks and balances. Once installed at the provinces, the SIGM will enable the central level to have day-old (at most) stock on hand and issues data from the provinces and hospitals.

The richness of data that will be available through the SIGM database will enable the production of numerous management information reports as well as provide data mining possibilities for monitoring and evaluation of the effectiveness of the logistics system.

ELEMENT V: ESTIMATION OF USAID CONTRACEPTIVE NEEDS

DELIVER prepared CPTs for USAID/Mozambique once the RLA was posted in Maputo in the last year of the project (see Element III).

ELEMENT VI: PROCUREMENT OF ANTIRETROVIRAL DRUGS

DELIVER's procurement of ARVs and its clarification and management of the ARV importation process helped Mozambique to avoid shortages of ARV commodities. In support of the national antiretroviral therapy program in 2006, DELIVER procured 10 different antiretroviral drugs from six suppliers, valued at $1,606,647.12,[2] for donation to CMAM on behalf of USAID. These drugs were to support second-line and alternate first-line antiretroviral treatment regimens in 2006. As mentioned above, the national program began in 2006 with 18,675 patients on treatment and plans to scale up to 55,000 on treatment and 105 sites by the end of 2006. By April 2006, 45 sites throughout Mozambique provided ART.

DELIVER coordinated final procurement quantities of each drug with CMAM planning department staff. A matrix describing the steps in the importation process was developed and used to closely monitor the performance of suppliers and progress during the importation process. Upon arrival in the central warehouse, DELIVER and CMAM staff conducted a visual inspection of ARVs received, and they affixed USAID branding stickers on the outside of each case and official acceptance of goods by CMAM.

Both GlaxoSmithKline and Bristol Myers Squibb were unable to meet contracted delivery dates. Negotiations with these suppliers for partial shipments made it possible for DELIVER to provide enough ARVs in time to avoid any stockouts.

Challenges in the importation process arose primarily because suppliers did not provide information on the pro forma invoices per Mozambican requirements. A further challenge involved a breakdown in the communication process between suppliers, CMAM, and Medimoc during the importation process, which requires authorizations, inspections, approvals, shipment, and then clearance to take place. Shipments of ARV medicines began arriving in January 2006, and the final consignment was received in July 2006. Table 2 provides information on the total quantity and value of the ARVs procured by DELIVER.

2. This figure does not include all shipping and fees.

Table 2. ARVs Procured by DELIVER

ARV	Quantity	Value ($)	Supplier
Ritonavir RTV 100-mg capsules (Norvir)	54,600	6,233.50	Abbott
Zidovudine 300-mg tablets (Zidovex)	100,020	22,504.50	Aurobindo
Zidovudine 300-mg / Lamivudine 150-mg tablets (Zidovex-L)	722,760	208,395.80	Aurobindo
Didanosine 400 mg EC capsules (Videx)	177,990	140,434,11	Bristol Myers Squibb
Didanosine 250 mg EC capsules (Videx)	74,040	45,263.12	Bristol Myers Squibb
Abacavir 300 mg tablets (Ziagen)	192,000	233,280.00	GlaxoSmithKline
Nelfinavir 250 mg tablets (Viracept)	513,810	141,611.97	Hoffmann-LaRoche
Efavirenz 200 mg capsules (Stocrin)	75,420	37,022.84	Merck Sharp & Dohme
Efavirenz 600 mg capsules (Stocrin)	651,330	665,225.04	Merck Sharp & Dohme
Idinavir 400 mg tablets (Crixivan)	362,160	106,6786.24	Merck Sharp & Dohme
Total			

LESSONS LEARNED AND FUTURE DIRECTIONS

USAID will continue to support the CMAM with logistics technical assistance through the PEPFAR-funded Supply Chain Management System (SCMS) project. CMAM will also receive support for non-HIV/AIDS logistics through the USAID | DELIVER PROJECT.

The SCMS will continue to support SIGM implementation activities, procure ARVs, and provide other logistics system and human capacity strengthening activities to CMAM. It is hoped that the following lessons learned and recommendations will be helpful, first and foremost to CMAM and the MOH, and also to donors, other partners, and staff of future logistics technical assistance projects.

SIGM SOFTWARE DEVELOPMENT AND IMPLEMENTATION

The development and implementation of a sophisticated integrated drug logistics management system, such as CMAM envisioned the SIGM to be, is a complex and long-term project involving a great deal of consensus building on what information is desired and advisable. It would have been difficult for project stakeholders to envision the level of effort required to produce and implement quality software with the functionality needed by CMAM. Given the significant staff changes in the last year, CMAM´s SIGM institutional memory is weak. It is extremely important that CMAM devote sufficient human resources necessary to develop a new generation of SIGM experts to work alongside SIGM technical assistance providers to ensure the implementation, institutionalization, and the sustainability of the SIGM. Human resources suggestions include—

- Appoint a full time deputy director at CMAM for SIGM implementation and monitoring.
- Ensure full availability and continuity of key CMAM and warehouse technical staff during activities related to Release 2 and 3 of SIGM.
- Create a permanent CMAM SIGM provincial implementation team to be trained and become specialized in the provincial-level implementation activities that will take place in 2007.

USE OF MANAGEMENT INFORMATION

The SIGM will make more management information available than CMAM, other programs, and senior managers and policymakers in the MOH have ever had access to before. Use of management information varies depending on the management culture of an organization. For the effectiveness of the SIGM to reach its full potential, managers and policymakers at CMAM and the MOH need to become aware of the availability and potential use of the information to be produced by the SIGM. The following activities would be useful:

- Develop a SIGM management information guide.
- Facilitate a logistics management information orientation seminar for program managers and senior staff of the MOH.
- Explore local service organizations that could provide user support for the SIGM through Help Desk or other mechanisms as subcontractors to the MOH .

PROCUREMENT OF ARVS

Many ARV manufacturers are unable to comply with contractual delivery dates for one or two shipments per year. CMAM should—

- Plan for smaller and more frequent consignments to provide more flexibility in procurement.
- Keep supplier aware of impending stock availability problems for the program.

IMPORTATION OF CONTRACEPTIVES, ARVs, AND OTHER DONATED HEALTH COMMODITIES

The strict informational requirements and multiple steps in the importation process require close monitoring of expected shipments to be able to resolve problems and ensure timely arrival of expected products. CMAM should—

- Plan for proactive communication between CMAM planning and procurement staff as well as the donor agency procurement staff or procurement agency to prevent and resolve problems that arise in the process.

COORDINATION FOR IMPROVED COMMODITY SECURITY

The CPT exercise enabled a review of distribution, expected shipments, future needs, and coordination of financial resources to plan for improved contraceptive security in 2007 and 2008. The RH Working Group, which had been formed in a moment of crisis, should—

- Continue to meet at least quarterly to monitor the contraceptive and condom pipeline and resolve issues in a timely manner.
- Become more formalized and appoint a member as the permanent facilitator to ensure regular meetings and preparation of the agenda and minutes.

REFERENCES

Country Situation Analysis (by the Joint United Nations Programme on HIV/AIDS), http://www.unaids.org/en/Regions_Countries/Countries/mozambique.asp (accessed August 2006).

MEASURE Demographic and Health Survey (DHS). *2003 Demographic and Health Survey.* Available at http://www.measuredhs.com (accessed August 2006).

Rosche, Tim. 2004. *Mozambique Contraceptive Logistics Project, USAID Support to the Ministry of Health´s"Central de Medicamentos e Artigos Medicos" July 2002–June 2004 Final Report.* Maputo, Mozambique: John Snow, Inc., for the U.S. Agency for International Development. (Unpublished).

World Bank. 2006. *Mozambique Country Brief.* Available at http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/MOZAMBIQUEEXTN/0,,menuPK:382142~pagePK:141132~piPK:141107~theSitePK:382131,00.html (accessed August 2006).

APPENDIX 1

CS BRIEF

Contraceptive Security Brief	
Population	19,420,000 (mid-2005, Population Reference Bureau [PRB])
Population growth rate	1.67%
Women of reproductive age	9,127,000 (47%) (Demographic and Health Survey [DHS] 2003)
Fertility rate	5.5 (DHS 2003)
Contraceptive prevalence rate (CPR) (modern methods, married women) • public sector • private sector • other	11.70 (DHS 2003) 8.1 1.3 2.2
HIV/AIDS prevalence rate (adults 15-49)	12.2
Health regions, districts, and SDPs providing RH/family planning (FP) services (their numbers)	10 regions. 128 districts. Approximately 150 SDPs provide FP services.
Forecasting	
Current method mix (CPR projected trend)	DHS 2003: oral contraceptives: 4.9 (42%); injectables: 4.8 (41%); condoms: 1.1 (9%); female sterilization: 0.9 (8%); intrauterine devices (IUDs): 0.1 (1%). Traditional methods CPR: 4.7
Presentation and use of CPTs in management decision-making	The use of CPTs (or another methodology) is not yet institutionalized in Mozambique. In 2003–2004, the Contraceptive Logistics Project, and in 2006 the DELIVER project, used CPTs to present logistics data, which greatly improved the use of management decision making.
Assumptions related to data used in the CPTs *(approach used)*	There is poor availability of reliable data at the central level for forecasting. In 2006, a combination of adjusted services statistics data from the family planning program and adjusted distribution data from central to provincial level were used and compared to a demographic data forecast prepared by DELIVER/Washington using Spectrum software.
Sources and accuracy of data used in forecasting *(data quality)*	See above.
Role of technical assistance	Build the capacity within CMAM and the MOH. Strengthen the forecasting, procurement, and storage and distribution of essential drugs, contraceptives, and HIV commodities. Increase the availability of essential drugs, contraceptives, and HIV commodities at SDPs.

Procurement	
Existence and role of the procurement unit	CMAM has a procurement department that supervises Medimoc, the procurement subcontractor, which procures approximately $60 million in medicines and medical supplies per year. It is unclear whether Medimoc will continue to provide this service to the MOH once their current contract expires at the end of 2007. The MOH does not currently procure any contraceptives or condoms. These have all been donated in-kind by either UNFPA or USAID. As part of an MOH funding phase-in, CMAM will be responsible for procuring approximately $500,000 in contraceptives to arrive by the end of 2007.
Stock status analysis over a one-year period (overstocks, stockouts, and consistency of procurement plans)	In 2005, there were overstocks of condoms, orals, and injectables at the central level. The year 2006 began with much stock availability uncertainty. By July 2006, all products were in stock, and the coordination and management was on track with the hopes of preventing a similar situation in the future.
Contraceptive supplier situation (percentage of commodities provided by supplier)	USAID provides all injectables, IUDs, and condoms. USAID and UNFPA both provide Lo-Femenal and Microgynon. UNFPA provides Microlut. In 2007, the MOH will begin to procure orals and injectables.
Historical, current, and future role of USAID as a contraceptive donor	USAID has long been a provider of contraceptives to Mozambique. While there has been talk of phaseout (or phase down) of contraceptive donations in the recent past, it seems that the USAID/Mission recognizes that phaseout can only take place once Mozambique has alternative sources of financing and the ability to conduct its own procurement.
Financing	
Commodity funding mechanism (i.e., basket funding, cost recovery, local public funds, etc.)	One-hundred percent in-kind donations from UNFPA and USAID (emergency donation of condoms from PSI in 2005). In 2007, the MOH will procure approximately 10 percent of contraceptive needs ($500,000).
Current and future donor contribution in commodity financing plan over the next five years	USAID and UNFPA are expected to remain stable or decrease if MOH resources increase.
USAID/Mission intervention strategies (strategic objectives and plan for contraceptive security)	Provide technical assistance in CPTs through the USAID | DELIVER PROJECT. Continue to coordinate with the MOH and UNFPA.
Supply Systems	
Length of the pipeline	19 months
Major institutions involved in RH/FP activities	MOH Nongovernmental organizations PSI condom social marketing (possibly pills in the future)
Logistics management information system status (level of efficiency)	Dispensed-to-user data poor; low compliance with reporting.
Commodity availability at SDPs	Unverified, but reportedly problematic in 2005 and 2006 because of central-level stockouts.

Major Issues

The two biggest issues are—

- *stockouts of all products at the central level that over time created problems in stock availability at the provincial level and some SDPs in 2005 and early 2006*
- *lack of true consumption data to improve forecasting.*

APPENDIX 2

PROGRAM RESULTS MATRIX

Objectives/Strategies	Results	Contribution to DELIVER's Elements	Remarks
Improve access to quality logistics management information	Completed 5 SOP Manuals for Via Classica and Essential Drug Kit Management	Element I	
	Completed development of SIGM software for implementation.	Element I	
	Developed and produced SIGM user's manuals	Element II	In Portuguese and English
	Trained 59 people in use of SIGM	Element II	
	Implemented SIGM at central level	Element I	
	Codification procedures	Element I and II	
	Trained SIGM DBA in SQL 2005	Element II	
	Defined requirements for SIGM modifications to be included in Release 2 of software	Element I	Release 2 to be funded by DELIVER, through extension, to be completed in October 2006.
	Performed quality assurance testing on 14 lots of condoms	Element I	
Procure ARVs	Procured ARVs from six suppliers valued at $1,606,647.12 in support of 2006 ART program	Element VI	Delivered between January and July 2006
Improve Coordination for Increased RH Commodity Security	Conducted 2002 condom logistics assessment	Element I	
	2006 CPTs used for donor coordination medium-term resource contraceptive planning		
	Rescheduling of condom shipments to prevent overstocks in poor warehousing conditions	Element I	

Objectives/Strategies	Results	Contribution to DELIVER's Elements	Remarks
	2006 stockouts resolved and shipments confirmed for 2007 and planned for 2008	Element III	
Other	Completed the Nacala warehouse study	Element I	First step in process for construction of a central warehouse in the north of Mozambique

APPENDIX 3

PROJECT CLOSURE AND PROPERTY TRANSFER OF INFORMATION

All legal and contractual issues related to the closure of the project (such as severance payments) were appropriately addressed.

Following approval of the USAID Mozambique Mission and upon completion of the project, all nonexpendable property on the DELIVER Project inventory was transferred to SCMS and the USAID|DELIVER PROJECT.

Additionally, the DELIVER project produced a CD with all technical documents and provided it to CMAM and USAID.

For more information, please visit www.deliver.jsi.com.

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