USAID | DELIVER PROJECT

Nigeria: Vendor-Managed Inventory Pilot System Design

Bauchi State and Ebonyi State

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Abstract
In May 2012, the USAID | DELIVER PROJECT, Task Order 4, conducted a system design for a pilot distribution system, based on vendor-managed inventory design principles, for Bauchi and Ebonyi states in Nigeria. The design included a logistics management information system; inventory control system; storage, distribution, and transport; and the human resource structure required to effectively implement the design. The monitoring and evaluation plan was also developed. This report includes key design decisions made for the pilot.

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Acronyms

ACR	AutoDRV Commodity Receipt
A/L	artemether/lumefantrine (Coartem)
AutoDRV	Automated Delivery/Receipt Voucher
BACATMA	Bauchi State Agency for the Control of HIV/AIDS, Malaria, Tuberculosis and Leprosy
CMS	Central Medical Stores
DFID	Department for International Development
DMA	drug management agency
DMMA	Drug and Medical Consumables Agency
DRV	Delivery and Receipt Voucher
DTTU	Delivery Team Topping Up
eLMIS	electronic logistics management information system
FMOH	Federal Ministry of Health
ICS	inventory control system
LMIS	logistics management information system
MAPS	Malaria Action Program for States
MCH	maternal and child health
MOH	Ministry of Health
MOU	memorandum of understanding
NMCP	National Malaria Control Program
PMTCT	prevention of mother-to-child transmission
RFQ	Request for Quotation
RDT	rapid diagnostic test
SDP	service delivery point
SDR	Summary Delivery Report
SP	sulfadoxine-pyrimethamine
TO4	Task Order 4
T/SHIP	Targeted States High Impact Project
TWG	technical working group

UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
VMI	vendor-managed inventory
ZNFPC	Zimbabwe National Family Planning Council

Acknowledgments

The authors offer sincere thanks to all who participated in the design workshop, which was held in Abuja, Nigeria, on May 8–11, 2012. Participants included staff from the Federal Ministry of Health, and representatives from the State Ministries of Health from Bauchi state and Ebonyi state. A number of development partners also participated. The design recommendations of the vendor-managed inventory pilot system presented in this report reflect the innovative, hard work of these participants. Thanks also go to the Zimbabwe office of the USAID | DELIVER PROJECT for providing background information on the Delivery Team Topping Up system.

Executive Summary

The USAID | DELIVER PROJECT, with support from the Federal Ministry of Health (FMOH) and the state Ministry of Health (MOH), plans to pilot an innovative distribution system, based on vendor-managed inventory (VMI) design principles. The objective of the pilot is to ultimately improve the availability of commodities at the service delivery point (SDP) level, increase the visibility of information, and transfer logistics tasks from the SDP staff to dedicated logistics staff, to allow SDP staff more time to spend serving clients. With VMI, inventory management tasks, and sometimes related activities, are shifted to the vendor or other third party. A VMI system in Zimbabwe, known as Delivery Team Topping Up (DTTU), provided several lessons learned and best practices that informed the design and implementation of the pilot in Nigeria.

A four-day system design workshop was held in Abuja, Nigeria, from May 8–11, 2012. The overall goal of the workshop was to design a logistics system, based on VMI design principles, that would be piloted in Ebonyi and Bauchi states; and to describe the next steps for implementing the design. Participants designed the key system parameters—including paper-based and electronic logistics management information systems (eLMIS) tools—identified the general resources required for the pilot, developed implementation plans, and developed a research plan to monitor system performance and manage the pilot. Participants also developed a draft list of products to be included. They developed general steps to the system—in terms of the flow of information and commodities.

The logistics management information system (LMIS) proposed in the pilot in Nigeria is based on Zimbabwe's DTTU system. This includes the use of the Automated Delivery/Receipt Voucher (AutoDRV), which is an electronic tool used to capture essential logistics data from facilities. The inventory control system is a two-level system—state and facility—and products are stored at the state Central Medical Stores. Every facility will receive a delivery every two months. To draft distribution routes, participants reviewed and organized the list of facilities, according to their geographic locations in the state and knowledge of local road networks. A competitive selection process will be conducted to identify the most appropriate vendors to carry out the bimonthly distribution.

Key human resources for the pilot include the pilot project director (one), state pilot coordinators (one for each state), LMIS officers (one for each state), transport officers (one for each state), and finance and administration officers (one for each state). The state MOH will provide team leaders (one for each distribution route); truck drivers (one for each distribution routes) will be part of the contract with the transportation vendor selected.

Rigorous monitoring of the pilot is critical to measure success and to assess its performance. Workshop participants reviewed and modified objectives of the pilot; they also developed the indicators that would measure progress toward those objectives. Indicators include stockout rates and delivery coverage rates. The progress of the pilot will be regularly reported to a group of key stakeholders at the state level.

Participants agreed that the target for the first round of deliveries is October 2, 2012. To meet this target date, activities—with associated timeframes—were developed as part of the implementation

plan. The plan includes sections for overall pilot management, LMIS, storage and distribution, and human resources.

Potential challenges to implementation were identified and discussed. These include the non-full supply status of some products, considerations around the state Ministry of Health (MOH) staff posted as team leaders, support for the software that will be used as part of the pilot, and the budget. If these challenges are addressed appropriately and in a reasonable timeframe, the pilot will have a greater chance for success.

Background

Supply Chain Challenges in Nigeria

In Nigeria, several supply chains manage the public-sector health commodities. Those include separate systems for the following categories of products: vaccines, contraceptives, HIV and AIDS commodities, tuberculosis, and malaria. These separate systems face similar challenges, including—

- *Lack of visibility of logistics data up and down the supply chain.* For all systems, data flow up from service delivery points (SDPs) to intermediary levels; and, eventually, to the state and national levels. Almost all systems have very low reporting rates. Without data, informed decisions on commodity management cannot be made. By increasing the visibility of data, the gap between supply and demand can be reduced.
- *Several levels in the system.* For many supply chains, products and information pass through several different levels: central, zone, state, local government area, and the SDP. Having several levels in the system can impede the flow of information and commodities, further separating the supplier from the user, and can increase stock levels.
- *Lengthy time periods for availability of aggregated reports on system performance.* In addition to the low reporting rates from SDPs, for many systems the time it takes to produce reports on system performance—key for informed decisionmaking—is lengthy. Appropriate technology can be used to collect, analyze, and share data, further promoting visibility.
- *Because SDP staff have to pick up products, caregivers are distracted from their core roles.* For some systems, such as the contraceptive logistics system, SDP staff must travel to collect their supplies. This takes them away from their core function of serving clients.
- *Accountability.* Supply chain integrity is of paramount importance. The movement of commodities from the point of entry of the system to the final delivery to SDPs must be transparent. This builds trust in the system.
- *Non-full supply.* Non-full supply of commodities is a reality for many systems. Sufficient quantities of commodities are often unavailable to resupply SDPs up to their established maximum stock level. In a non-full supply situation, it is impossible for the systems to function as designed. Also, multiple types of staff are making decisions on how best to ration, which can distort supply and demand information.

The USAID | DELIVER PROJECT, with the support of the Federal Ministry of Health (FMOH) and the state Ministry of Health (MOH) intends to pilot an innovative distribution system, based on vendor-managed inventory design principles. The ultimate objectives of the pilot are to improve the availability of commodities at the SDP level; increase the visibility of information; and transfer logistics tasks from SDP staff to dedicated logistics staff, which will give SDP staff more time to serve clients.

Vendor-Managed Inventory

Vendor-managed inventory (VMI), a category of supply system models, holds promise for supply chain performance improvement in developing country health systems. VMI in public health is an approach that *leverages the interest and capability of an external party to assume responsibility for managing commodity inventory at a public health facility*. With VMI, inventory management tasks, and sometimes related activities, are shifted to the vendor or other third party.

Traditionally, VMI has been implemented in the private sector in retail and commodity distribution for immediate efficiencies, and to enable long-term relationships that support additional improvements in the supply chain. The fundamental drivers of these improvements support the expectations of similar benefits for healthcare delivery in the public sector in developing countries. An immediate benefit includes more efficient inventory management, while a contingent benefit may include changes to the supply chain that result in cost savings because of the greater interdependency and control created by VMI.

To benefit from VMI, it must be carefully introduced to ensure a smooth transition; attention must also be given to any additional factors needed to ensure that any contingent benefits are integrated into the new VMI model.

Delivery Team Topping Up System in Zimbabwe

Zimbabwe has successfully implemented a VMI system. The Delivery Team Topping Up (DTTU) system, an inventory control and distribution system, has been operating in Zimbabwe since 2004. The DTTU is implemented by six partners, each with distinct roles and responsibilities essential to successfully executing the distribution system: Zimbabwe National Family Planning Council (ZNFPC); the Ministry of Health and Child Welfare Directorate of Pharmacy Services; the National Pharmaceutical Company; the USAID | DELIVER PROJECT and Supply Chain Management Systems Projects (both managed by John Snow, Inc.); and Crown Agents Zimbabwe, funded by the Department for International Development (DFID). Initially, the DTTU system managed condoms and contraceptives. In 2007, HIV rapid test kits (RDTs), syphilis rapid tests, and nevirapine for the prevention of mother-to-child transmission (PMTCT) of HIV were added. Since then, more PMTCT medicines, as well as other diagnostics have been added.

In the DTTU system, deliveries are made by a team headed by a team leader—who is a member of the ZNFPC provincial staff—and a truck driver. Deliveries are made to all public sector facilities in the country (1,600+) once a quarter. There are two levels in the DTTU system: central and facility. At the start of a delivery run, trucks are filled with a predetermined quantity of a product—based on past delivery quantities—and the products are driven to health facilities.

The delivery team leader determines, on-site, the quantities of commodities required at each site using an automated DTTU Delivery and Receipt Voucher (AutoDRV). SDPs do not place orders for products. For the AutoDRV to calculate the quantities required at each SDP, the delivery team counts the stock and asks the staff about losses and adjustments. The team *tops up* the inventory of each facility with quantities needed to meet the next period's requirements. The team also reviews storage of the commodities at each facility for adherence to good storage practices.

An SDP should have approximately three months of stock of each product remaining when the delivery team arrives. Because there is zero lead time[1] at the SDP level in the DTTU system—the order is filled on the spot after the requirements are calculated—the safety stock[2] level at the SDP is the same as the minimum stock level, or three months. The delivery team also removes excess stock and damaged or expired products from the SDP inventory.

Since 2008, the collection of logistics data has been automated. Team leaders travel with a laptop loaded with an application—AutoDRV. Using the AutoDRV, they collect essential logistics data and determine quantities to resupply to each facility. After completing a delivery round, the team leader gives the laptop to the logistics management information system (LMIS) manager for DTTU. The LMIS manager migrates the data on the laptops to a server-based software, the Top Up, software. No data entry is needed. National-level logistics data are quickly available. Automating the data collection and aggregation process has reduced time spent at facilities, reduced errors in calculations, and improved the overall visibility of logistics data throughout the system.

The DTTU system has been very successful in Zimbabwe. Stockout rates are less than 5 percent; delivery coverage averages around 98 percent; and facility staff do not complete order forms or travel to collect supplies for their facilities. Given the success of the DTTU in Zimbabwe, Nigeria was interested in developing a pilot based on the DTTU system, and implementing it in two states: Bauchi and Ebonyi.

Core Funding

Assuming a consistent availability of the selected products, the VMI approach described above improves commodity availability in health facilities and reduces the burden on health service providers, as proven in Zimbabwe; where data collection, transfer, and analysis have now been automated through an innovative software product. The automation yields near-instant national logistics data visibility.

In 2011, the USAID | DELIVER PROJECT Task Order 4 (TO4) decided to explore the applicability of this type of inventory control system (ICS) to settings other than Zimbabwe by implementing a pilot in another country. Given the challenges in the Nigeria supply chains, it was determined that some states in Nigeria would be appropriate for a pilot of the Zimbabwe experience, especially in states with several vertical distribution systems that were not performing optimally.

TO4 prepared and submitted a proposal to USAID/Washington to request funds to implement the pilot in Nigeria, as part of its annual core work plan submission. The request was approved and USAID/Washington allocated some funds to TO4 to implement the pilot project, with the understanding that additional funds from USAID/Nigeria, and from the selected states in Nigeria, would be leveraged to support the pilot. The USAID | DELIVER PROJECT Nigeria team is currently working with officials from the two selected states—Bauchi and Ebonyi—and the USAID mission to address issues of feasibility, resource requirements, and funding to ensure full supply of the selected products.

Considering the current exercise timeline for TO4, the pilot project should be completed by September 2013.

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[1] Lead time is the time between when new stock is ordered and when it is received and available for use.
[2] The safety stock level is the buffer, cushion, or reserve stock kept on hand to protect against stockouts caused by delayed deliveries, markedly increased demand, or other unexpected events.

Process

Technical assistance was provided from the Arlington, Virginia, office to conduct a system design and planning for a VMI pilot system. A four-day system design workshop was held in Abuja, Nigeria, from May 8–11, 2012. See appendices A, B, and C for the goal and objectives, schedule, and participant list, respectively. The overall goal of the workshop was "to design a logistics system, based on vendor managed inventory design principles, to be piloted in Ebonyi and Bauchi states, and to describe the next steps for implementing the design." Participants in the workshop include representatives from the following entities:

- State MOH staff (three from each state)
- National Primary Health Care Development Agency
- Food and Drug Services
- National Malaria Control Program
- U.S. Agency for International Development
- Nigeria Urban Reproductive Health Initiative
- Targeted States High Impact Project (T/SHIP)
- USAID | DELIVER PROJECT.

The first day of the workshop was devoted to context setting. During the following three days, participants designed key system parameters, identified the general resources required for the pilot, developed implementation plans, and developed a research plan to monitor system performance and to manage the pilot.

Context Setting

Nigeria office project staff reviewed the structure, strengths, and limitations of existing supply chains. This included the supply chain for family planning, malaria, and maternal and child health (MCH) products. The flow of products and information were outlined for each system.

McKinsey and Company is operating a pilot in Senegal, based on the VMI design principles; they were invited to present on this pilot. USAID asked the project to find out about the pilot in Senegal, particularly the indicators they were tracking, so they could compare the results of the VMI pilot in Nigeria to the Senegal project. Tim Knapp of McKinsey gave an overview of the pilot. This pilot manages family planning products in three cities, including a biweekly resupply period. At the time of the presentation, it had been running for one month; it is very similar to Zimbabwe's DTTU system. Although the findings are still preliminary, the pilot has improved the availability of selected family planning products in selected facilities in Senegal. The indicators tracked by the pilot are the same as those tracked in the DTTU: stockout rates and delivery coverage.

A significant amount of time was dedicated to presenting and discussing the details of Zimbabwe's DTTU system, because it was assumed that the Nigeria pilot would be based on similar design principles. As an overview, the video of the automation of the LMIS in Zimbabwe's DTTU—Information Highway to Health—was first shown. Basic design parameters were presented, including each LMIS form used, and the flow of information and commodities. The human resource structure used to manage DTTU was also presented.

Design

Products Included

Participants discussed which products should be included. It was agreed that some family planning products, some malaria products, and some MCH products would be managed in each state. The list of products to be included in the pilot has been reviewed with state counterparts (see table 1).

Table 1: Products in the VMI Pilot

Contraceptives	Maternal and Child Health	Malaria
Microgynon	Oxytocin	A/L 1 × 6
Microlut	Oral rehydration solution	A/L 1 × 12
Noristerat	Zinc	A/L 1 × 18
Depo-Provera	Misoprostol tablet	A/L 1 × 24
Male condoms	Magnesium sulfate injection	RDTs
		SP

If Depo-Provera and Noristerat are included, syringes must be included for injections and safety boxes to dispose of used syringes. The MCH products to include were discussed at length.

Steps in the System

As commodities move down to SDPs, information moves up from SDPs to the pilot management staff; they disseminate information to the appropriate stakeholders. Table 2 outlines the activities in the system.

Table 2. Steps in the System

Step	By Whom	Activity
1.	Team leader	On the *Letter of Request,* estimates quantities required for the next delivery round.
2.	State pilot coordinator	Reviews quantities estimated by the team leader; does an initial approval of the quantities to issue, and forwards it for secondary approval to either the malaria program manager or the family planning program manager.
3.	Family planning program manager or malaria program manager	Approves quantities requested on the *Letter of Request*, and forwards it to the CMS pharmacist for picking and packing.
4.	Team leader	Travels to state CMS to receive commodities for deliveries.

5.	CMS pharmacist	Supervises loading of stock on the truck, and updates the warehouse *Stock Cards*.
	Team leader	Completes PART 1 of the three part *Stock Reconciliation Form*.
6.	Truck driver	Begins completing *Truck Stock Cards* prior to the delivery run, and continues to update them throughout the delivery run.
7.	Delivery team (team leader + truck driver)	Delivers commodities to SDPs.
		Prepares a *Facility Worksheet* to complete the *AutoDRV* on the team laptop for the quantities of commodities delivered at each facility; generates the *ACR for* all the commodities received by the SDP.
8.	SDP staff	Reviews *AutoDRV* on laptop and signs the *ACR* for all commodities received.
9.	Delivery team (team leader + truck driver)	Returns to central warehouse, conducts a physical inventory of the products returned to warehouse, and completes PART 2 and 3 of the *Stock Reconciliation Form,* using the *Truck Stock Cards* and by conducting a physical inventory of products on the truck.
	Warehouse controller	Returns stock to warehouse, and updates the *Stock Cards*.
10.	Team leader	Submits the laptop, *Facility Worksheets,* and the completed *AutoDRV Commodity Receipts* to the LMIS manager. Completes a *Post-Delivery Report* and submits it to the state pilot coordinator. Submits the completed *Stock Reconciliation Form* to the state pilot coordinators.
11.	LMIS officer	Migrates data from the *AutoDRV* on the ruggedized laptops into the Top Up software.
12.	LMIS officer	Processes the migrated/encoded data in Top Up software to produce the statistical part of the *SDR* that shows stock on hand, adjustments, monthly consumption, quantities delivered, and stock levels for each facility. The *SDR* is sent to the state pilot coordinators.
13.	State pilot coordinator	Generates the narrative (cover letter) portion of the *SDR* and provides additional information about the supply status of commodities.
14.	Area distribution coordinator	Distributes copies of the *SDR* to state-level stakeholders, and the team leaders when they arrive for the next delivery round.
15.	Pilot director	Distributes copies of the *SDR* to national-level stakeholders.

Logistics Management Information Systems

During the workshop, participants reviewed all the LMIS forms, both paper and electronic, used in Zimbabwe's DTTU system. All the participants agreed to the proposed changes to the forms. Overall, the changes proposed were small. All LMIS forms used in the DTTU will be used in the Nigeria pilot, including using the AutoDRV as the primary tool to capture essential logistics data from facilities. See table 3 for a list of the LMIS forms, and their purpose, that will be used in the pilot.

Table 3. LMIS Forms Used in the Pilot

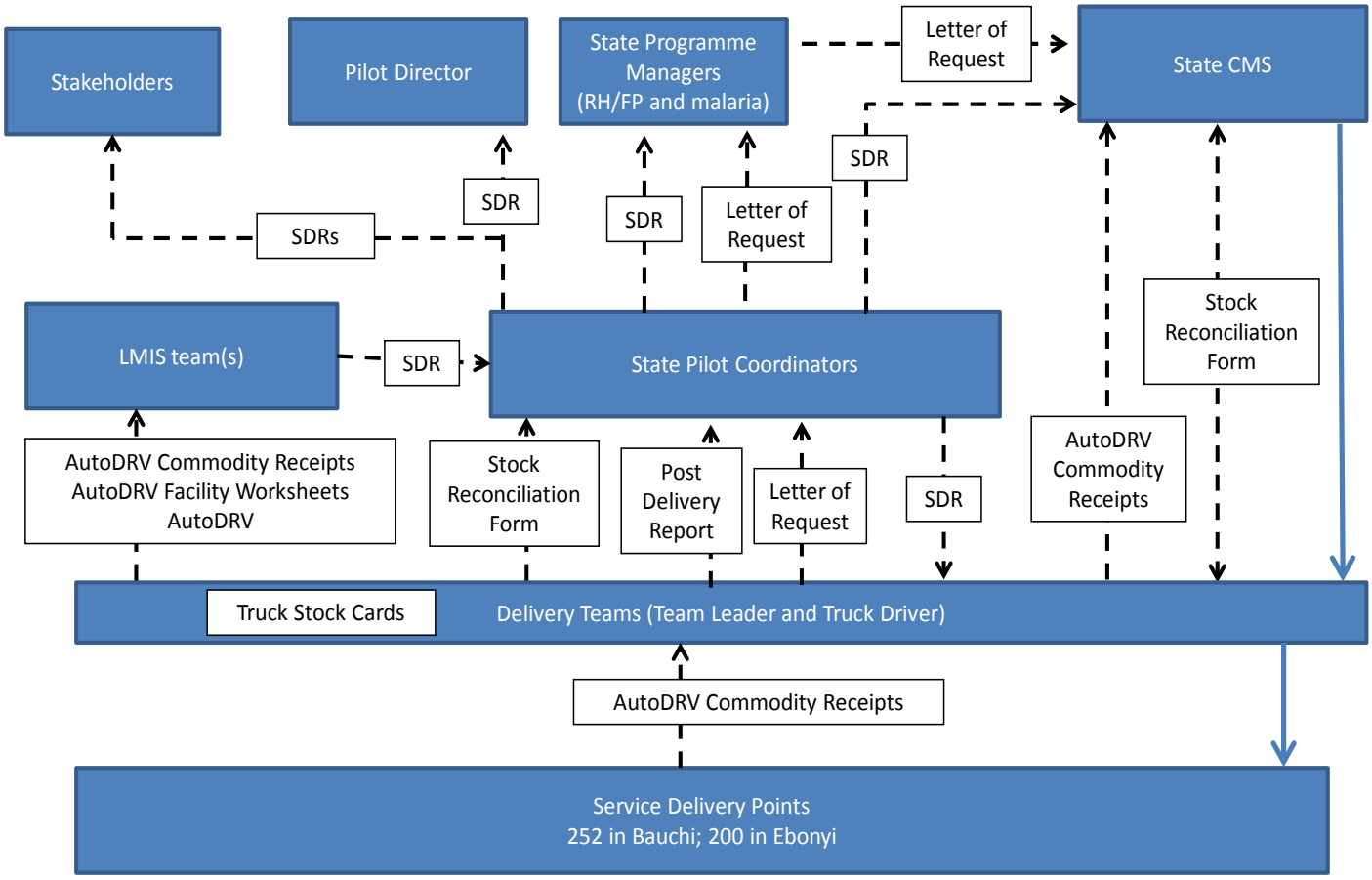
Form Name	Purpose
Letter of Request	To estimate quantities of products required for the upcoming delivery run, to request additional commodities needed during a delivery run, or to request commodities for an emergency order for a facility.
Stock Reconciliation Form	To provide accountability for the products from the time they are issued to the delivery team until excess commodities, if any, are returned to the warehouse.
Truck Stock Card	To account for commodities held on the delivery truck, including any receipts and issues.
AutoDRV Delivery and Receipt Voucher (electronic form)	• To determine how much of each product to deliver to each facility. • To provide essential logistics data to the central level for decisionmaking. A paper version of this form can be completed by hand if the automated system fails.
AutoDRV Facility Worksheet	To collect information on losses and adjustments, physical count, and days stocked out in order to complete the AutoDRV.
AutoDRV Commodity Receipt (ACR)	To provide proof of delivery to facilities.
Post-Delivery Report (PDR)	• To provide the qualitative information on how the results of the delivery run. • To highlight any outstanding activities that occurred during the delivery run.
SDR	To provide relevant staff and program managers with summarized information about a delivery; the central level LMIS team generates it using the Top Up software.

Participants agreed that automation should be used from the beginning. This means that team leaders will use the AutoDRV software on laptops to collect logistics data from SDPs, and then calculate resupply quantities. The Top Up software will be used to aggregate the data from the AutoDRVs and produce system-level reports on performance. Many changes are needed for both types of software.

Flow of Commodities and Information

Figure 1 outlines the flow of commodities and information in the pilot system.

Figure 1. Flow of Commodities and Information



Inventory Control System

The pilot will use a forced ordering ICS. The system has two levels: the central level and SDPs. The state Central Medical Store (CMS) is the central level. Every two months, the delivery truck will visit every facility on the established list of facilities. Participants agreed to the following stock levels:

- *Safety stock level: two months.* The buffer, or cushion, of stock the facility should have to prevent stockouts; or for any unforeseen circumstance.
- *Minimum stock level: two months.* The amount of stock the facility should have when the delivery truck arrives. This is calculated by adding the safety stock level (two months) to the lead time stock level (zero months for VMI).
- *Maximum stock level: four months.* Facilities will be topped up to four months of stock every time the delivery truck visits. This is calculated as the minimum stock level plus the review period, in this case, it is also the delivery frequency (two months).

- *Emergency order point: one month.* The VMI pilot is designed to prevent emergency orders. However, participants agreed that if stock levels at the facility are ever at or below one month, the SDP should inform the team leader that an emergency order must be placed.

Storage

Products distributed in the pilot will be stored at the state CMS' in Bauchi and Ebonyi states, because these CMSs already provide storage for these products for the public sector. Generally, storage conditions in the Ebonyi CMS were assessed to be better than those at the Bauchi CMS. At the Ebonyi CMS, products for the pilot will be given dedicated space and stored with all the other products. The CMS in Bauchi intends to provide a separate warehouse for all products as part of the pilot. More detailed assessments should be completed to ensure that sufficient, appropriate storage space is available for all products.

Distribution and Transportation

Distribution and transportation are at the heart of the VMI pilot, as data collection is done at the same time the products are distributed. Prior to the workshop, state MOH staff reported that 252 facilities will be included for the pilot in Bauchi; while in Ebonyi, 200 facilities will be included. During the workshop, participants were given the list of facilities that will be part of the pilot, including maps that outline the road network in each state.

The group reviewed and organized the list of facilities, based on their geographic locations in the state. From this, they drafted distribution routes, indicating the number of facilities to be served on each route, an estimated time (in days) for each route, and the number of trucks required for each state (see table 4).

Table 4. Draft Distribution Routes

Bauchi State	**Ebonyi State**
Three distribution zones	Three distribution zones
Zone A: 97 facilities, 19 days	Zone A: 75 facilities, 31 days
Zone B: 55 facilities, 21 days	Zone B: 60 facilities,33 days
Zone C: 65 facilities, 17 days	Zone C: 60 facilities, 33 days
Total: ~217 facilities, 57 days	Total: ~195 facilities, 97 days
3 trucks for all facilities in each state	

The list of facilities needs to be finalized. Although it was reported that 252 facilities would be included in Bauchi, the list given to the workshop participants included only 217 facilities. Similarly, in Ebonyi, it was reported that 200 facilities would be included, but the list of facilities showed only 195.

The workshop facilitators determined that the number of days required for the Bauchi distribution is probably underestimated, while those in Ebonyi are probably overestimated. An upcoming technical assistance visit from the Arlington, Virginia, office will include a transportation analysis for the Bauchi zone. The same must also be done for Ebonyi.

Human Resources

Sufficient numbers of qualified staff are needed for the pilot to operate as designed and to yield the desired results. Participants worked in small groups to identify the human resource requirements to manage the proposed design. The participants proposed the following human resource structure:

- one pilot project director
- two state pilot coordinators (one for each state)
- two LMIS officers (one for each state)
- ~six team leaders (one for each distribution route; because the routes should be revisited and refined, more team leaders will probably be needed)
- ~six truck drivers (one for each distribution route; because the routes should be revisited and refined, more truck drivers will probably be needed. It is also anticipated that transportation will be outsourced; therefore, these positions will not be hired, but will be part of the contract with the transportation vendor selected)
- two transport officers
- two finance and admin officers.

The positions outlined above are new positions; no one currently has these responsibilities. The workshop participants proposed that the state MOHs' post existing MOH staff as team leaders for the duration of the pilot. This will require careful negotiation with the state MOHs to ensure that the right people are selected for these postings; and that pilot management staff will supervise these staff while they are working on the pilot.

In addition to the positions listed above, which are *new* positions, the following positions are required for the pilot. These positions and individuals already exist; for the pilot, they will need to dedicate time.

- CMS store officers
- CMS pharmacists
- facility commodity manager.

The CMS store officers and pharmacists will ensure that sufficient quantities of products are given to the delivery teams at the start of a delivery. They will also take back into CMS stock any undelivered products that the delivery teams returns at the end of a delivery.

Resources Required and Available

In addition to human resources, participants identified a number of other types of resources required for the pilot; they also determined if they were already available, or if they would need support from the USAID | DELIVER PROJECT. These resources include, but are not limited to, the items listed in table 5. The source of support is also indicated.

Table 5. Resources Required

Resource	Provided by…	Notes
Office supplies	USAID | DELIVER PROJECT	
Communication (phone/ airtime, Internet)	USAID | DELIVER PROJECT	
Per diem	USAID | DELIVER PROJECT	The project and state MOHs will set and agree to a per diem rate.
Server	USAID | DELIVER PROJECT	Will determine the number and location of the servers. See the Challenges to Implementation chapter for more information.
Laptops	USAID | DELIVER PROJECT	Will develop and procure detailed specifications for laptops using a competitive process, based on those used in Zimbabwe.
Software and software adaptations	USAID | DELIVER PROJECT	The AutoDRV and Top Up software will need adaptations.
Vehicles, fuel, and vehicle maintenance	USAID | DELIVER PROJECT	The project will not procure vehicles; transportation will be outsourced through a competitive RFQ process. The selected vendor will provide vehicles, fuel, and vehicle maintenance.
Generator maintenance, service, and fuel	State MOHs	
Warehouse space	State MOHs/CMSs	The state CMSs in Bauchi and Ebonyi will provide warehouse space for the products managed as part of the pilot. See the Storage section in the Design chapter for more information.
Office space	State MOHs	• In Ebonyi, pilot management staff share office space. Advocacy is needed to secure this space. • In Bauchi, pilot management staff will be co-located with the DMA office.

Monitoring Plan

Rigorous monitoring of the pilot is critical to measure success and to assess its performance. Workshop participants reviewed and modified objectives of the pilot and listed the indicators that would be used, the data required to calculate the indicator, the frequency of data collection, the data source to be used, and the person who would collect that data. The following objectives for the pilot are proposed:

1. Increase availability of selected products in selected facilities in Bauchi and Ebonyi states.
2. Improve the reporting rates of selected products.
3. Improve the visibility of logistics data for all necessary stakeholders.
4. Determine the cost effectiveness of the system.

To achieve these objectives, participants identified and described the indicators listed in table 6. All indicators will be reported bimonthly.

Table 6. Indicators for the Pilot

Indicator	Data Required to Calculate Indicator	Source of Data
Stockout rates	Calculated by product Numerator: Number of facilities with zero stock on hand at day of visit Denominator: Total number of facilities served	AutoDRV/Top Up
Reporting rate / coverage rate	Numerator: Number of facilities that received a delivery Denominator: Total number of facilities in the pilot	AutoDRV/Top Up
Rate of resupply to max	Calculated by product Numerator: Number of facilities that were resupplied up to the maximum stock level Denominator: Number of facilities served on a delivery	AutoDRV/Top Up: need to determine whether Top Up is able to produce this report
Report dissemination rate	Numerator: number of stakeholders that received the summary delivery report Denominator: total number of stakeholders that are supposed to receive the summary delivery report.	

The indicator that will be used to measure non-full supply needs to be more thoroughly discussed. Ideally, it will be the *rate of resupply up to the maximum*. This can be a report run in the Top Up software. However, if this is not possible, other options could be—

- *truck order fill rate:* the percentage of products that were loaded up to the required levels on the truck at the start of a delivery run
- *rate of full supply:* calculated by product; the percentage of products in full supply.

In addition to these indicators, the design group agreed to capture information on the overall cost of running the pilot project. Because the anticipated result is an improved and better performing logistics system, it is important to compare the cost of a VMI system to that of a traditional distribution system, with the ultimate goal of doing a cost-effectiveness analysis. Furthermore, the USAID | DELIVER PROJECT Nigeria team requested a segmented cost analysis of the various supply chain functions of the pilot, such as transportation, management information systems, products procurement, human resources, etc. The pilot management team will work with one of the project's health financing and costing specialists to develop a costing scheme for the pilot project.

The LMIS officer is responsible for calculating the indicators described above, producing the necessary reports, and providing them to the state pilot coordinators for dissemination to necessary state-level stakeholders. The pilot director will disseminate the reports to national-level stakeholders. The stakeholders include, but are not limited to—

- Directorate of Planning and Research
- Directorate of Pharmaceutical Services
- Directorate of Primary Health Care (ministry and agency)
- Bauchi State Drugs and Medical Consumables Agency (DDMA)
- Bauchi State Agency for the Control of HIV/AIDS, Malaria, Tuberculosis and Leprosy (BACATMA)
- hospital management board
- heads of programs: National Malaria Control Program (NMCP), family planning
- projects and partners: USAID, T/SHIP, Malaria Action Program for States (MAPS)
- FMOH, Director of Food and Drugs
- National Assembly Health Committee.

Implementation Plan

The first round of deliveries should begin on October 2, 2012. To meet this target date, activities listed in the implementation plan in table 7 must be completed by the indicated date. The plan is to run the pilot for 12 months—until the end of September 2013. This represents six delivery rounds.

Participants recommended forming technical working groups (TWGs) at the state level to be kept informed of the progress and results of the pilot. This group would meet bimonthly to review what happened in the previous delivery round, and to plan for the next delivery round. This planning would include discussing any rationing strategies that will need to be implemented. Additionally, the indicators described in the previous section would be disseminated to a larger group of stakeholders bimonthly. Members of TWGs, by state, include—

Bauchi TWG

- Drug Management Agency
- State Primary Health Care
- Director of Public Health
- Director of Pharmaceutical Services
- programs: malaria, reproductive health
- State CMS pharmacist
- T/SHIP
- hospital management board.

Ebonyi TWGs

- Director of Primary Health and Disease Control, MOH
- Director of Primary Health Care, Local Government
- Director of Public Health
- Director of Pharmaceutical Services
- Program managers: malaria, reproductive health
- State CMS pharmacist
- Society for Family Health.

In addition to the state-level TWG, a larger stakeholder group will be convened (1) six months after the pilot begins; (2) mid-way through the pilot; and (3) at the end of the pilot, after 12 months.

After completing the design, and the resources required to implement the design, participants worked in small groups to identify and describe activities and sub-activities needed to operationalize the design. They identified the activities, listed the responsible party, and proposed a timeline for key activities. The implementation plan in tables 7, 8, 9, and 10 are divided into four areas: overall pilot management, LMIS, transportation and distribution, and human resources.

Table 7. Overall Pilot Management Implementation Plan

Activity	Sub-Activities	Date Completed by
Obtain donor commitment for products to include in pilot	Discuss with donors—World Bank for malaria in Bauchi, UNICEF for MCH, USAID for malaria in Ebonyi. Present total quantities required for pilot duration.	May 31
Finalize product list, especially for malaria products and MCH products	Trip to Ebonyi & Bauchi to discuss with Hon. Commissioner, after discussing with Dir. of PH and Perm Sec	May 31
	Discuss with USAID/Nigeria	May 31
	Discuss with USAID/Washington	June 7
Finalize MOUs with each state for— • office space • storage space • posting of state MOH staff to act as team leaders	Review by USAID/Washington	August 1
Brief state officials and relevant stakeholders on design; obtain approval		May 31
Finalize research plan and indicators (confirm indicator that will be used to measure non-full supply)	Determine if the Top Up software can calculate the rate of resupply up to the max	May 31
Form TWGs at each state level	Draft Terms of Reference	June 30
Determine rationing strategy, which will be included in the SOP manual developed	List all available options, including— • resupply up to min • resupply 3 months • resupply 1 month • % of total required Top distant facilities up to max; closer facilities to min	August 15
Determine strategy for first deliveries, to determine quantities that should be loaded onto the trucks, and guidance for team leaders on supplying SDPs for the first time		August 31

Table 8. LMIS Implementation Plan

Activity	Sub-Activities	Date Completed by
Identify and list all required changes to paper-based forms	Determine the Letter of Request. If products are not in full supply, cannot base the quantities needed for the next delivery round on the quantities of products delivered in the previous round. Instead, need to base it on the quantities of products that were required in the previous round.	June 15
Identify and list all required changes to AutoDRV and Top Up		June 15
Determine if remote data transfer is possible		June 15
Determine level of effort for software changes		June 30
Make software changes (AutoDRV and Top Up)		August 15
Test software		August 21
Incorporate any necessary changes; software ready to use		August 31
Train of LMIS officers on Top Up software		September 7
Procure software; e.g., SQL server		July 31
Install software on laptops		September 15
Determine where Top Up software will sit		June 15
Define specs for hardware (laptop and servers, if necessary)	Obtain the specs that Zimbabwe used, and give to Nigeria.	June 15
Procure hardware		July 31
Determine the disposition procedure		June 15
Revise LMIS forms		June 15
Print LMIS forms		July 31
Develop and document data backup procedure		July 31
Develop SOP		July 31
Develop curriculum		August 31
Begin training		September 20

Table 9. Storage and Distribution

Activity	Sub-Activities	Date Completed by
Assess storage conditions and ensure appropriate and adequate space for pilot products at state CMS		June 15
Conduct transportation analysis for each state	• Finalize distribution routes. • Finalize the number of trucks.	May 31
List possible transport vendors in each state		
Get truck specs from Zimbabwe to determine what adaptations were made		June 15
Write first draft of RFQ and send to JSI contracts		June 30
Post RFQ		July 15
Hold bidder's conference		July 22
RFQ closes		July 31
Select vendor		August 15
Contract signed		August 31

Table 10. Human Resources

Activity	Sub-Activities	Date Completed by—
Finalize the number and type of positions		June 30
Write job descriptions/terms of reference		July 31
All staff recruited and in place.	Determine start dates for all positions—state coordinators may need to be hired earlier.	August 31
Review and establish per diem rates and confirm who will pay the per diem rates, how they will be paid, and what financial reports are required		June 30
Develop training strategy and training plan		July 31

Challenges to Implementation

Several concerns will affect the success of the pilot if they are not addressed adequately.

- **Non-full supply status of some products.** Any maximum-minimum ICS can only operate as designed if a full supply of commodities is available. It is recognized that not all products selected for the pilot will be in full supply. Without a full supply, staff cannot resupply facilities up to their maximum stock level; instead, a rationing system must be used. The non-full supply status of some products in the pilot will be addressed in the pilot in the following ways:
  - *Establish a rationing strategy*. This needs to be developed and agreed-to prior to each delivery run. Possible strategies include topping up facilities farthest away from the CMS to their maximum stock level, while resupplying facilities closest to the CMS to their minimum. Or, resupplying facilities up to their minimum, or another percentage of the total resupply quantity required. Some products may not be in full supply.
  - *Revise the Letter of Request.* Currently, the Letter of Request is based on the quantities of products delivered in the previous round. If products are not in full supply, different data must be used to calculate the quantities required. It should be based on the *quantities* of products that were required in the previous round, not what was *delivered* in the previous round.
  - *Consider non-full supply status when analyzing stockout data.* As part of the monitoring plan, data on facilities stocked out of a product will be collected and analyzed. However, this indicator must be understood in context of non-full supply status. If a facility is not topped up to the maximum stock level, the chances of stocking out would be much greater.
- **State MOH staff posted as team leaders.** Workshop participants determined that current state MOH employees should be posted as team leaders for the duration of the pilot—12 months. This will require pilot implementers to identify the appropriate staff, draft detailed MOUs that describe this role, and ensure pilot implementers supervise the team leaders.
- **Support to AutoDRV and Top Up management.** During the workshop, participants agreed that AutoDRV should be the tool used for capturing essential logistics data from the facilities, and the data from the AutoDRV should be migrated into the Top Up software, as is done in Zimbabwe. This means that the paper-based system is essentially bypassed. The focus on ensuring the business processes outlined in the system design occur as planned must continue, regardless of what tools are used to complete them. Any contractual considerations must be addressed appropriately. The staff at the Zimbabwe office have the expertise for using and managing the ARV and Top Up software. As this report is being written, it is unknown if they will be available to support this pilot. Appropriate implementation of the software will be critical to the success of the pilot.
- **Budget.** The funding for the pilot is primarily core Task Order 4 funding, including some field support funding. The budget must be carefully monitored and managed.

Appendix A: Workshop Goal and Objectives

Logistics System Design Workshop:
Vendor-Managed Inventory Pilot
Goal and Objectives

Goal: To design a logistics system, based on vendor-managed inventory design principles, to be piloted in Ebonyi and Bauchi states; and describe the next steps for implementing the design.

Objectives:

1. List all commodities that will be managed in the system.
2. Map the flow of commodities and information.
3. List logistics management information tools to be used, both paper and electronic.
4. Define data management procedures, including frequency and information flows; to ensure that accurate and timely commodity information is produced, reported, and used for logistics decisionmaking.
5. Describe the ICS, including the levels of the system to be involved, the frequency of ordering, the ideal maximum-minimum months of stock at each level, the overall length of the pipeline, and how the order quantities should be determined.
6. Describe the storage, distribution, and transportation procedures.
7. Define the required human resource structure for the pilot.
8. Define roles and responsibilities of each staff position.
9. Determine options for outsourcing, specifically warehousing, distribution, and information management, considering the risks and constraints.
10. List the next steps necessary to implement the system design.
11. List the existing resources that are available to support the pilot.
12. Describe the monitoring and evaluation plan for the pilot, including indicators that will be used to measure performance, and the procedures for frequency of reporting and sharing results.

Appendix B. Workshop Schedule

Logistics System Design Workshop: Vendor Managed Inventory Pilot
May 8 – 12, 2012, Abuja, Nigeria

Tuesday May 8	**Wednesday May 9**	**Thursday May 10**	**Friday May 11**	**Saturday May 12**
8:30 – 9:00	**8:30 – 8:45**	**8:30 – 8:45**	**8:30 – 8:45**	**8:30 – 8:45**
fficial Workshop Opening	Introduction to the day	Introduction to the day	Introduction to the day	Introduction to the day
	8:45 – 10:30	**8:45 – 10:30**	**8:45 – 10:30**	**8:45 – 10:30**
	Design Group Work Session1	HR requirements	Implementation Group Work Session 1 presentations	Research planning
9:00 – 10:00				
ce breaker, Goal & Objectives, Schedule, Norms, Admin.				
10:00 – 10:15	**10:30 – 10:45**	**10:30 – 10:45**	**10:30 – 10:45**	**10:30 – 10:45**
Break	Break	Break	Break	Break
10:15 – 11:15	**10:45 – 13:00**	**10:45 – 12:30**	**10:45 – 13:00**	**10:45 – 13:00**
urrent context: Existing Supply Chains and Challenges	Design Group Work Session 1: presentations	Resources required and possible provision	Implementation Group Work Session 1 presentations (continued)	Research planning
11:15 – 12:15		**12:30 – 13:00**		
cKinsey: Senegal Pilot Model		Summary of design and overview to implementation planning phase		
12:15 – 13:00				
Zimbabwe DTTU Video				
13:00 – 14:00	**13:00 – 14:00**	**13:00 – 14:00**	**13:00 – 14:00**	**13:00 – 14:00**
Lunch	Lunch	Lunch	Lunch	Lunch
14:00 – 15:30	**14:00 – 15:30**	**14:00 – 15:30**	**14:00 – 15:00**	**14:00 – 16:00**
Overview of the DTTU in Zimbabwe	Design Group Work Session 2	Implementation Group Work Session1	McKinsey research plan	Next steps and Wrap up
15:30 – 15:45	**15:30 – 15:45**	**15:30 – 15:45**	**15:00 – 16:00**	
Break	Break	Break	DTTU Research Plan	
15:45 – 16:15	**15:45 – 17:15**	**16:00 – 17:15**	**16:00 – 16:15**	
Guiding Principles for design	Design Group Work Session 2: presentations	Implementation Group Work Session1 continued	Break	
16:15 – 17:15			**16:15 – 17:15**	
ommodities to include in pilot Facilities to include in pilot			Research planning	
17:15 – 17:30	**17:15 – 17:30**	**17:15 – 17:30**	**17:15 – 17:30**	
Wrap up	Wrap up	Wrap up	Wrap up	

Appendix C. Workshop Participant List

TRAINING/WORKSHOP REGISTRATION SHEET

Title of Training: Pilot DTTU design workshop

Date: 8 - 12 May 2012

Venue: Gombe Jewel, Hotel, Abuja

Tick all that apply

Project Funding	GF		DELIVER		SCMS			
Program Area	TB		RH		Malaria		H	

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