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Nigeria: Costing of the Contraceptive Logistics Management System

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Nigeria: Costing of the Contraceptive Logistics Management System

USAID | DELIVER PROJECT, Task Order 1

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Abstract

In October 2010, the USAID | DELIVER PROJECT, Task Order 1, conducted an assessment of the cost of the contraceptive logistics management system (CLMS) in Nigeria.

The main objective for the assessment was to provide cost information about the in-country public health supply chain system for contraceptives. This report presents the findings of the costing study for a sample of facilities, as well as the national cost estimates.

USAID | DELIVER PROJECT

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Acronyms

ACT	artemisinin-based combination therapy
ART	antiretroviral therapy
CCW	Contraceptive Central Warehouse
CLMS	contraceptive logistics management system
CMS	see State Central Medical Stores or State CMS
CPR	contraceptive prevalence rate
CR	cost recovery
DCDPA	Department of Community Development and Population Activities
DFID	Department for International Development
FCT	Federal Capital Territory
FDS	Food and Drugs Services
FEFO	first-to-expire, first-out
FMOH	Federal Ministry of Health
FP	family planning
IMNCH	Integrated Maternal, Newborn and Child Health
IUCD	intrauterine contraceptive device
LGA	local government area
LLIN	long-lasting insecticide-treated bed net
LMIS	logistics management information system
MCH	maternal and child health
MOH	Ministry of Health
NGO	nongovernmental organization
NPHCDA	National Primary Health Care Development Agency
NYSC	National Youth Service Corps
PHC	primary health care center
RDT	rapid diagnostic test
RH	reproductive health
SCCT	supply chain costing tool

SCMS	State Central Medical Store or State CMS
SDP	service delivery point
SHC	secondary health center
SMOH	State Ministry of Health
State CMS	State Central Medical Stores
UNFPA	United Nations Population Fund
USAID	U.S. Agency for International Development

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Executive Summary

The Federal Ministry of Health and its implementing partners—USAID, United Nations Population Fund (UNFPA), and Department for International Development (DFID) in the U.K.—are committed to improving access to high-quality contraceptives for all Nigerians. The use of family planning in Nigeria is low, with a contraceptive prevalence rate (women in union, using modern methods) of only 9.7 percent and an unmet need of 20.2 percent (DHS 2008). The population is growing at a rate of 2.4 percent a year and the maternal mortality rate is 1,100 (UNICEF 2005).

To improve this situation, national partners have agreed to carry out a series of studies to better understand the costs related to providing family planning services and to quantify the systems, if possible. As part of this effort, the USAID | DELIVER PROJECT, in October 2010, collected information on the estimated total supply chain costs of the contraceptive logistics management system (CLMS) in Nigeria, and estimated the costs being addressed by the country's cost recovery scheme.

The function-based supply chain costing tool (SCCT) was used for this analysis. The tool divides supply chain activities into four discrete functions—procurement, storage, transportation and management—enabling uniform data collection and analysis that can be used for decisionmaking. Data is collected at multiple levels, or *tiers*, of the supply chain; because activities carried out at each tier are often different and probably have different cost drivers. The costing approach examines actual processes to measure the level of effort and resources required to distribute commodities at each tier in the supply chain. The tool also records the quantity of commodities passing through the system (*throughput*), from the port of entry through to the service delivery points (SDPs), in terms of value, volume, and weight. These measures are used for a cost comparison analysis on a per unit basis.

The sample for this study includes 44 facilities, representing all the tiers in the CLMS, including the Contraceptive Central Warehouse (CCW) in Lagos, State Central Medical Stores (SCMS), local government area (LGA) medical stores, and SDPs. The facilities were selected from six states: one from each geopolitical region. The Federal Ministry of Health (FMOH), UNFPA, USAID, and DFID were also included in the study.

To extrapolate the information to the national level, it was necessary to identify the cost drivers of each function and apply a similar algorithm to the function costs at each tier, thereby capturing the differences in the component costs. Procurement activities only take place at tier 1, so extrapolation was not necessary.

The cost components of storage are labor and space (warehousing), of which the labor component is the main cost driver. Labor for the storage function is determined primarily by the time spent serving clients (i.e., lower-level facilities) and staff salaries. Considering standard times for common activities and average staff salaries, the authors used a bottom-up approach to arrive at national storage cost estimates for each tier.

Transportation costs, however, were found to be directly correlated to the distances driven to deliver or collect commodities. An exercise was done to estimate the distances from the State CMS to the LGAs for 94 out of 583 LGAs with active family planning programs in the country. Total

transportation distances within the sampled states were measured and used to estimate costs at the national level.

Management costs were found to be highly variable for facilities at all tiers. From the data collected, the authors did not find a common set of activities, or cost components, on which to base a robust extrapolation to the national level. As such, average management costs for the sampled facilities at each tier were applied to the remaining facilities in each tier.

Sample Findings

An analysis of the sample data indicates that the system is operating well below capacity, with widespread underutilization of resources, including labor and infrastructure (mainly warehouses). High fixed costs in the system drive up the cost of the supply chain, particularly at the lower levels. As shown in table 1, supply chain costs greatly increase at the lower levels, compared to the small quantity of commodities handled. In fact, costs increase fourfold when moving only from tier 2 to tier 3. In general, the commodity throughput for the system, as a whole, appears very low; resulting in high supply chain costs per unit (value, weight, or volume), particularly at the lower levels.

Table 1. Supply Chain Costs by Tier for Sampled Facilities (\$)

Function	Tier 1	Tier 2	Tier 3	Tier 4	Total
Sample total					
Total sampled costs	118,008	33,364	13,300	20,682	185,354
Total throughput value	970,742	326,133	33,192	39,487	n/a
Average cost per \$ throughput by tier	0.12	0.10	0.40	0.52	1.15
Number facilities sampled	1	6	12	24	43

When costs per dollar of throughput are examined by function, rather than by tier, the storage function represents almost half of all supply chain costs, at \$0.57 per dollar (or 57 percent of value) of throughput, and transportation (distribution) at \$0.12 per dollar (or 12 percent of value). Benchmarks from other supply chain costing studies (see appendix H) indicate that logistics costs for contraceptives range from 1 percent (distribution function only) to 12 percent (distribution and management functions only). The average cost per dollar of throughput from the Nigerian CLMS is considerably higher for any tier or function. However, before drawing any conclusions from comparisons with other countries, the country context should be considered. The cost structures and the cost of the inputs (for example, salaries and staff levels) may be very different and may also be a factor in determining supply chain costs.

Results from the sample data also revealed the varying cost structures of each tier, and which functions appear to be driving the costs of the supply chain. Storage, management, and transportation costs have different cost components. To interpret the data and extrapolate the sample results to the national level, these components must be understood.

For sampled facilities, labor is the main cost driver for all tiers. Most cost components can be considered as fixed costs, because they remain unchanged regardless of the changes in the volume throughput of commodities. Freight is the one exception, because it requires an actual cash outlay when it is used, and it fluctuates with the quantity of throughput. This implies little flexibility in the

system in terms of reducing overall costs. At the same time, however, it also implies that, because the system appears to be operating well below capacity, it can handle a larger quantity of commodity throughput without significantly increasing total costs and, thus, decreasing average costs. While there are some indicators of the current capacity utilization at the higher levels, additional data would be needed to quantify current resource utilization and to estimate the capacity threshold.

National Results

The overall estimated national supply chain costs for the CLMS are U.S.\$2,915,254¹. To extrapolate the costs, the authors used the methodology noted earlier to examine the cost elements for each function. Labor costs were one of the primary determinants of cost for all four supply chain functions at the national level, and it was often the main cost driver. The exceptions were procurement at tier 1 and transportation at tier 2—UNFPA procurement administrative fee is the main cost component for procurement at tier 1; freight costs are the highest cost at tier 2 where deliveries from CCW to the states are fully outsourced, that is, without support from implementing partners or the Ministry of Health (MOH) staff. Table 2 summarizes the estimated supply chain costs at the national level, detailed by function and tier, including the cost implication per dollar of throughput.

Table 2. Total Supply Chain Costs for Nigerian CLMS by Tier

Function	Tier 1 (\$)	Tier 2 (\$)	Tier 3 (\$)	Tier 4 (\$)	Total (\$)
System total					
Procurement	67,952	940	23,578	102,241	194,710
Storage	47,999	60,972	118,188	863,490	1,090,649
Transportation	–	46,314	494,865	311,464	852,643
Management	2,057	81,317	343,562	350,315	777,251
Total system costs	118,008	189,543	980,192	1,627,511	2,915,254
Total throughput	970,742	970,742	970,742	970,742	970,742
Average cost per \$ throughput by tier	0.12	0.20	1.01	1.68	3.00
Number of facilities					

In terms of function, storage and transportation represent the main costs of the total contraceptive supply chain. Total storage costs increase with each successive move down the supply chain. This is primarily a function of the number of facilities (there are more facilities at the lower levels). Warehousing and labor are the primary components of storage costs. The capital investment (warehousing) component of storage costs appears to be unrelated to the quantity (value, volume, or weight) of commodities that move through the system, at any level; this results in facilities with low warehouse capacity utilization. Similarly, the labor component of storage costs, while related to the frequency of activity necessary to move commodities through the systems, does not appear to be

¹ All dollar amounts in this document are in U.S. dollars.

directly related to the quantity of commodities that pass through the system. This is especially true in tiers 1 and 2, where staff are dedicated to medical store activities, instead of health service delivery activities. High per unit total storage costs result from the combination of these two components. As quantity of throughput increases, total storage costs per unit would be expected to decrease until they reach the capacity utilization threshold of the current resources.

Transportation costs can be directly correlated to the distance of distribution facilities from the resupply points. At the two highest levels, distribution is infrequent and it benefits from economies of scale. The lower levels incur larger transportation costs, because of the number of distribution points to be serviced, and the total distance traveled for resupply. At the lower levels, the quantity of commodities being transported to each facility is small, again resulting in high per unit transportation costs. In addition, the system is a pick system, where health workers travel in a private contracted vehicle (taxi) from each facility to the next tier up to collect commodities. Combining the collection of contraceptives with other commodities could lower transportation costs. However, as collection activities are exclusive to contraceptives, no benefit is realized.

Other system-wide cost drivers observed include the time health workers spend filling out reports and managing finances for the cost recovery program for the CLMS. These activities are exclusive to the cost recovery program and, under normal circumstances, would not be done. This implies additional labor costs, which are incurred only in tiers 2, 3, and 4; and, for this study, have been categorized as administrative costs under the procurement function.

In general, and as noted in the discussion above on the sample findings, high per unit costs across the supply chain result from the low quantity of commodities currently handled by the system, compared to its current level of resources. With the exception of tier 1, where costs are driven by the procurement administration fee, the average costs per dollar of throughput, when extrapolated to the national level, also *increase* with each successive move down the supply chain.

As a result, when throughput indicators are measured at the national level, costs per unit more than double (from \$1.15 to \$3.00), the result of two factors, both related to the sample selection. First, most sampled facilities are located within relatively short distances from the resupply points, resulting in lower than average transportation costs compared with most facilities. Second, states selected to participate in the study had to have active family planning programs—six states were selected—which accounted for 34 percent of the system throughput; 29 states shared the remaining quantity of throughput. The combination of these two factors—higher costs and lower throughput, particularly at the lower levels—resulted in much higher per unit costs at the national level. It would be instructive if simulations were done to show what the impact of increased commodity throughput would be on average costs; an analysis would also be needed for the current existing capacity and to determine which of the variable costs would increase when throughput increased.

Cost Recovery Funds

Based on the annual throughput quantities observed during data collection and the established cost recovery *margins* per tier, an estimated \$334,196 would be generated to cover the costs of distributing contraceptives. As noted above, transportation costs (freight) were identified as the only variable costs in the system. When the estimated cost recovery margins generated are compared to the national estimate of variable costs incurred, the system would have a deficit of \$518,447. In addition, there also appears to be an imbalance in the fee structure, which results in a surplus for tiers 1 and 2, and a very large deficit for tiers 3 and 4.

Background

The health care delivery system in Nigeria has many program-specific parallel supply chains, which various stakeholders have developed and implemented to address specific population needs and program requirements. Each program also has its own policies and processes; which, individually, usually function well. However, in some cases, they have caused broader policy conflicts, highlighting a need for better harmonization among programs and service delivery. Family planning services, essential medicines delivery, and the malaria control program have recently received attention.

Contraceptives are currently being distributed to health facilities in Nigeria through a program-specific supply chain. In this requisition system, the service delivery points (SDPs) pull from local government areas; which, in turn, pull from states; which then pull from the contraceptive central warehouse in Oshodi, Lagos. Since its inception in 2002, one feature of the contraceptive logistics management system has been cost recovery through user fees. While all contraceptives in the public sector are donated, these nominal fees serve several purposes: (1) transportation of goods between the tiers of the distribution system, (2) funding for reproduction and distribution of logistics management information system (LMIS) tools, and (3) payment for some operational costs at the facilities related to the provision of family planning services at the SDPs. These three activities are critical to the operation of the family planning program's distribution strategy.

In 2009, the Federal Ministry of Health (FMOH) introduced an Integrated Maternal, Newborn and Child Health (IMNCH) program; it provides services to Nigerians at its primary health care centers (PHCs), and does not collect user fees.

Subsequently, the cost recovery policy for contraceptives has been seen as being out of place and a potential barrier to providing family planning services. Although *Free IMNCH* is still primarily an unfunded mandate, there is considerable discussion about offering *free* contraception as part of the IMNCH package. Of vital importance to the family planning program are the questions of how their activities will be funded when user fees are eliminated and how they can best ensure commodity availability to the PHCs.

During this study, the drugs that IMNCH provided free did not have a national supply strategy, which has resulted in various stakeholders developing ad hoc procurement and logistics activities. For example, some state governments have procured goods and allocated them to the PHCs to support Free IMNCH. However, these goods are provided inconsistently, with no inventory or tracking policy. At the same time, the National Primary Health Care Development Agency (NPHCDA) has attempted to develop its own role in supporting Free IMNCH, including support for commodity logistics. Although, in principle, NPHCDA is already a significant partner in vaccine and nutrition program logistics, because they oversee distribution through four to six zonal stores; the current capacity of these stores and their effectiveness in the supply chain is not documented.

Last, the National Malaria Control Program (NMCP) operates another program-specific supply chain that delivers artemisinin-based combination therapy (ACTs), rapid diagnostic tests (RDTs), and long-lasting insecticide-treated bed nets (LLINs) to PHCs for distribution, without user fees.

Multiple parallel supply chains for health programs can place an undue burden on a system with already-limited resources. Recognizing the opportunity to improve operational efficiency, as well as

service delivery, partners plan to explore ways to harmonize these systems, while maximizing drug and other supply availability for family planning, IMNCH, and malaria. Discussions like these require knowledge of the costs of the relevant supply chains.

Purpose

The supply chain costing work in Nigeria is a two-part study.

The first part of the study documents the costs of the CLMS at each tier; this will enable the FMOH and implementing partners to better understand the costs of its current systems for contraceptive distribution. This document represents the results from the first part of the study.

The second part of this study will be a similar costing activity for the supply chains of the malaria and essential medicines programs. The findings will be used to compare storage and distribution costs of these programs for the contraceptive logistics management system (CLMS). This critical analysis will help inform the FMOH and other partners about the most appropriate distribution system for the future preventive and program-specific commodities needed for Free IMNCH.

Assessment Methodology

For this assessment, the technical team primarily used the supply chain costing tool (SCCT), developed by the USAID | DELIVERY PROJECT. The team collected quantitative information on the CLMS and assessed the series of steps performed at each supply chain level, including the associated costs of procuring and distributing contraceptives—issuing, storage and transportation management; reporting, monitoring and supervision; and training. Standard survey forms from the SCCT were adapted for the Nigerian CLMS and, during the training session, were revised after input from data collectors.

Supply Chain Costing Tool

The SCCT is a comprehensive tool that can be used to cost any public health supply chain. It is used to estimate the cost of moving individual commodities through the in-country supply chain, from the port of entry to the SDPs. The costing approach looks at actual supply chain processes to measure the level of effort and resources required for distributing commodities at each stage in the supply chain. The tool divides the supply chain into discrete functions and levels, or *tiers*, and also measures the quantity of goods that flow through the system. To estimate the total supply chain cost, the characteristics of each of these must be documented in the tool.

The SCCT used pre-populated, standardized forms—classified into four main supply chain functions—to collect data, which were used to create the baseline (or current scenario). The four main supply chain functions in the SCCT are—

- procurement
- storage
- transportation
- management (quantification, quality assurance/supervision, LMIS, training, and operating costs).

Using these functions, the tool enables data collection in a uniform, systematic way for all levels of the supply chain. In the tool, each function is divided into a labor component, an equipment component, and a third component that is specific to each function. This level of detail enables the user to analyze the cost drivers' other relevant dimensions, such as the impact of fixed and variable costs. A suite of reports and charts, according to function or health system level, is also available to support the costing analysis.

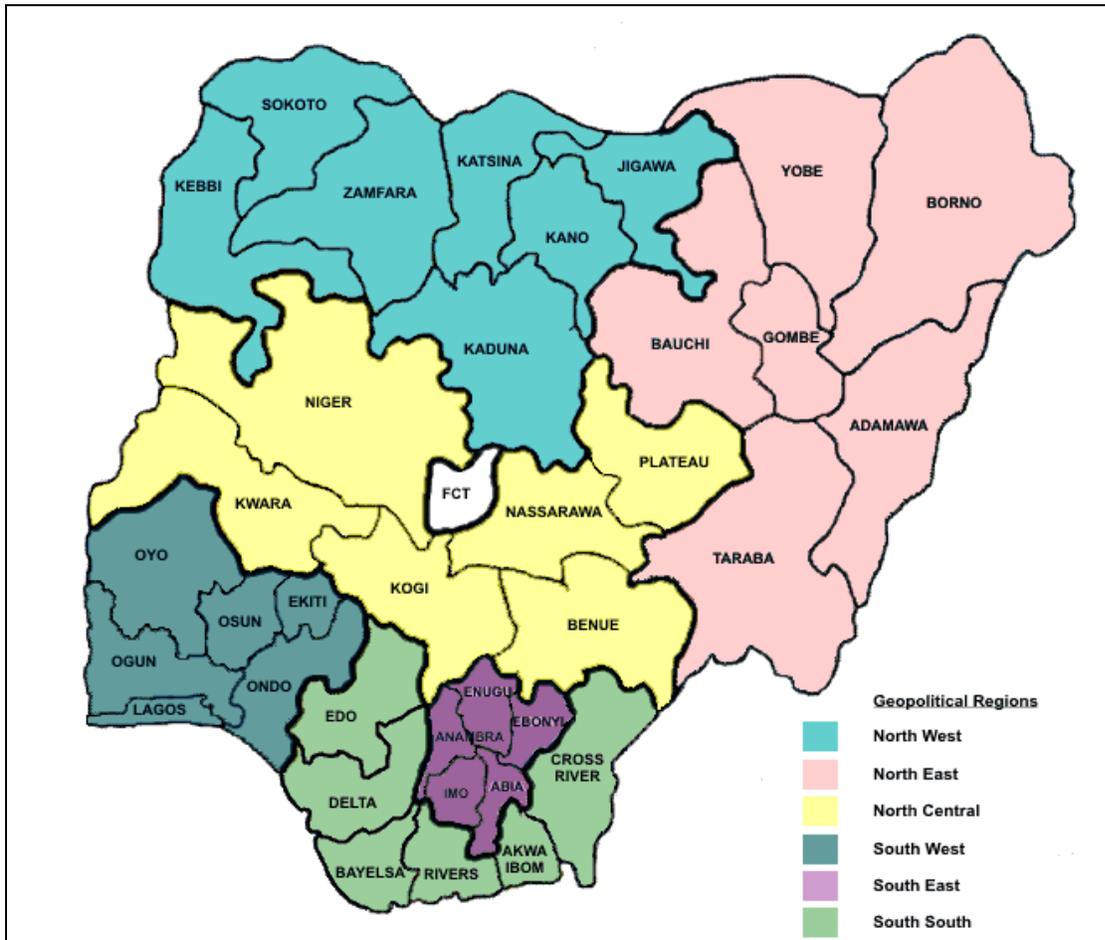
For more details, please see the forthcoming USAID | DELIVER PROJECT, *Supply Chain Costing Tool: User's Manual*.

Sample Facilities Definition

The main criteria for selecting facilities to be visited during this assessment included geopolitical zone, level of family planning activity, and level of support from the USAID | DELIVER PROJECT for the CLMS.

Nigeria has a federal government system; its central government headquarters is in Abuja. The country has 36 states plus the Federal Capital Territory (FCT); all are grouped into six geopolitical zones. Going forward, in this document, *states* will refer to the 36 states and the FCT. For this activity, one state from each geopolitical zone was considered. The assessment could then capture any differences in managing the CLMS, by geographic region. Figure 1 highlights the six geopolitical zones in Nigeria.

Figure 1. States and Geopolitical Zones of Nigeria



The implementing partners and the FMOH agreed to only consider states with active family planning programs, based on inventory reports from the central level. To develop the best estimate of the public sector CLMS costs, the team considered the states that had received the least investments in management and infrastructure from the implementing partners; therefore, only states managed either by the FMOH or UNFPA were considered. States managed by the USAID | DELIVER PROJECT were not considered.

Two states, Zamfara and Jigawa, were identified as not participating in the CLMS, because the central store/FMOH had not received any commodities requisition during the past two years, these two states were not considered in the analysis. The six states selected included Anambra, Cross River, Gombe, Kebbi, Plateau, and Ogun. From each state, the following sites were selected to be visited: (1) the State Central Medical Store (SCMS), (2) two local government areas (LGAs), one in

an urban area and one in a rural area; and (3) four SDPs, two PHCs, and two secondary health centers (SHC). During the site visits, one tertiary facility that is resupplied by the CLMS was added. In all, six SCMSs, 12 LGAs, and 25 SDPs were selected. At the central level, the assessment included FMOH staff in Abuja; implementing partners, including the United Nations Population Fund (UNFPA), the U.K.'s Department for International Development (DFID) and the USAID | DELIVER PROJECT; and the Contraceptive Central Warehouse (CCW) in Lagos. See Appendix A for a detailed list of the facilities visited.

Team Definition

Six assessment teams, supported by the USAID | DELIVER PROJECT, were formed, and each team was assigned to one state. Each team was composed of the Family Planning Coordinator for the particular state assigned, one representative from the FMOH, and one representative from the USAID | DELIVER PROJECT. See Appendix B for a list of participants in each state team.

Training on the Assessment Tool

Prior to the assessment, the consultants collected product and facilities' information specific to the contraceptive supply chain; it was used to set up the baseline scenario in the SCCT. Subsequently, a one-day training on the tool was conducted for data collectors from the FMOH, the State Ministry of Health (SMOH), UNFPA, and the project. The training included an overview of the SCCT, an overview of the forms to be used for data collection, and a practical exercise.

Data Collection Process

The SCCT was the main data collection tool. Each team was given a set of data collection forms and guidelines, which were customized for each state. A variety of methods were used for data collection:

- *Key informant interviews:* Collected information from development partners, including UNFPA and DFID, and from department and division heads at the FMOH.
- *Field visits:* Conducted interviews and collected data at the CCW, the state, LGA, and SDPs.
- *Desk review:* Review included various policy documents; program publications; surveys (including the *Nigeria Demographic and Health Survey*); and Internet resources.

All the data collected was compiled and reviewed for errors, omissions, and outliers. Follow-up interviews were conducted with the field teams and other key informants, as needed.

Preliminary findings from the sampled facilities were presented to stakeholders at the end of the data collection exercise. Feedback was incorporated into further stages of the analysis and into the final report.

Study Limitations

The sites for the study were carefully selected and agreed upon by representatives from the FMOH and the USAID | DELIVER PROJECT. One state was selected from each of the six geopolitical areas. Each state team visited the State CMS and one urban and one rural LGA. For each LGA selected, two urban and two rural SDPs were selected, for a total of four SDPs for each LGA. If possible, a secondary and a primary facility were included in the selected SDPs. One exception was

in Plateau state, where, because of an ongoing strike, it was impossible to visit any secondary facilities. The findings from the individual selected facilities offer a snapshot of the particular facility and are not representative of the entire state or country. However, the sampled facilities, combined with sound assumptions, provide a reasonable estimate of the costs to operate the contraceptive supply chain in the country.

In addition, the quantity of commodities handled by the CLMS in Nigeria during the period under review was very low, both relative to the system's capacity and when compared to other contraceptive supply chain costing studies. The low quantity of throughput will likely result in cost metrics that are skewed toward high values and that exaggerate the costs of the supply chain when examined per unit (value, weight, or volume). As such, comparisons of cost and supply chain efficiency against other countries are difficult to estimate. However, the results of this study can serve as a baseline for future CLMS performance and also to compare against other commodity supply chains in Nigeria.

Assumptions

Administrative fee for procurement

The FMOH and implementing partners currently engage UNFPA as the procurement agent for contraceptive commodities and other goods. The procurement is based on the amount of donor funds. An administrative fee of 7 percent is levied against goods procured. This fee covers the cost of managing and administering donor funds, other than from UNFPA, for contraceptive procurement. If UNFPA is not the procurement agent for the FMOH, two alternate scenarios are available for contraceptive procurement.

In the first scenario, the FMOH carries out the procurement internally. While some savings may be seen in manpower because of lower salaries, it is unlikely that FMOH, at current staff levels, can take on these activities; and it is unclear if the ministry has access to staff with appropriate skill and experience to manage large-scale procurement with international vendors. In addition, acting on its own, the FMOH could not leverage the same scale as UNFPA and would probably incur higher commodity price points.

In the second scenario, the FMOH outsources procurement to an external commercial agent. In this case, the role would be similar to that of UNFPA, typically with a negotiated fee-for-service structure, based on the value and volume of goods procured. In all cases, it is clear that the role of the procurement agent is necessary, whether the activities are carried out by the FMOH or a third party. For this study, the actual fees charged by UNFPA are considered to be the procurement agent's fee; no effort has been made to estimate the costs to FMOH if they transfer procurement administration activities internally.

Annual throughput

As goods are ordered for replenishment (subject to available funding), it was assumed that all goods distributed from the CCW also represent the absolute quantity of goods that pass through all tiers of the contraceptive supply chain, down to the end user. Also, as the cost recovery program, in effect, acts as an incentive to only order goods in demand, it was also assumed that excessive inventory is not being ordered at any of the lower levels; and that replenishment orders represent end-user consumption.

Fixed asset costs for warehouse and storage space

Of the facilities visited during this survey, only the CCW and the states had warehouses dedicated to storing contraceptive commodities. A survey of warehouse/storage facilities in three states determined the average warehouse value to be approximately 164,000 naira or \$1,095 per square meter. This survey assessed facilities in the Anambra, Lagos, and Kebbi states (see appendix C for detailed information). This figure is assumed to be representative for all storage facilities. Costs of warehouses and other storage facilities were determined by applying straight line depreciation of 25 years to the resulting valuations.

Fixed asset depreciation

Depreciation schedules used in the supply chain costing activity in Zimbabwe were considered to be the best available reference for this activity because of the unavailability of such information for the CLMS in Nigeria. Capital assets (warehouse and storage space) were applied straight line depreciation of 25 years; vehicles and equipment assets were applied straight line depreciation of 5 years.

Exclusions

All facilities identified in the study were fully assessed. Based on the findings, one SDP (Adedero) was fully excluded from the analysis, resulting in 24 SDPs analyzed. A second SDP (NYSC Calabar) was excluded only from the transportation analysis (see below).

In this report, *sampled SDPs* or *assessed SDPs* refer to the 24 valid SDPs, including NYSC Calabar.

- Adedero health clinic was fully excluded from the analysis because it had less than 12 months of history participating in the CLMS; and, therefore, could not represent annual activity.
- NYSC clinic, Calabar, was excluded from the transportation analysis because of its location within the LGA complex; and, therefore, it does not incur transportation costs.

Contraceptive Supply Chain

The Nigerian contraceptive supply chain is best described in terms of the operational tiers through which goods flow—from the CCW, the first point of entry to the county—to the SDP, where goods are made available to the end user. It is a pull system. In this type of system, the quantity of commodities distributed to each facility within a tier is determined by the demand or consumption of that facility (issued or dispensed quantities). Cost recovery funds are collected at each tier to support operational costs related to in-country distribution of goods.

Tier 1, the central level, represents activities carried out by the FMOH, the CCW, and national partners: UNFPA, DFID, and USAID, and others. Tier 1 players set procurement policy and make national purchasing decisions. In Nigeria, tier 1 is the first point of entry for contraceptive commodities. Currently, all contraceptives in the public sector are procured with donor funding. UNFPA, in its role as procurement agent, administers donor funds and procures specific commodities in the agreed-upon quantities and time frames, on behalf of the FMOH. The landed cost of the procured goods includes all costs incurred, from the supplier through to delivery at the CCW.

The Food and Drugs Services (FDS) manages the CCW operations. It is a department under the FMOH; its mandate is to regulate and control drugs, medical supplies, food, and other products that are locally manufactured or distributed in Nigeria. FDS is responsible for inventory after it is received at the CCW; planned shipments are received three times each year. The FDS reviews and manages the central safety stock levels. It also makes any decisions that concern inventory allocation and manages the distribution of contraceptives from the CCW to the State CMS and the FCT.

Tier 2 represents activities carried out by the SMOH, including the State CMS. The State CMS *receives distributions* from the CCW every four months, which are coordinated with shipments received at the CCW. It is a distribution center for the LGAs in its state, as well as the secondary health facilities. A family planning coordinator is responsible for each State CMS; the coordinator is the liaison between the state and the LGA. Six states were selected for this analysis.

Tier 3 represents activities carried out by the LGAs. Facilities in this tier *collect orders* from the respective State CMS every three months. LGA facilities are the distribution centers for designated PHCs and are typically managed by a nurse or other senior health care worker. For this analysis, 2 LGAs were selected in each state.

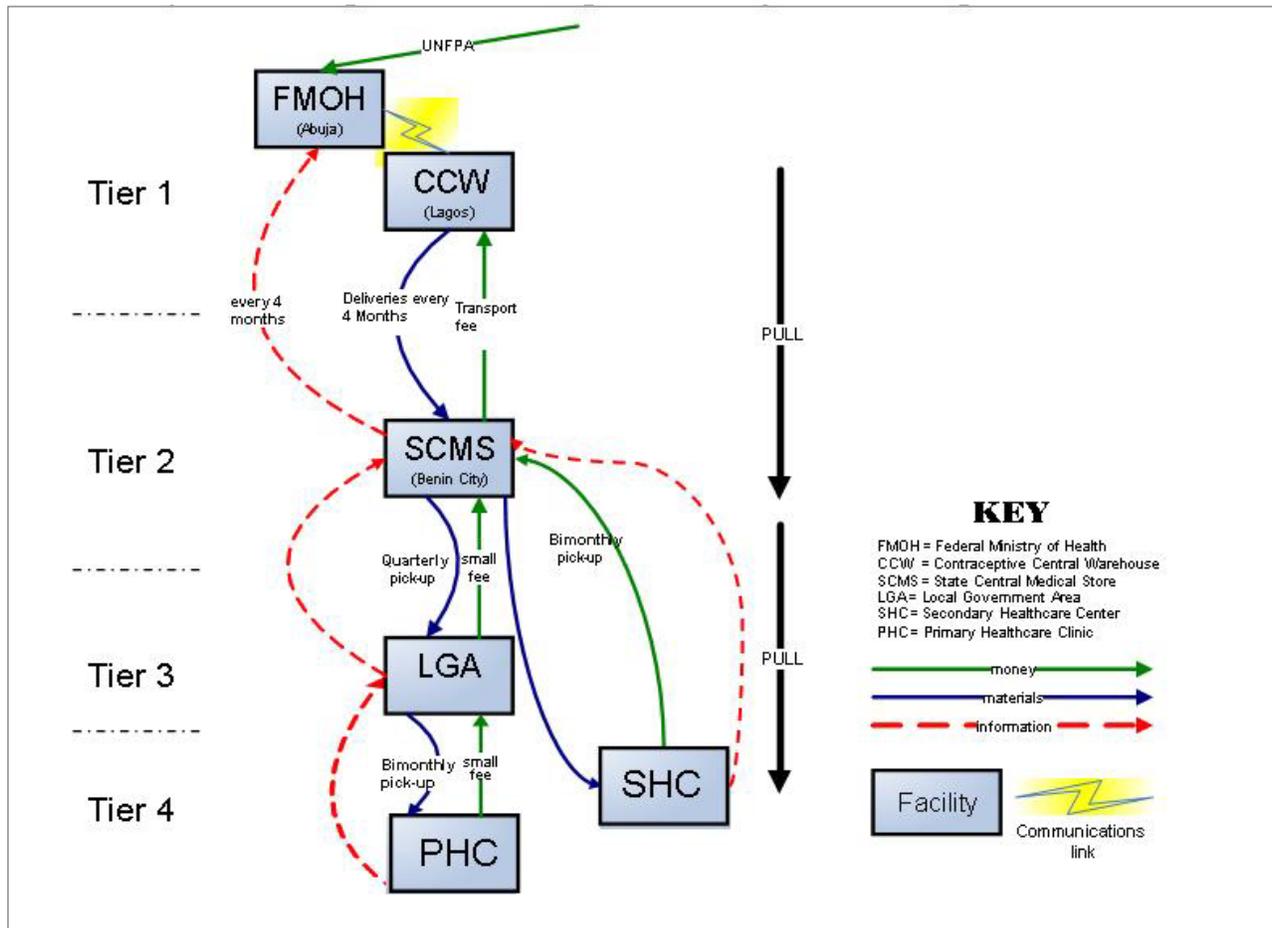
Tier 4 represents the lowest level in the supply chain—the SDP for the client. PHCs and secondary health facilities are in this tier. The respective LGAs govern the PHCs; the PHCs *collect orders* from the LGA every two months. Secondary facilities, however, are state institutions, and they *collect orders* from the State CMS, typically every two months. A total of 25 SDPs were selected for this analysis, drawn from the six selected states.

Table 3. Summary of Sampled Facilities

	Tier 1—CCW	Tier 2—State CMS	Tier 3—LGA	Tier 4—SDP
Number of facilities sampled	1	6	12	25
Annual ordering frequency	3	3	4	6

Figure 2 illustrates the flow of commodities through the Nigerian contraceptive supply chain.

Figure 2. Nigerian Contraceptive Supply Chain



Analysis and Findings

Annual Commodity Throughput for the CLMS

In this study, annual throughput is defined as the number of units of contraceptive commodities that pass through the in-country supply chain. To measure throughput for the Nigerian CLMS, quantitative data related to commodities issued or dispensed from each assessed facility, at all levels, was collected for the period October 2009 to September 2010. This data was then converted, based on the commodities' landed cost, volume, and weight per shipping unit (see appendix D).

The value, volume, and weight of commodities under tier 1 in table 4 represent the total quantity of commodities distributed from the CCW to all states and the FCT during the 12-month period described in the paragraph above. Because goods are ordered on the basis of replenishment (subject to available funding), the assessment team assumed that all goods distributed from the CCW also represent the absolute quantity of goods that pass through all tiers of the contraceptive supply chain, down to the end user. Also, as the cost recovery program, in effect, acts as an incentive to only order goods that are in demand, the team also assumed that excessive inventory was not being ordered at any of the lower levels; and that replenishment orders represent end-user consumption. Figures from tier 2 to tier 4 in table 4, represent the total throughput, at each level, for the assessed facilities only.

Table 4. Annual Quantity of Commodities Passing through the Supply Chain—Sampled Facilities

Tier	Value of Commodities (\$)	Volume of Commodities (m³)	Weight of Commodities (kg)
Tier 1 – CCW	970,742	503.95	81,844
Tier 2 – State CMS	326,133	160.20	24,986
Tier 3 – LGA	33,192	9.17	1,028
Tier 4 – SDP	39,487	8.30	788

It is important to note that during the period under review, the throughput for the system as a whole was very small, both in terms of absolute quantity and observed system capacity (which will be discussed later). At the lowest level, commodity throughput, on average, was \$1,645 per facility; however, of the 24 facilities sampled, four individual facilities were observed to have annual throughput of less than \$100.

The low quantity of throughput will have implications for the throughput indicators, driving up the metrics for supply chain cost against the value, volume, and weight of goods. In addition, cost metrics for throughput for the national supply chain will probably be even higher because the facility selection was not a random sample. One criteria for the states selected to participate in the costing study was that the state had to have an active family planning program. It is likely that many of the remaining states have less active programs, with lower annual throughput.

This can be seen in the measures above, where the throughput for tier 2 is almost one-third of the annual throughput for the system, yet it represents only six states out of 35. This implies that throughput for the six sampled states is approximately \$54,000, on average, while the remaining 29 states have throughput of only \$22,000, on average. The lower levels have similar inequalities, which also exaggerates the relationship between the supply chain cost and throughput.

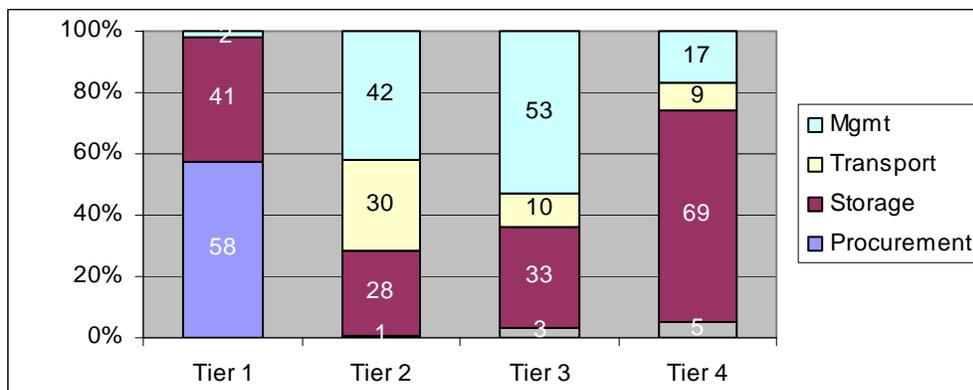
Supply Chain Cost Structure

Function costs vary widely between tiers, because the costs for each function reflect the level of activity related to the different responsibilities of each function at each tier. For example, management activities for tier 2 (state) typically represent a larger percentage of total tier costs, because training, supervision, and other activities take place at this level and serve many LGAs or SDPs. This, combined with the varying sample sizes for each tier, limits the ability to use the aggregated supply chain costs of the sample facilities as representative of the total country supply chain costs. Therefore, key findings are presented in terms of function cost by tier for the sampled facilities, and then extrapolated for all facilities in the tier and CLMS, where possible.

Summary of Supply Chain Costs for Sampled Facilities

Figure 3 shows the share of costs attributed to each function carried out in each tier, for sampled facilities only. Function costs vary within each tier. The cost associated with each function, in each tier, is determined primarily by the role that tier plays in the contraceptive supply chain and the number of clients served by that tier.

Figure 3. Share of Supply Chain Costs by Tier for Sampled Facilities



National procurement activity takes place primarily at tier 1. It represents the procurement body and the first point of entry of all contraceptives coming into the country. As such, one of the main cost components in this tier is for procurement activities, which include forecasting, vendor management, and order management. For the period under review, procurement represents 58 percent of tier 1 costs. In tiers 2–4, the costs captured under procurement represent the labor required to administer the Cost Recovery program; it represents, at most, 5 percent of the tier costs.

With the exception of tier 1, storage represents a greater percentage of tier costs as you move down the supply chain, from tier 2 to tier 4. In tier 1, storage costs are highest, given the size of the warehouse required to accommodate all commodities passing through, and the sizeable staff dedicated to inventory management (see Table 5). In all other facilities, however, the cost of warehousing is small and the storage costs are driven by labor. Labor costs for storage are

determined by the amount of time each facility spends serving clients (e.g., filling orders for lower-level facilities), the time spent replenishing its own inventory, and the staff salaries. At each lower tier, the number of facilities served and the frequency of serving them tend to increase, driving up storage costs, when compared to other function costs.

Conversely, transportation costs as a percentage of tier costs decline as you move down the supply chain. Costs are greatest between tier 1 and 2, primarily because of the volume of goods transported and the distance traveled between the CCW and the State CMS. Consolidated routes, with bulk shipments, deliver contraceptives between these points. This constitutes the largest transportation expenditure, per facility, throughout the system (see table 5). At lower levels, shipments and deliveries tend to be smaller and facilities usually hire vehicles, often taxis, to collect the goods—this results in lower transportation costs per facility. It should be noted that although transportation between the CCW and the State CMS is contracted and managed by the FDS, cost recovery funds pay the transportation expenses; therefore, for this analysis, they are captured under tier 2 costs (State CMS).

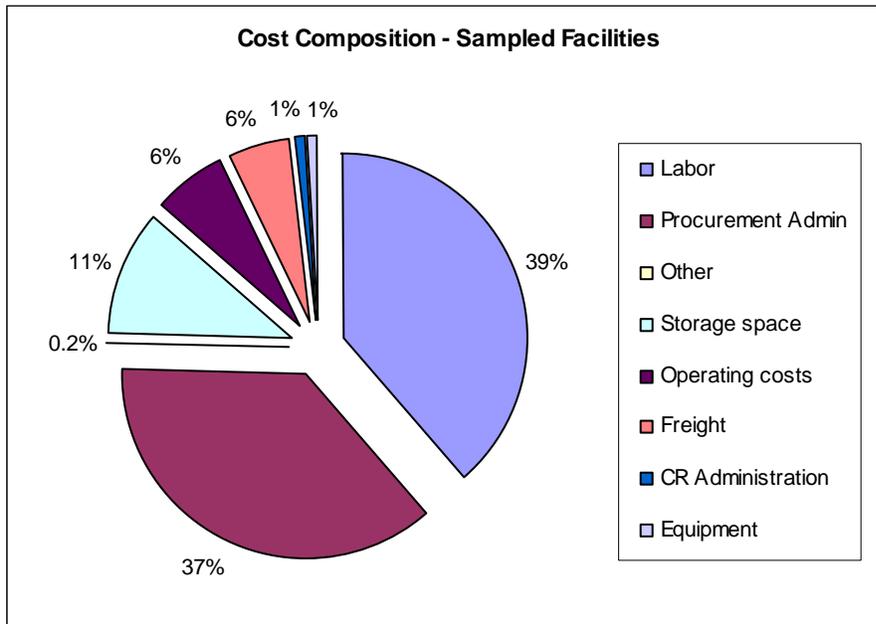
Management costs are noticeably inconsistent across the sampled facilities. Because each state operates its own family planning program, no standardized set of management activities is carried out in all states. In addition, family planning programs are more developed in some states than others; although the degree of development does not necessarily correlate to the volume of commodities that pass through the system. For all the states visited, each appeared to carry out different management-related activities, with varying amounts of training and supervision visits to their subordinate facilities.

Table 5. Supply Chain Costs by Tier for Sampled Facilities (\$)

Function	Tier 1	Tier 2	Tier 3	Tier 4
Sample total				
Procurement	67,952	168	439	1,046
Storage	47,999	9,203	4,408	14,338
Transportation	—	10,054	1,381	1,846
Management	2,057	13,940	7,072	3,452
Total sampled costs	118,008	33,364	13,300	20,682
Number facilities sampled	1	6	12	24

To understand the drivers of cost in the supply chain, the function costs were disaggregated into the cost component categories: labor, equipment, storage space, operating costs, freight, and others. Figure 4 illustrates the composition of the total costs for the sampled facilities. For the sampled facilities, labor costs are the largest cost component, followed by the procurement administrative fee, cost of storage space, operating costs, and freight costs. Costs associated with equipment, cost recovery administration, and other miscellaneous costs account for less than 1 percent each of the total costs.

Figure 4. Supply Chain Components for Sampled Facilities



With a few exceptions, the staff employed in the CLMS are salaried. As such, the cost of labor in this context is a fixed cost. Storage space and equipment are typically owned and operated by the central, state, or local government; they are also fixed costs. Similarly, the relevant government office controls the operating costs for these facilities. The cost of freight (transport of commodities between facilities) is the only notable cost in the supply chain that requires a cash outlay at the time of its use; it can be analyzed as a variable cost. With the exception of tier 1, where the procurement administrative fee drives costs, fixed costs represent most of the costs for all tiers (see table 6). This is particularly true at the lower levels of the supply chain, where almost all the tier costs are fixed costs.

With each successive move down the supply chain, fixed costs per unit tend to increase, while variable costs per unit tend to decrease. When the smaller throughput quantities at the lower levels are considered, the cost-to-value ratio is even more exaggerated. As will be seen during the discussions of function costs, the high level of fixed costs throughout the system result in high per unit costs for all functions, across all tiers.

To improve the efficiency of the system, there is little flexibility to reduce overall costs, because fixed costs will remain the same, regardless of throughput. However, depending on the capacity and resource utilization of the system, there may be an opportunity to increase throughput without significantly increasing the overall costs—only variable costs would increase marginally if throughput increased.

Table 6. Supply Chain Fixed and Variable Cost by Tier for Sampled Facilities

	Tier 1 (\$)	Tier 2 (\$)	Tier 3 (\$)	Tier 4 (\$)
Total costs	118,008	33,364	13,300	20,682
Fixed costs	50,056	24,224	12,463	19,958
Variable costs	67,952	9,140	838	724

	Tier 1 (\$)	Tier 2 (\$)	Tier 3 (\$)	Tier 4 (\$)
Throughput value	970,742	326,133	33,192	39,487
Fixed costs/\$	0.05	0.07	0.38	0.51
Variable costs/\$	0.07	0.03	0.03	0.02
Total cost/\$	0.12	0.10	0.40	0.52

Summary of Supply Chain Cost Metrics for Sampled Facilities

Table 7 summarizes the cost metrics for the sampled facilities in the Nigeria CLMS. Costs by tier for the sample were measured against annual throughput, as described earlier, to understand the cost impact according to the value, volume and weight of commodities passing through the supply chain. Results show that the costs per unit are very high for all tiers. The total cost per dollar for the sampled facilities in the four tiers combined is \$1.15 (see table 7). This means that the total cost to deliver \$1.00 worth of commodities from the CCW to an SDP is \$1.15. Most of this cost (\$0.92) is incurred in the lower levels of the supply chain, where throughput is extremely small and costs tend to increase rapidly.

Results also show a similar pattern for all metrics: costs per unit (value, volume, or weight) tend to increase as you move to the lower levels of the supply chain. For example, costs per U.S. dollar value of throughput in tier 4 are five times the costs in tiers 1 and 2. At the lower levels, cost metrics for volume and weight increase at a faster rate; costs per cubic meter in tier 4 are more than 10 times the tier 1 costs; costs per kilogram are 18 times the tier 1 unit costs.

As discussed earlier, these high per unit costs result from the very low throughput in the system, particularly when measured at the lower levels.

Table 7. Commodity Throughput Indicators for Sampled Facilities by Tier

Tier	Value (\$)	Cost/ \$1 (\$)	Volume (m³)	Cost/ m³ (\$)	Weight (kg)	Cost/kg (\$)
Tier 1	970,742	0.12	503.95	234.14	81,844	1.44
Tier 2	326,133	0.10	160.20	208.27	24,985	1.33
Tier 3	33,192	0.40	9.17	1,450.59	1,028	12.94
Tier 4	39,487	0.52	8.30	2,492.24	788	26.24
Total		1.15		4,385.25		41.96

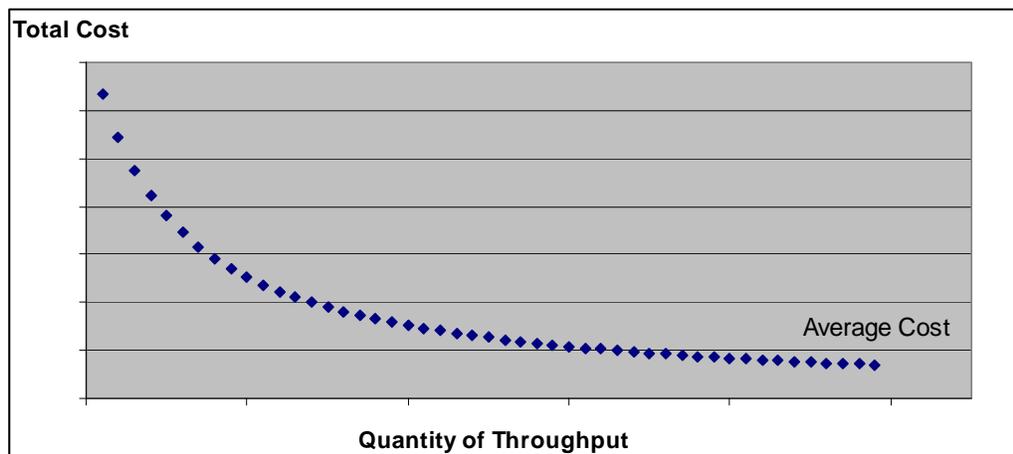
Throughput indicators can also be examined according to function. From this perspective, it is clear that the storage function represents the greatest cost, per unit (see table 8).

Table 8. Supply Chain Throughput Indicators for Sampled Facilities by Function

	Procurement (\$)	Storage (\$)	Transportation (\$)	Management (\$)	Total (\$)
Total Costs	69,605	75,948	13,281	26,521	185,355
Cost /\$	0.11	0.57	0.12	0.35	1.15
Cost/m ³	315	2,434	447	1,308	4,504
Cost/kg	2.59	23.41	4.08	11.84	41.92

As noted earlier, storage costs are primarily fixed costs. Given the low resource utilization observed, however, it would be expected that the system could handle increased throughput; and, with this increase, the costs per unit would decline, until it reached a capacity threshold. In figure 5, this concept is illustrated with the average fixed cost curve.

Figure 5. Average Fixed Cost Curve



Capacity utilization and cost implications for the storage function, and cost drivers for other tiers are discussed in more detail in the next section.

Cost Results by Supply Chain Function

Procurement Function

Costs captured under the procurement function are divided into two categories: national procurement and cost recovery administration.

Total annual costs captured under the procurement function for the sampled facilities of the CLMS in Nigeria are \$69,605. Extrapolated for all facilities in the country, these costs are estimated at \$194,710. These costs are divided as follows:

- national procurement costs: \$67,952
- cost recovery administration: \$1,653 (sample facilities); \$126,758 (national, all facilities).

National Procurement Costs—Tier 1

Tier 1 represents the procurement body and the first point of entry for all contraceptives for the country. As such, one of the main cost components in this tier is for procurement activities, including forecasting, vendor management, and order management. For the period under review, this cost was \$67,952 or 58 percent of tier 1 costs. The cost of shipping, customs clearance, insurance, and inbound freight (from the port to the CCW) are included in the price paid for the commodities; therefore, they are already counted in tier 1 costs.

The FMOH and partners currently engage UNFPA as the procurement agent for contraceptive commodities and other goods; UNFPA is one of the main donors of contraceptives, as well. An administrative fee of 7 percent is levied against goods procured with funds from other donors. This fee covers the cost of managing and administering donor funds for procuring contraceptives.

Because the fee is a percentage of the value of goods procured annually, the share of tier 1 costs attributed to procurement will vary each year, depending on the value of goods procured and passed through the contraceptive supply chain.

Cost Recovery Administration—Tiers 2, 3, and 4

The main cost elements considered to extrapolate the cost of administering the cost recovery program from sample to the national CLMS were:

- total number of orders placed annually and the average time spent preparing forms related to the cost recovery program
- number of facilities in each tier
- annual salary of staff responsible for order management activities.

Procurement costs captured in tiers 2, 3, and 4 represent the labor required to administer the cost recovery program, instead of commodity procurement. Cost recovery activities performed at these tiers include preparing the appropriate cost recovery forms and the related financial documents (e.g., bank draft, etc.). Because this set of activities is similar for all facilities—and most facilities carry between eight and 10 types of contraceptives—a standard time to perform these activities was determined, based on interviews; it was assumed to be a valid estimate for all facilities. While the costs to administer cost recovery in tiers 2, 3, and 4 represent a relatively small share of total supply chain costs, costs tend to increase as you move down the supply chain. Per facility, this can be attributed to the increase in order frequency; while in aggregate, the cost increase is a function of the number of facilities in each tier (see table 9).

Table 9. Estimated Annual Procurement Costs for Supply Chain

Tier	Number Facilities Sampled	Costs for Sampled Facilities (\$)	Cost Percentage to Value of Commodities (%)	Number of Facilities in CLMS*	Total Estimated Procurement Costs for CLMS (\$)
Tier 1	1	67,952	7.0	1	67,952
Tier 2	6	168	0.1	35	940
Tier 3	12	439	1.3	583	23,578
Tier 4	24	1,046	2.7	2,537	102,241
Total Procurement		69,605		3,156	194,710

*Estimated number of facilities in CLMS with a family planning program

Storage

The total annual storage cost for the sampled facilities of the CLMS in Nigeria is \$75,948. Extrapolated for all facilities in the country, storage costs are estimated at \$1,090,649 (see table 10).

The cost components of storage are labor and space (warehousing), of which the labor component is the main cost driver. To extrapolate storage costs from the sampled facilities to the national CLMS, the following cost inputs were considered:

- frequency of placing orders (inventory replenishment) and fulfilling orders (serving other facilities), and the average time to carry out these activities
- number of facilities in each tier
- number of facilities or clients served by each tier
- annual salary of staff responsible for storage activities
- average fixed asset investment (warehousing).

Table 10. Estimated Annual Storage Cost for Supply Chain

Tier	Number Facilities Sampled	Costs for Sampled Facilities (\$)	Cost Percentage to Value of Commodities (%)	Number Facilities in CLMS*	Number Facilities Served**	Total Estimated Storage Costs for CLMS (\$)
Tier 1	1	47,999	4.9	1	1	47,999
Tier 2	6	9,203	2.8	35	694	60,972
Tier 3	12	4,408	13.3	583	2,426	118,188
Tier 4	25	14,338	36.4	2,537	2,379,404	863,490
Total storage		75,948		3,156		1,090,649

*Estimated number of facilities in CLMS with family planning program

**Tier 4 figure represents number of customers served, rather than number of facilities served

Storage Costs—Tier 1

Storage activities represent the second largest cost component in tier 1—approximately 41 percent of tier costs, or \$47,999. Storage costs comprise the costs for labor and space (the physical warehouse). Labor represents 74 percent (\$35,548) of storage costs in tier 1, and space costs are the remaining 26 percent, an estimated \$12,451. The CCW employs eight full-time staff to manage inventory in the warehouse; they have two security guards. Staff salaries are fixed; labor costs do not fluctuate with the quantity of commodities that pass through the CCW. Similarly, space costs are considered fixed and do not fluctuate with changes in throughput.

As noted earlier, the throughput for the system, relative to the capacity, is low. While data to quantify the system capacity and actual utilization is not available, indicative data can be used to demonstrate resource utilization in tier 1. Table 11 summarizes the stock card for male condoms, including detailed major inventory movements at the CCW from November 2009 to August 2010. Although multiple facilities were served on the dates given, the table illustrates that activity at the warehouse is concentrated around a few key dates—when shipments are received and readied for distribution. During the time around the receipt and distribution dates, the facility is typically at or over capacity (during the site visit, the team noted that much of the administrative space in the warehouse was filled with boxes of condoms because a shipment had recently arrived). Otherwise, the facility sees long periods of very low levels of activity and low levels of inventory to manage. Note that from 12-08-2009 to 02-17-2010, the facility had less than 4,000 units on hand and no transactions took place. Similar status can be seen during 03-18-2010 to 06-25-10. From this data, it can reasonably be assumed that the resources of the CCW are operating below optimum capacity.

Table 11. CCW Inventory Transactions Summary for Male Condoms

Date*	Transaction Type	Quantity	Ending Inventory Balance
11/06/09	Receipt	2,880,000	2,880,000
11/09/09	Receipt	1,440,000	4,320,000
12/02/09	Issue	-1,360,288	2,959,712
12/07/09	Issue	-2,845,943	113,769
12/08/09	Issue	-109,864	3,905
02/17/10	Receipt	3,240,000	3,243,905
02/18/10	Receipt	3,456,000	6,699,905
03/17/10	Issue	-5,797,298	902,607
03/18/10	Issue	-890,207	12,400
06/25/10	Receipt	7,560,000	7,572,400
07/13/10	Issue	-126,000	7,446,400
07/28/10	Issue	-936,000	6,510,400
07/29/10	Issue	-1,504,800	5,005,600
08/02/10	Issue	-479,232	4,526,368
08/03/10	Issue	-3,838,662	687,706

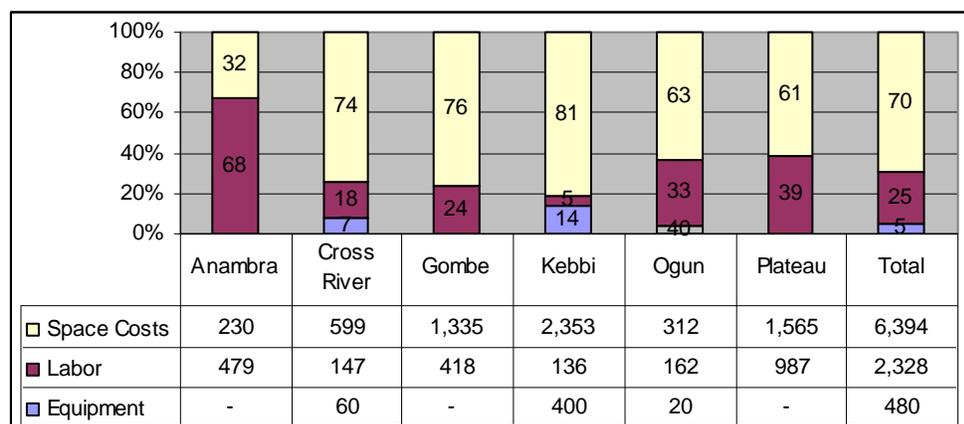
Note: Each line item summarizes the transactions that took place on that date.

Table 11 highlights activity for male condoms only, which is the largest item stocked at the CCW in terms of units and volumetric space. However, it should be noted that the timing of shipments for most commodities handled at the facility are typically planned to coincide, when possible, and that issues to the states typically include all types of available commodities.

Storage Costs—Tier 2

The total estimated storage costs for the State CMS level (tier 2) for the CLMS in Nigeria was \$60,972. For the six state medical stores assessed, storage costs were \$9,203, of which 70 percent were related to space costs (warehouse), 25 percent to labor costs, and 5 percent to equipment costs. Figure 6 illustrates the cost components for the sampled state contraceptive medical stores.

Figure 6. Tier 2 Storage Cost Components by State (State CMS)



All the surveyed State CMSs had a warehouse dedicated to storing contraceptive commodities. Space costs for each state shown were determined by applying the average warehouse value, as estimated by the real estate assessor (164,000 naira or \$1,095 per square meter). This value was assumed to be applicable for all State CMS warehouses. Straight line depreciation of 25 years was applied to all warehouse valuations.

In the states surveyed, the size of the warehouse, and, therefore, the space cost, had no relationship to the amount of goods that flow through it; many had very low capacity utilization. Of the states surveyed, Kebbi state had the largest warehouse (approximately 54 m²) but a relatively low volume of commodities that pass through annually (approximately 2.1 m³). In contrast, Anambra state had the smallest warehouse, (approximately 5.3 m²), which is one-tenth the size of the Kebbi SCMS, yet handled 80 percent more volume (approximately 3.8 m³) annually. As such, space costs generate a considerable amount of variability in the storage cost metrics, as shown in table 12, with lower volume facilities having the highest per unit costs for all measures.

Table 12. Tier 2 Storage Costs Metrics for Assessed State CMS

	Anam- bra	Cross River	Gombe	Kebbi	Ogun	Plateau	Sampled States
Total value of commodities passing through (\$)	8,165	16,521	96,571	5,398	17,395	182,084	326,133
Total volume of commodities passing through (m ³)	3.8	6.7	43.1	2.1	7.9	96.6	160.2
Total weight of commodities passing through (kg)	398	815	6,883	300	907	15,683	24,985
Total storage costs (\$)	708	806	1,754	2,889	493	2,552	9,203
Storage costs per \$1,000 of commodities (\$)	87	49	18	535	28	14	28
Storage costs per m ³ of commodities (\$)	187	120	41	1,360	63	26	57
Storage costs per kg of commodities (\$)	1.78	0.99	0.25	9.64	0.54	0.16	0.37

Unlike tier 1, storage labor costs for tier 2 are determined by the frequency with which a common set of activities is carried out, including the staff salaries of those performing the activities. The common set of activities is determined by the frequency of inventory replenishment, and the number of lower-level facilities served by this tier and the frequency with which they are served (order fulfillment). At the State CMS, inventory replenishment of the medical store from the CCW takes place three times per year, and order fulfillment for lower-level facilities occurs four times per year. The State CMS supplies goods for the state's LGAs and secondary health facilities. A survey of 33 states (out of the 35 states that participate in the CLMS) revealed that approximately 79 percent of LGAs have active family planning programs, with distribution of contraceptives to SDPs (see appendix E). This ratio was assumed to be valid for the remaining two states, resulting in a total of 583 LGAs that distribute contraceptives through the CLMS; and, therefore, require order fulfillment from the State CMS, in addition to 111 estimated secondary health facilities.

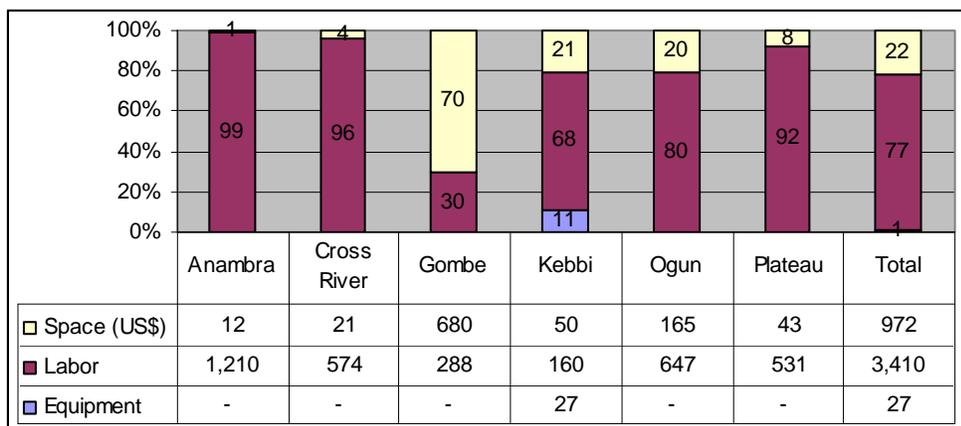
Storage activities are typically carried out by the family planning coordinator. If there is more than one employee at the facility, a junior staff member may assist. As salary scales differ across states, an average salary for tier 2 storage activities was determined and applied when estimating storage labor costs for all state medical stores.

Investments in equipment, such as shelving, were small and, in some cases, zero. An average annual equipment value estimated at \$80 was considered for all tier 2 facilities, and straight line depreciation of five years was applied to all equipment valuations.

Storage Costs—Tier 3

The total estimated storage costs for the LGA level (tier 3) for the CLMS in Nigeria is \$118,188. For the 12 LGAs assessed, storage costs are \$4,408, of which 77 percent of the total storage costs are related to labor costs, 22 percent to space costs (warehouse), and only 1 percent to equipment costs. Figure 7 illustrates the cost components for the sampled LGAs, aggregated by state.

Figure 7. Tier 3 Storage Cost Components of Sampled LGAs by State



With the exception of facilities in Gombe, labor costs are the main component of storage costs at the LGA level. Similar to storage labor costs for tier 2, storage labor costs for tier 3 are determined by the frequency with which a common set of activities is carried out and the staff salaries of those performing the activities. For the LGAs, stock replenishment of the medical store from the State CMS takes place four times per year, and order fulfillment for lower-level facilities (PHCs) takes place six times per year. The combination of increasing activity frequency and smaller volume and value of commodities drives up the cost-per-unit of measure moving down the supply chain from tier 2 to tier 3. As shown in table 13, the value of commodities passing through tier 3 is \$33,192, which is approximately 10 percent of that passing through tier 2, yet the storage costs per \$1,000 of commodities is nearly five times higher in tier 3 (\$133), when compared to tier 2 (only \$28). Similar comparisons can be made for weight and volume metrics. Again, these findings seem to point to resources being underutilized, although it is unclear to what degree, because these facilities often manage more than one program. The figures also show how the cost-per-unit relationship is exaggerated when the base quantity is very small.

Table 13. Tier 3 Storage Cost Metrics for Assessed LGAs

Metric	Result
Total value of commodities passing through	\$33,192
Total volume of commodities passing through	9.2 m ³
Total weight of commodities passing through	1,028 kg
Total storage costs for assessed LGAs	\$4,408
Storage costs for \$1,000 of commodities	\$133
Storage costs per m ³ of products	\$481
Storage costs per kg of products	\$4.29

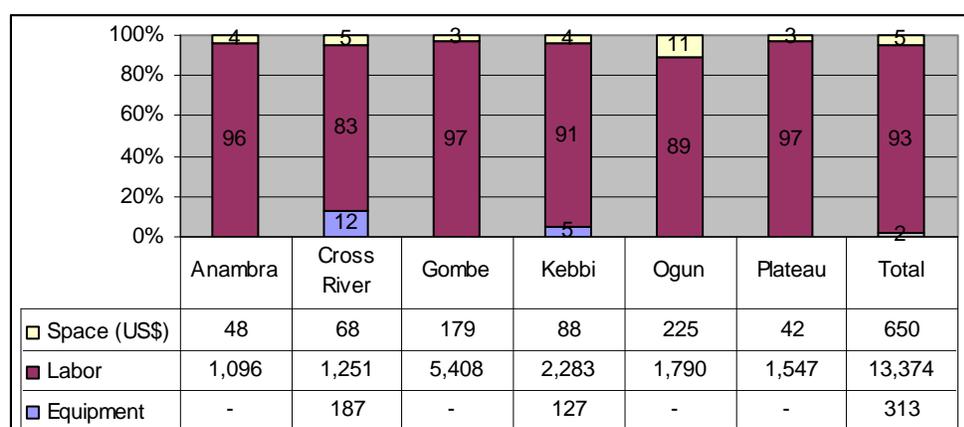
At lower levels of the supply chain, storage costs become increasingly small. For facilities at the LGA and SDP levels, storage for contraceptives usually includes a set of dedicated shelves in a locked store room, or a locked cabinet in a dispensing area. The total storage area dedicated to contraceptives in these facilities is usually less than 0.5 square meters; only eight of the 41 tier 3 and four facilities surveyed have a storage space larger than 0.5 square meters. The square meter valuation provided by the real estate appraiser was applied to all LGAs. Cost estimates for the shelving and cabinets range from 5,000 to 30,000 naira (\$33 to \$200).

Storage Costs—Tier 4

The total estimated storage costs for the SDP level (tier 4) for the CLMS in Nigeria is \$863,490. For the 24 SDPs assessed, storage costs are \$14,338, of which 93 percent is related to labor costs, 5 percent to space costs (warehouse), and 2 percent to equipment costs. Figure 8 illustrates the cost components for the sampled SDPs, aggregated by state.

Storage costs for most facilities sampled averaged around \$360. The facilities surveyed in Gombe state, however, included a specialist hospital with a large storage area, but also the highest throughput. So, while this facility drives up overall storage costs for tier 4, the per unit storage costs are one of the lowest.

Figure 8. Tier 4 Storage Cost Components of Sampled SDPs by State



At the lowest levels of the supply chain, labor is the primary driver of storage costs. Similar to tiers 2 and 3, labor costs are determined by the frequency with which a common set of standard activities is carried out. In tier 4, inventory replenishment from the LGA or State CMS takes place six times per year, and order fulfillment activities to lower-level facilities are replaced by the logistics activities related to dispensing products to clients. Dispensing-to-client activities were determined to be a common set of activities that could be applied as a standard time per client, across all facilities, based on the number of client visits per year. Time required for service delivery is not included in this measurement. Appendix F lists the inputs used to estimate the total number of client visits per year at tier 4, including the total unit volume dispensed and the dispensing rate *per client visit*.

All commodities were assumed to be dispensed at a rate of one per client visit, except male and female condoms, which assumed a dispense rate of 12 per client visit, and oral contraceptives, which assumed a dispense rate of three per client visit. This resulted in approximately 1.99 million client visit per year for contraceptives for all SDPs. Because the Nigerian CLMS operates under a cost recovery scheme, clients are expected to pay a nominal fee for commodities. This probably has an impact on the actual dispense rate, and, therefore, the number of client visits. Because service providers will only dispense the quantity of commodities that the clients can pay for, clients must visit more frequently to purchase the needed commodities. A sensitivity analysis was done to understand the effects on tier 4 storage costs caused by decreasing the dispensing rate of condoms and oral contraceptives, based on the following four scenarios (see table 14):

1. Condom dispense rate decreased from 12 to 10.
2. Condom dispense rate decreased from 12 to 8.
3. Oral contraceptive dispense rate decreased from 3 to 2.
4. Oral contraceptive dispense rate decreased from 3 to 1.

Table 14. Tier 4 Storage Costs—Sensitivity Analysis

	Baseline*	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total client visits (millions)	1.99	2.06	2.31	2.78	2.01
% change in client visits	-	4%	16%	40%	1%
Total storage costs (U.S.\$million)	0.86	0.89	0.96	1.10	0.87
% Change in storage costs	-	3%	11%	28%	1%

*Baseline scenario: 12 condoms per client visit, three oral pill cycles per client visit, one unit per client visit for all other contraceptives

Table 14 shows that the number of client visits is a key determinant for storage costs in tier 4. The number of client visits can be affected by not only the dispense rate, but also program or system changes. As the unit volume of commodities in the system increases with funding or other factors supporting the contraceptive prevalence rate (CPR), labor costs directly related to storage activities would be expected to rise along with the number of client visits.

Storage space and equipment are minor items in tier 4 storage costs. Only three SDPs were found to have storage areas dedicated to contraceptives larger than 1 m², the majority having less than 0.5 m² of storage space. The square meter valuation provided by the real estate appraiser was applied to all SDPs. Similarly, equipment investments were observed to be small in tier 4; an average of \$13 was applied to estimate costs for storage equipment for all SDPs, based on observed equipment.

Table 15 summarizes storage cost metrics for tier 4. As shown, costs increase considerably at the lowest level of the supply chain—three to four times that of tier 3. As noted above, costs at the lowest level are primarily driven by the unit volume of throughput, whereas tiers 2 and 3 are driven by frequency of replenishing stock and fulfilling orders, which are not directly correlated to throughput, but are primarily correlated to policy and process.

Table 15. Tier 4 Storage Costs Metrics for Assessed LGAs

Metric	Result
Total value of commodities passing through	\$39,487
Total volume of commodities passing through	8.3 m ³
Total weight of commodities passing through	788 kg
Total storage costs for assessed SDPs	\$14,338
Storage costs for \$1,000 of commodities	\$363
Storage costs per m ³ of products	\$1,728
Storage costs per kg of products	\$18.19

Transportation

The total transportation costs for the assessed facilities are \$13,281, and the total estimated transportation costs for the Nigeria CLMS is \$852,643. Third-party transportation companies, contracted by the FDS (Abuja) on a service-as-needed basis, transport the contraceptives from the CCW to the 34 states participating in the CLMS and the FCT. The FDS provided freight cost estimates for routes from CCW to each state. Considering that the SCMS ultimately pays for transportation from CCW through the FMOH cost recovery program, and for proper cost allocation in this study, these costs were apportioned to the SCMS level (tier 2) for each state. As noted earlier, primary distribution costs (sea freight and ground transport to the CCW) are included in the landed cost of the commodities purchased; therefore, analysis of transportation costs will be limited to tiers 2, 3, and 4.

Transportation Costs—Tier 2

The total estimated transportation cost at the SCMS level (tier 2) for the CLMS in Nigeria is \$46,314 (see table 16). The main cost elements considered to extrapolate to the national CLMS were:

- total sum of the specific freight costs from CCW to the 34 states and FCT
- average labor cost from the assessed states where SCMS staff travel to the carriers' local office to collect commodities shipped from CCW.

Table 16. Tier 2 Estimated Annual Transportation Cost

Number of Sampled SCMS	Total Number of SCMS	Costs for Sampled SCMS	Estimated Tier 2 Transport Cost	Value of Commodities Sampled	Total Value—Commodities Throughput	Percentage to Value of Commodities Assessed
6	35	\$10,054	\$46,314	\$326,133	\$970,742	34%

Of the estimated transportation costs for the assessed SCMS (\$10,054), 90 percent is related to freight costs from CCW to the SCMS for all states except Ogun, which is the only assessed SCMS with a vehicle (Toyota Hiace) available to collect commodities from the CCW. This vehicle is owned by the state MOH, and five different programs share it; 6 percent of the total estimated costs include vehicle depreciation and maintenance for Ogun’s SCMS. Last, 4 percent are related to labor costs.

Table 17 displays transportation cost metrics by value, volume, and weight of commodities. The distance driven was found to be the main cost driver for distribution of contraceptives. For example, transportation cost to value of commodities is the highest for Kebbi state because of its long distance from CCW in Lagos, and it has the lowest volume of commodities delivered among the six states visited. Ogun benefits from being a neighbor of the state of Lagos; therefore, it presented the lowest total transportation cost, yet not the best ratio to the value of commodities. Plateau state was found to have the lowest transportation cost ratio to the value of commodities, 2 percent, mainly because of the high volume of commodities for this state compared with the others.

No direct correlation between transportation costs and cargo weight or volume was found, primarily because of the low weight and volumetric cargo space that contraceptives represented for the observed 12-month period for most assessed states. Anambra, Cross River, Kebbi, and Ogun states each handled less than 8 m³ of commodities, but they had similar or greater transportation costs than Gombe state, which handled 43 m³ of goods. While amount of commodities transported to Kebbi state is the lowest of the states surveyed, the high transportation cost is partially explained by its distance from the CCW. Overall, transportation costs to the value of contraceptive throughput is 3.1 percent.

Table 17. Tier 2 Transportation Costs Metrics for Assessed SCMS

	Anam- bra	Cross River	Gombe	Kebbi	Ogun	Plateau	Total Sample
Total value of commodities passing through (\$)	8,165	16,521	96,571	5,398	17,395	182,084	326,133
Total volume of commodities passing through (m ³)	3.8	6.7	43.1	2.1	7.9	96.6	160.2
Total weight of commodities passing through (kg)	398	815	6,883	300	907	15,683	24,985
Total transport costs (\$)	950	1,201	1,600	1,954	748	3,600	10,054
Percentage of transportation costs to value of commodities passing through	11.6%	7.3%	1.7%	36.2%	4.3%	2.0%	3.1%
Transport costs per m ³ of transported products (\$)	250.6	179.3	37.1	920.4	95.0	37.3	62.8
Transport costs per kg of transported products (\$)	2.39	1.47	0.23	6.52	0.83	0.23	0.40

Transportation Costs—Tier 3

There are approximately 583 LGAs actively participating in the CLMS in Nigeria. The total estimated transportation costs for their resupply is \$494,865. For the 12 assessed LGAs, 51 percent

of the total transportation costs are related to labor because staff from the LGAs travel to the SCMS to collect contraceptives. The remaining 49 percent are vehicle charges (usually private taxis).

Similar to tier 2, driving distance is the main cost driver at this level. Weight and volumetric cargo space for contraceptives collected by the assessed LGAs are sufficiently low that the LGAs can use passenger vehicles (taxis) to collect all their supplies in only one trip, for each ordering period. The transportation metrics table (table 18) shows that the transportation costs between tiers 2 and 3 per \$1,000 of throughput is \$41.60 (or 4.2 percent) for the 12 assessed LGAs.

Table 18. Tier 3 Transportation Costs Metrics for Sampled LGAs

Metric	Result
Total value of commodities passing through	\$33,192
Total volume of commodities passing through (m ³)	9.2
Total weight of commodities passing through (kg)	1,028
Total transport costs for assessed LGAs	\$1,381
Transport costs for \$1,000 worth of commodities	\$41.60
Transport costs per m ³ of transported commodities	\$150.62
Transport costs per kg of transported commodities	\$1.34

Two scenarios were developed to estimate and compare transportation costs at the national level: one included driving distance as a factor, and one excluded it.

Transportation Costs—Scenario 1: Based on Driving Distance

The number of active LGAs in the CLMS (approximately 583) is much smaller than the number of active SDPs (approximately 2,537). LGAs also make longer trips for their resupply from the SCMS; they collect the total volume of contraceptives, which the SDPs then collect from the LGAs. Total driving distance was, therefore, identified as a key variable in transportation costs and is included in the cost extrapolation for all LGAs. This was done in two steps:

- *Step 1:* This is for the six assessed states:² The total distance driven from each of the six SCMS was measured (94 LGAs total), and that number was multiplied by the annual average number of trips for replenishment (six trips on average, based on the 12 assessed LGAs). The total driving distance was then multiplied by the average transport cost per km—\$0.57 for this tier—details on average cost per km (see table 19). The total estimated transportation cost is \$79,789 for the six states; \$849 is the average cost per LGA.
- *Step 2:* The \$849 average cost per LGA was multiplied by 583, the estimated number of active LGAs in the CLMS; the total, \$494,865, was the estimated national figure for this tier.³

² Google Maps was used for the distance measurement.

³ Measuring driving distance for all 583 active LGAs in Nigeria may result in a more accurate cost extrapolation. However, given the number of LGAs measured, in relation to the total, and the dispersion of distance to the resupply points, the results would probably be only marginally different.

Table 19. Tier 3 Estimated Annual Transportation Cost for LGAs

Step 1—Average transportation cost per LGA	\$849
Transportation cost for six assessed states	\$79,789
Step 2—Estimated number of LGAs active in family planning (CLMS)	583
Total estimated national transportation cost CLMS—Tier 3	\$494,865

Transportation Costs—Scenario 2: Excluding Driving Distance

The 12 assessed LGAs made 72 trips for resupply from the SCMS during the 12-month period observed. The minimum number of trips was four and the maximum was 15, with most of the LGAs making six trips during this period. The cost per trip for each LGA was calculated by dividing the total transportation costs for each LGA by the number of trips per LGA; the result was an average cost per trip of \$22.77.

If the same number of facilities described in step 1 (94 LGAs) had an average trip cost of \$22.77, and six trips a year for resupply, the total transportation costs for the same 94 LGAs would be \$12,841. This estimate, which excludes driving distance as an input, is considerably lower than the estimate in table 20—\$79,789—which does include driving distances. This clearly illustrates the importance of considering driving distance as an input when estimating transportation costs. Table 20 shows how the 94 LGAs are distributed, based on their distance to the SCMS.

Table 20. LGAs per Range of Distance to SCMS

Distance	No. LGAs
< 50 km	33
51 km–100 km	31
101 km–200 km	15
201 km–300 km	10
> 300 km	5

*minimum = 5 km; maximum = 362 km

Average Transportation Cost per LGA

Transportation costs, per kilometer, for the assessed LGAs varied widely. The highest was \$1.42/km for Akpabayo LGA, Cross River state; the lowest \$0.11/km for Argungu LGA, Kebbi state, but with no strong correlation between cost per kilometer and kilometers driven. This is explained by the wide variations in salary for staff performing similar logistics activities, and the different rates charged by the private taxis hired by each facility. As such, the average cost per kilometer for all assessed LGAs—\$0.57/km—was the input for the transportation cost calculations.

Transportation Costs—Tier 4

Approximately 2,537 SDPs participate in the CLMS. The estimated annual transportation cost for all active SDPs is \$311,464. Health workers from each of the assessed SDPs use private vehicles (hired taxis) to collect commodities from their resupply points. PHCs collect their goods from the LGA, while secondary facilities collect from the SCMS. In tier 4, 61 percent of transportation costs are related to labor, and the remaining 39 percent are related to vehicle charges (taxis).

For the assessed facilities in tier 4, transportation cost per 1 m³ of contraceptives was estimated at \$225.⁴ This high figure results from the low volume of contraceptives throughput and because they only collect contraceptives during each resupply trip. The estimated cost to transport contraceptives worth \$1,000 is \$47.24. In other words, the transportation costs alone between tiers 3 and 4 are 4.7 percent of the value of the contraceptives transported (see table 21).

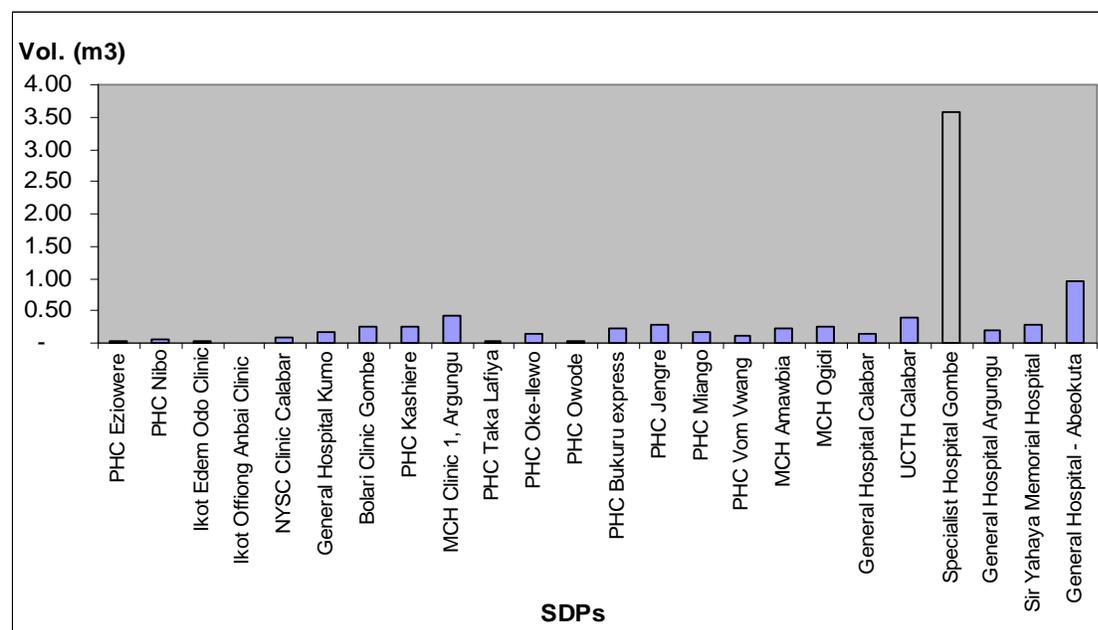
Table 21. Tier 4 Transportation Costs Metrics for Sampled SDPs

Metric	Result
Total value of commodities passing through	\$39,072
Total volume of commodities passing through (m ³)	8.2
Total weight of commodities passing through (kg)	777
Total transport costs for assessed SDPs	\$1,846
Transport costs for \$1,000 worth of commodities	\$47.24
Transport costs per m ³ of transported products	\$225
Transport costs per kg of transported products	\$2.38

Note: Tier 4 transport analysis excludes NYSC Clinic Calabar SDP because it is located within the LGA complex and has no transportation costs.

Overall, the throughput for the system appears low, particularly when examined at the lower tiers; which, as noted earlier, drive up the cost-per-unit metrics. Figure 9 illustrates the volume range of commodities transported for the assessed SDPs. Only two out of 25 assessed SDPs presented a volume of contraceptives over 1 m³ for the 12-month period.

Figure 9. Range of Commodity Throughput Volume for Assessed SDPs (m³)



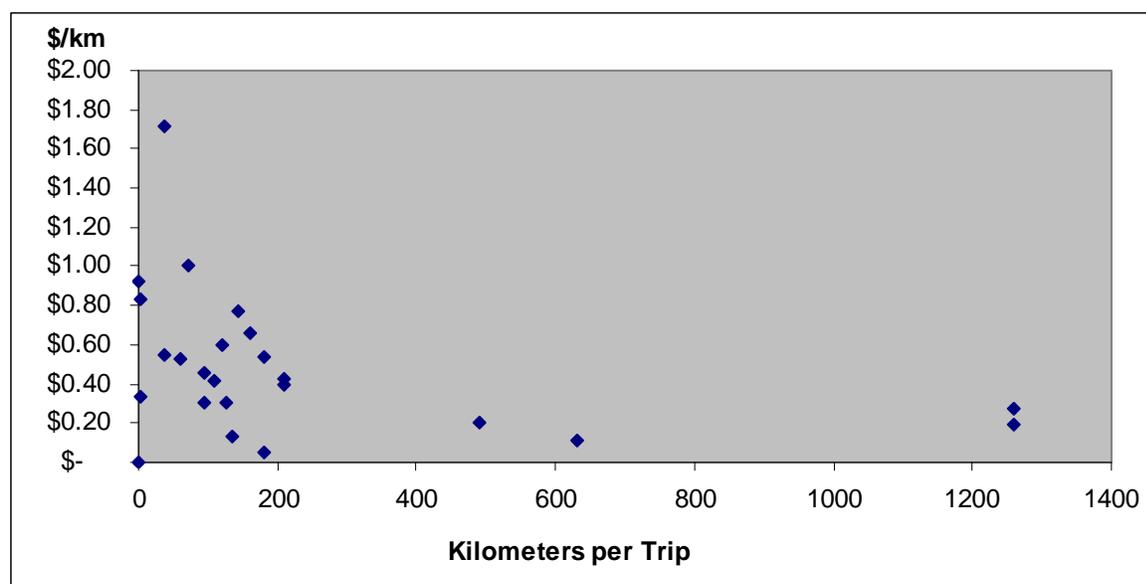
⁴ NYSC Clinic Calabar SDP was excluded from the transportation analysis because it has zero transportation costs; it is located within the LGA complex. The volume throughput for this facility is included in figure 10 for illustrative purposes only.

To estimate national transportation costs for SDPs—a similar methodology used for the LGAs, including estimating average transportation cost per kilometer—was applied to the SDPs. Like tier 3, the cost per kilometer of transported contraceptives varies greatly at tier 4. The minimum was \$0.06/km, and \$1.72/km was the maximum, with no strong correlation between cost per kilometer and kilometers driven. Again, this variability is caused by the wide range of staff salaries; staff with different working experience and skills are performing the same work—collecting contraceptives from the next level up. Excluding outliers, the cost per km for most SDPs is clustered in the range of \$0.20 to \$0.80. Therefore, the average cost per kilometer of \$0.51 was used as a reasonable input to the national cost calculation for tier 4. Table 22 lists the key figures in extrapolating national transportation costs for tier 4; figure 10 shows transportation cost, per km, for each assessed SDP.

Table 22. Tier 4 Estimated Annual Transportation Costs for SDPs

Metric	Result
Average transport cost per km	\$0.51
Total annual driven distance in km for assessed SDPs	5,776
Annual average transportation cost per SDP	\$122.77
Estimated number of active SDPs (CLMS)	2,537
Total estimated national transportation costs—Tier 4	\$311,464

Figure 10. Transportation Cost Variation per Kilometer for Assessed SDPs



Management

The overall estimated management cost for the CLMS in Nigeria is \$777,251. The main activities and costs under the management function include training, supervision, LMIS reporting, and operating costs. Top tiers in the supply chain perform more management activities, particularly those related to training and supervision; therefore, top tier facilities have higher management costs per facility, as shown detailed in table 23. With few exceptions, staff from the assessed state facilities

do not perform management activities. For this assessment, the time allotted for each management activity was carefully reviewed.

Table 23. Management Costs for CLMS

Level	Number Sampled	Number in the CLMS	Total Costs–Sample	Total Cost–CLMS	Cost per Facility
Tier 1	1	1	\$2,057	\$2,057	\$2,057
Tier 2	6	35	\$13,940	\$81,317	\$2,323
Tier 3	12	583	\$7,072	\$343,562	\$589
Tier 4	24	2,537	\$3,452	\$350,315	\$138
Total	43	3,156	\$26,521	\$777,251	\$246

Management activities include only 2 percent of tier 1 costs (\$2,057), but it is the second highest cost per facility. The CCW manager or CEO is responsible for validating or approving all inventory movements and works with the FDS to fulfill replenishment orders from the states (tier 2). In addition, she spends an average of 10 days per quarter doing regular training and supervision visits with the states. The CEO salary is the main component of management cost for the tier.

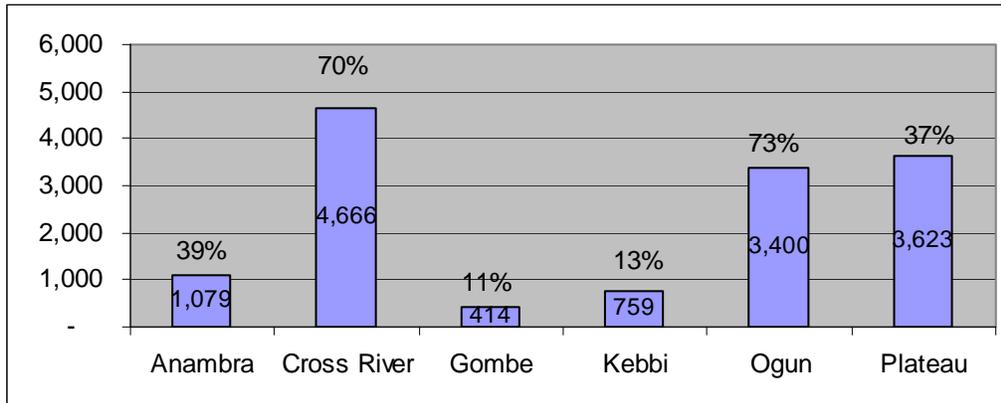
In tiers 2 and 3, management costs are the largest cost component for the facilities sampled; the costs vary widely, and they are particularly visible when comparing states. Using tier 2 management costs as an example, figure 11 shows that management costs are greater than 70 percent of tier 2 costs for Cross River and Ogun states; while Gombe and Kebbi state have only 11 percent and 13 percent, respectively, of their costs attributed to management activities. However, on an absolute basis, Cross River, Plateau, and Ogun have the highest management costs.

Interviews with State CMS staff and site visits suggest that this variability has many causes (non-exhaustive and in no particular order):

- degree of the family planning program development in that state
- funding to support training and supervision visits
- training *received* on LMIS and logistics
- salary of the family planning coordinator or CMS manager.

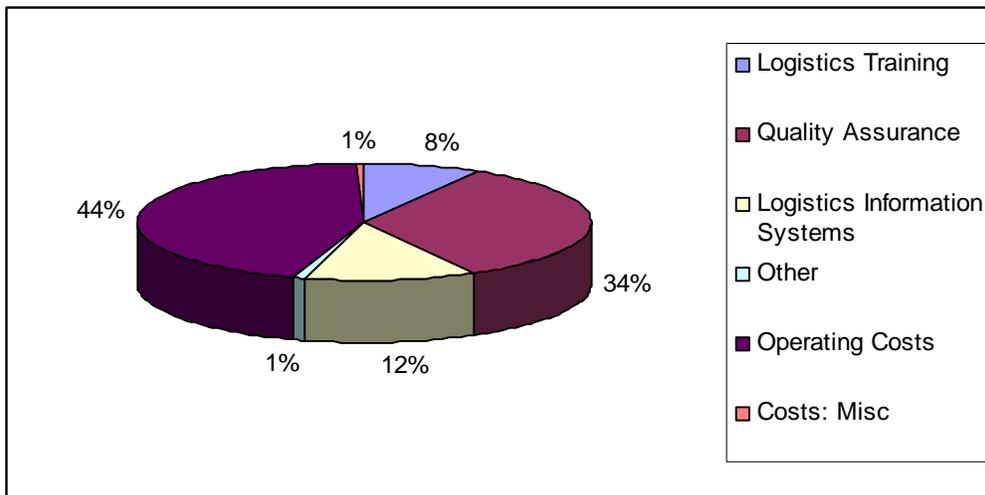
Considering the inconsistency in management activities across the states, and the numerous variables affecting the activities, extrapolation of management costs to facilities not sampled will be based on observed average values. In tiers 3 and 4, management costs are notably lower per facility—\$589 and \$138, respectively.

Figure 11. Tier 2 Management Costs (\$) and Share of Tier Costs (%) for Assessed SCMS



For the assessed facilities, 44 percent (\$11,799) of management costs were related to operating costs, 34 percent (\$8,923) to quality assurance, 12 percent (\$3,189) for the LMIS, and 8 percent (\$2,236) for training (see figure 12). Management costs included mainly labor costs for logistics training at the different levels, quality assurance for inventory and reporting supervision to lower-level facilities, and logistics data consolidation and reporting. Operating costs included communication costs between facilities; and, related to CLMS, transportation costs for training and supervision, and cost of supplies.

Figure 12. Management Costs per Activity for Sampled Facilities



Estimated Total Cost of the Supply Chain

The total estimated annual supply chain cost, extrapolated to the national CLMS, is \$2,915,254. This is the total sum from each of the extrapolated costs, per function, described in the previous sections. If \$970,740 is the annual throughput value for the system, the total delivered cost is \$3.00 for each \$1.00 of commodity purchased. This means that for every dollar spent to buy commodities, approximately \$3.00 is spent for supply chain costs. Compared to international benchmarks, these figures are extremely high for any function. Contraceptive supply chain costing studies place distribution (transportation) costs from \$0.01 to \$0.12 per dollar of commodities (see appendix H).

Transportation costs alone for the Nigerian CLMS are estimated at \$0.88 per dollar. Table 24 lists the details on total supply chain costs, by function and tier; and the cost per dollar of throughput. These figures represent the costs incurred at each tier; costs at lower tiers of the supply chain do not include any costs incurred in the top tiers.

Table 24. Total Estimated Supply Chain Costs (\$), Nigeria CLMS

	Procurement	Storage	Transportation	Management	System Costs	Average Cost per \$ of Throughput
Tier 1	67,952	47,999	-	2,057	118,008	0.12
Tier 2	940	60,972	46,314	81,317	189,543	0.20
Tier 3	23,578	118,188	494,865	343,562	980,192	1.01
Tier 4	102,241	863,490	311,464	350,315	1,627,511	1.68
System costs	194,710	1,090,649	852,643	777,251	2,915,254	3.00
Average cost per \$ of throughput	0.20	1.12	0.88	0.80	3.00	
System throughput						970,740

The high supply chain cost-to-value of commodity throughput results from several factors:

- low quantity of commodity throughput in the system, particularly at lower tiers
- high fixed costs across tiers
- underutilization of system resources
- supply chain exclusive to contraceptives (vertical program).

Overall, throughput for the system appears to be very low. When throughput is examined at the lower tiers, the quantities handled per facility become extremely small; effectively causing the per-unit costs to rise. Based on system estimates, tier 4 facilities handle, on average, \$383 of throughput annually. Several observed facilities, however, handle considerably smaller quantities and have some of the highest per unit supply chain costs.

The system has high fixed costs in all tiers, primarily labor costs. Fixed costs are a higher percentage of tier costs, particularly in tiers 3 and 4. In these tiers, throughput is extremely small, as mentioned earlier, but the resources provided to support the throughput does not decline at the same rate.

This combination of high fixed costs and low throughput exaggerates the cost-per-unit. Per-unit costs are considerably higher in the national estimate versus the sample (\$3.00 versus \$1.15) for two main reasons, both linked to the sampling methodology. First, transportation costs for the system are considerably higher than that for the sampled facilities, particularly in tier 3. Most of the sampled LGA facilities are located relatively near the SCMS and are on good roads, allowing commodity collection to be completed in one business day or less. Many of the LGAs not surveyed, however, are located far from the SCMS; they have higher transportation costs each time a collection is made. These higher transport costs were modeled for all the LGAs in the six states included in this study

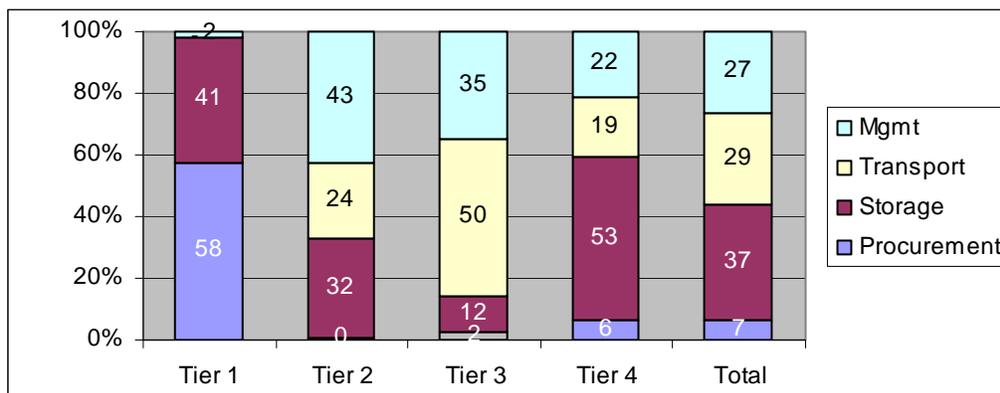
and extrapolated to the national level. Second, one of the criteria for a state to be selected was the state had to have an active family planning program. The six states included in the sample accounted for approximately 34 percent of the system throughput. This means that the throughput for the remaining 29 states is extremely low (\$22,000 on average), driving up the supply chain costs when measured against throughput.

The system, as a whole, appears to have a large pool of resources dedicated to contraceptive logistics, particularly at the state level and higher. Observation and data collected at these two levels indicate that the main resources—labor and warehousing—are underutilized considering the current quantity of throughput. Labor utilization at the lower levels is difficult to estimate because most facilities are SDPs; and, therefore, staff are dedicated to serving clients and, usually, for multiple programs.

Finally, the CLMS is a vertical program. As such, system resources are employed in activities exclusive to contraceptive logistics and they do not benefit from economies of scale, which could be achieved by combining resources across programs, such as transportation.

It is also important to note that the cost structure for each tier of the national CLMS is unique, and they vary from that of the sampled facilities. For the system as a whole, the storage function has the largest role in determining costs, mainly because of staff time—approximately 37 percent of system costs—followed by 29 percent for transportation costs and 27 percent for management costs. The figure 13 illustrates the impact of function costs for each tier. Particularly interesting are tiers 3 and 4, which have the highest overall cost and the highest costs per unit. Here, it is clear that transportation costs (variable costs) are the key cost driver for tier 3, where distances between resupply points are the longest. In tier 4, however, the storage function is the key cost driver, with high fixed costs for labor and warehousing.

Figure 13. Estimated Supply Chain Cost by Function—Nigeria CLMS.



Supply Chain Costs and Cost Recovery

The Nigerian CLMS operates under a cost recovery scheme—the client pays a nominal fee to the SDP for contraceptive commodities. The SDP then uses these funds to purchase its commodities from the next tier up in the supply chain. The SDP also retains a margin to pay for distribution costs; which, in this case, are primarily transportation costs. This same scenario is repeated for each successive tier up the supply chain. The FMOH sets the prices and margins for each tier.

The cost recovery program funds that were available to cover distribution costs were estimated by applying the margins for each commodity type to the observed system throughput at each tier for the period under review. A total annual margin is estimated at \$334,196. Compared to the total estimated transportation cost of \$852,643, the funds generated are insufficient. The cost recovery margin is short by approximately \$518,447, versus the total estimated transportation costs. In addition to funds generated being insufficient to cover transportation needs, the price (margin) structure at each level appears to be unbalanced. When compared to costs, funds generated in tiers 1 and 2 have a positive cash balance, whereas tiers 3 and 4 have a large negative cash balance. The costing analysis has shown that tiers 3 and 4 have per unit transportation costs that are, on average, 6–10 times higher than tier 2; but the price structure does not reflect this difference in costs. Table 25 lists the total margins generated, per tier.

It should be noted that when estimating the costs of the supply chain in this study, the costs for transporting goods from tier 1 to tier 2 have been categorized under tier 2. This was done to understand the costs from an operational perspective: tier 2 should incur the costs of delivering goods to facilities in tier 2, similar to the other tiers. In terms of cash flow, however, tier 1 manages the contract with a 3rd party logistics company that delivers goods from tier 1 to tier 2. For the analysis of the cost recovery funds, the cost of delivering goods from tier 1 to tier 2 have been categorized under tier 1. Total system costs remain the same.

Table 25. Cost Recovery Margins and Cash Balance (\$)—Nigeria CLMS

	Cost Recovery Margin Generated	Transportation Cost	Cash Balance
Tier 1	183,926	43,510	140,416
Tier 2	24,105	2,804	21,301
Tier 3	24,105	494,865	- 470,760
Tier 4	102,059	311,464	- 209,405
Total margin	\$334,196	\$852,643	- \$518,447

Conclusions

The Nigerian CLMS is characterized by high fixed costs and very low volume at all levels of the system. The result is a system that, when examined on a cost-per-unit basis, appears to be operating at sub-optimal levels. Allocation of system resources, particularly labor and warehouse space, seem to be arbitrary and, generally, underutilized when the current system throughput is considered. Similarly, the use of transportation is suboptimal at the lower levels, and the margins generated by the cost recovery scheme do not appear to be sufficient to cover these specific costs.

The system should be able to handle an increase in throughput without an increase in fixed costs, which would improve per-unit metrics. Additional data should be collected to understand the limitations of the current system capacity, including the labor and warehouse space thresholds.

Labor is the system's key cost driver, and labor inputs vary widely across facilities. Salary scales differ by state, and similar logistics functions are carried out by staff with different years of experience and different salaries; this creates substantial variability in the cost of labor for all facilities. Similarly, warehouse space allocation does not correlate to the quantity of throughput for most facilities. If system throughput increases, a facility's ability to absorb the additional volume will depend on the current utilization of space and labor; not all facilities will be able to handle large increases in commodities.

Transport is the only variable supply chain cost (other than the procurement administrative fee); and, therefore, the only cost that could be addressed in the short term. In the lowest tiers, transportation is not optimized; resupply trips are exclusively for contraceptives and cargo space is not fully utilized. Transportation costs are highest in tier 3, which may benefit from pooled transportation (multi-program), or planned transportation routes that supply several facilities, rather than each facility collecting its goods individually. However, the cost recovery (CR) administrative requirements would have to be addressed as facilities are currently required to deliver a bank draft prior to collecting commodities; this activity is often combined with the collection of goods.

In terms of the cost recovery scheme, the current level of CR margins generated appears insufficient to cover the cost of distribution of contraceptives for the system as a whole. In addition, because of the higher transportation costs at the lower levels, CR margins appear unbalanced by tier. With the current level of system throughput, tiers 1 and 2 breakeven when margins are compared to transportation costs; but tiers 3 and 4 appear to have a large deficit. The price structure of the CR scheme should be revisited to ensure the margins generated are sufficient to cover transportation costs at the lowest levels, where per unit costs are highest.

In general, a more integrated approach for distribution and management of contraceptive commodities that leverages resources, either within the tiers and functions of the CLMS, or among different programs, such as NPHCDA and NMCP; could improve resource utilization and costs, as well as improve product availability. To this extent, the second part of this study will document and compare the supply chain costs of essential medicines and malaria program commodities, from the state to the PHCs.

Addendum

Elimination of Cost Recovery: State Distribution Options and Operational Plans

Subsequent to this study, the Federal Government of Nigeria announced that contraceptives should, from this time forward, be free of charge to users (April 2011). However, they did not provide guidance to the states on how to organize or plan budgets for distribution without a cost recovery program. The Federal Ministry of Health (FMOH), with support from the USAID | DELIVER PROJECT and United Nations Population Fund (UNFPA), organized a workshop for family planning (FP) coordinators and directors of primary health care from all 36 states and the Federal Capital Territory (FCT) to help states plan and advocate for funding to distribute their family planning commodities.

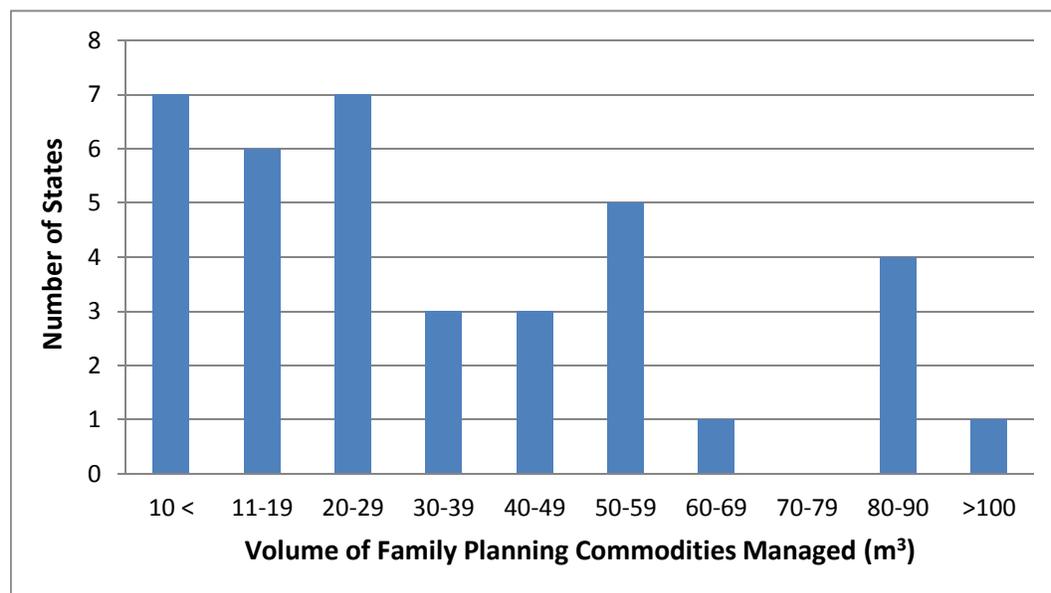
During this workshop, the participants developed state commodity forecasts to estimate quantities and volumes of products needed, and to validate the national forecasts for procurement. Different transport options were presented. Most states decided on a two-stage distribution process, with some type of delivery from the state central medical stores (CMS) to the local government areas (LGAs); with service delivery points (SDPs) collecting supplies from their LGA during regular review meetings. The delivery costs were then estimated and an implementation plan was developed; including forecast quantities, proposed transport options, cost assumptions, and a clear statement of the activities needed to ensure that distribution costs are funded.

Commodity Forecasts

Each state developed commodity forecasts, either based on commodity distribution data provided by each state, or by validating top-down national forecast allocations. Given the recent policy change, most states incorporated considerable growth into their forecasts to account for the expected increase in user demand.

Even when the expected strong growth in demand was considered, most states were found to manage a relatively small volume of commodities. Figure 14 illustrates the distribution of states based on the volume of commodities managed annually. Lagos state has the largest volume, with 225 m³ of family planning commodities, while most of the states manage less than 60 m³ per year.

Figure 14. Distribution of States by Volume of Family Planning Commodities Managed



Transport Options

All the states were facing a two-stage delivery problem. Most tried to use the existing state transport assets for the first stage of delivery—from the state CMS to the LGAs. This would mean combining the family planning commodities with the regular delivery schedules for other programs, or paying for those vehicles to make dedicated deliveries. Paying the fuel and driver allowances for family planning deliveries could be costly, but states can control delivery schedules and the family planning products are more likely to be delivered.

The second stage is distribution from the LGA to the SDPs. Most states assumed that SDP staff, during regular review meetings, could collect the small volume of commodities they would need.

Looking forward, some states may identify alternate distribution models, such as integrating family planning delivery with other product delivery, or using the transport assets of other programs where capacity is available. These alternate options will need to be piloted, and their costs and benefits assessed. Because states vary significantly in geography, management capacity, and contraceptive prevalence—which, in turn, impacts throughput volume—it is unlikely that one single transportation solution will meet the needs of every state in Nigeria.

Cost Estimates

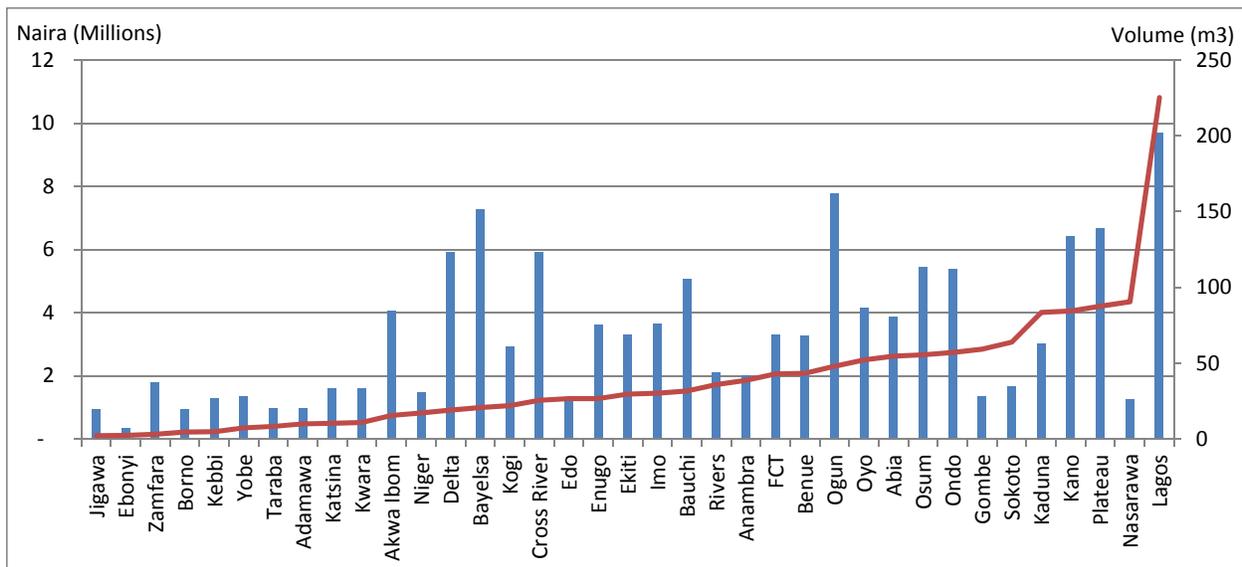
After the commodity forecasts and transport options were selected, cost estimates for commodity distribution were developed for each state. Cost assumptions for the various transport options were based on data from the November 2010 contraceptive logistics management system (CLMS) costing study and the individual family planning coordinators' knowledge of local costs.

Given the relatively small volumes handled by most states, the volume of commodities being delivered to LGAs and picked up by SDPs is less than the capacity of a single passenger vehicle. In most cases, the states could not justify purchasing vehicles, because a rented taxi would provide the most cost-efficient mode of transport for small volumes of commodities. Riverine states, however,

estimated that they would have higher relative transport costs because they must rent boats when transporting commodities.

The total cost of distribution, as estimated by the states during this workshop, is 127 million naira. Figure 15 illustrates the annual distribution cost, in naira, estimated by each state, and ranked by the annual volume of commodities handled. It should, however, be noted that the cost of gasoline in Nigeria, which is fixed by the federal government, increased 50 percent in 2012. In addition, efforts to increase the funding available for public sector contraceptives could significantly increase throughput; this would reduce unit costs; but, in the near term, could increase total supply chain costs.

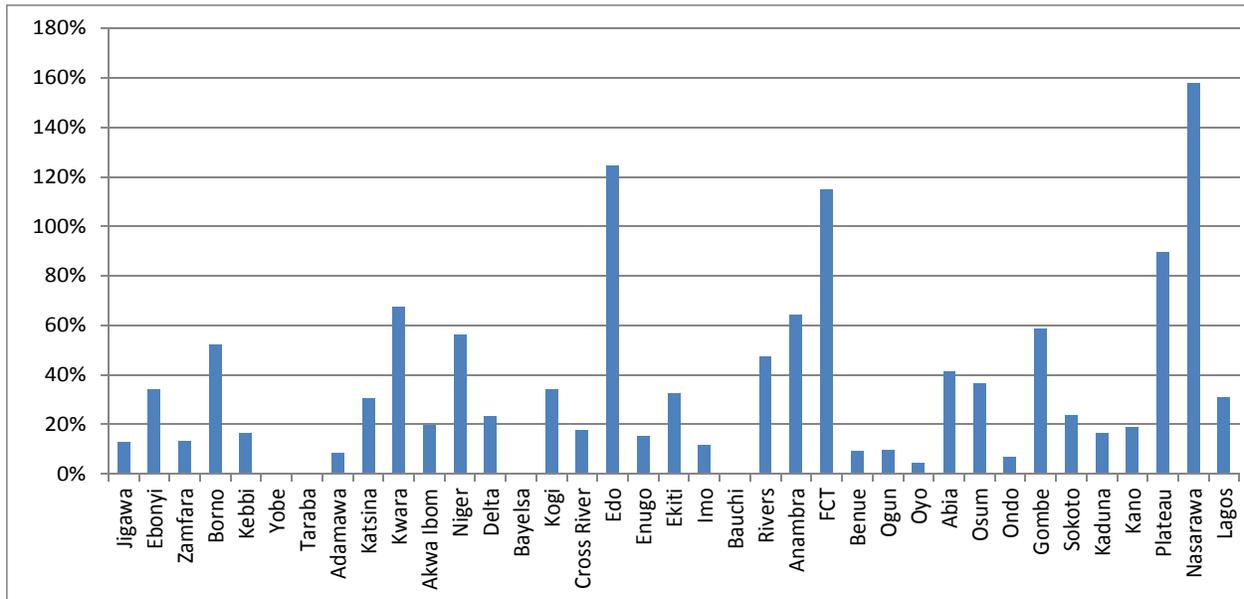
Figure 15. Annual Estimated Family Planning Distribution Cost, by State, Ranked by Volume (m³)



Funding of Commodity Distribution

During the workshop, the states provided information on cost recovery account balances and donor presence. States were segmented along these two dimensions. An analysis of the reported balances in each state's cost recovery account revealed that most states only had funds to cover less than six months of distribution costs (see figure 16). The total cost of distribution in the states most-at-risk for being unable to fund distribution was estimated at approximately 24.5 million naira for the following six months. For states with existing donor presence, the amount was higher, approximately 42.5 million naira.

Figure 16. Percentage of Distribution Costs, for Remainder of Year, Covered by Bank Account



States identified as most-at-risk for being unable to fund distribution, and those with no existing donor support, require more management support from the FMOH than the others (see figure 17). Active management and monitoring will be needed to ensure successful implementation of the distribution approaches identified.

Figure 17. Risk Assessment Matrix: Will States Fund and Manage In-State Distribution?

<p>Cost recovery accounts represent more than 50% of estimated distribution costs</p>	<p>Kwara Niger Edo Gombe Plateau Nassarwa</p> <p>Some risk management follow-up needed</p>	<p>Borno Anambra FCT</p> <p>Least risk of underfunding</p>
<p>Cost recovery accounts represent less than 50% of estimated distribution costs</p>	<p>Zamfara Yobe Taraba Katsina Delta Bayelsa Ondo Rivers</p> <p>Kogi Cross River Ekiti Imo Oyo Osun</p> <p>Most at risk of underfunding</p>	<p>Jigwa Ebonyi Kebbi Adamawa Akwa Ibom Ogun Enugu Bauchi</p> <p>Kaduna Kano Lagos Abia Sokoto Benue</p> <p>Donor coordination</p>
	<p>No donors working in family planning or reproductive health statewide</p>	<p>Donors working in family planning or reproductive health statewide (UNFPA, DFID, USAID)</p>

Identifying and gaining access to funds to cover these costs will be a critical factor in the successful implementation of the states' distribution plans. With support and guidance from the FMOH, strong advocacy for state engagement and financing for contraceptive distribution will be needed. Advocacy visits should be made to the state ministries, the state governors, state primary healthcare development agencies (if these are present), and existing (or new) donor organizations. In addition, at the technical working group meeting every six months, the partners should update the status of supply chain funding at the state level.

Operational Plans and Next Steps

After defining system throughput (quantities/volumes), transport modes, and costs, each state drafted an operational plan for implementing their distribution system. The plans included a specific agenda of next steps for information sharing and advocacy at all levels, and for obtaining approvals from the appropriate government bodies. Critical questions still to be answered include—what parties are responsible for ensuring the distribution of commodities from the state CMS and from the LGA? All parties agreed on a periodic follow-up meeting to monitor each state's progress on implementation and the status of budget support.

References and Resources

- Baruwa, Elaine, Marie Tien, and David Sarley. 2009. *Zambia ARV Supply Chain Costs: A Pilot of the Supply Chain Costing Tool*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.
- National Population Commission (NPC) [Nigeria] and ICF Macro. 2009. *Nigeria Demographic and Health Survey 2008*. Abuja, Nigeria: National Population Commission and ICF Macro.
- Raja, Sangeeta, Cheri Grace, and Andrew Chesley. 2000. *The Cost of Logistics: Development and Application of a Logistics Cost Model for Public Sector Health Commodities in Ghana*. Arlington, Va.: Family Planning Logistics Management/John Snow, Inc., for the U.S. Agency for International Development (USAID).
- Sarley, David, Linda Allain, and Anup Akkihal. 2009. *Estimating the Global In-Country Supply Chain Costs of Meeting the MDGs by 2015*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.
- Sarley, David., Elaine Baruwa, and Marie Tien. 2010. *Zimbabwe: Supply Chain Costing of Health Commodities*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.
- Tien, Marie, Sylvia Ness, Ugochukwu Amanyiwe, Echendu Adinma, Uzo Ebenebe, and Azubike Nweje. 2009. *Nigeria: Reproductive Health Commodity Security Situation Analysis*. Arlington, Va.: USAID | DELIVER PROJECT, Task Order 1.
- UNICEF. 2005. *At a Glance: Nigeria Statistics*. Available at http://www.unicef.org/infobycountry/nigeria_statistics.html (accessed March 2012).
- USAID | DELIVER PROJECT, Task Order 1. Forthcoming. *Supply Chain Costing Tool :User's Manual*. Arlington, VA: USAID | DELIVER PROJECT, Task Order 1.

Appendix A

Facilities Visited

Zone	State	LGA	SDP
South-East	Anambra	Awka South	Maternal and Child Health Amawbia
			PHC Nibo
		Idemili North	Maternal and Child Health Ogidi
			PHC Eziowere
South-South	Cross Rivers	Akpabayo	Ikot Edem Odo Clinic
			Ikot Offiong Anbai Clinic
		Calabar South	NYSC Clinic Calabar
			General Hospital Calabar
			UCTH Calabar
North-East	Gombe	Akko	General Hospital Kumo
			PHC Kashierye
		Gombe	Bolari Clinic Gombe
			Specialist Hospital Gombe
North-West	Kebbi	Argungu	Maternal and Child Health Clinic I, Argungu
			General Hospital Argungu
		Birnin Kebbi	PHC Taka Lafiya
			Sir Yahaya Memorial Hospital
North-Central	Plateau	Bassa	PHC Jengre
			PHC Miango
		Jos South	PHC Bukuru express
			PHC Vom Vwang
South-West	Ogun	Abeokuta South	General Hospital Abeokuta
			PHC Oke-Ilewo
		Obafeni	PHC Owode
			PHC Oke-Ilewo
Central	Lagos	-	Contraceptive Central Warehouse (CCW)

Appendix B

Contact List

Contact	Title	Organization
Austine Omiunu	M&E Advisor	SCMS and USAID DELIVER PROJECT
Bassey E. Duke	RH/Family Planning Coordinator	State MOH—Cross Rivers
Baumer Nalquabue	Deputy Representative	UNFPA
Chinwe Ogbanna	Health Economist	UNFPA
Christian Ibeh	Reproductive Health Advisor	UNFPA
Elizabeth Igharo	Monitoring & Evaluation Officer	SCMS and USAID DELIVER PROJECT
Elizabeth Ogbaje	Logistics Advisor	USAID DELIVER PROJECT
James Abu	Logistics Advisor	SCMS and USAID DELIVER PROJECT
John Durgavich	Deputy Chief of Party	USAID DELIVER PROJECT
John Quinly	Health Advisor	USAID
Kayode Morenkeji	Program Manager	USAID
Maryam A. Kaoje	RH/Family Planning Coordinator	State MOH—Kebbi
Obejee Ralph	Logistics Consultant	FMOH
Pativia Echezona	RH/Family Planning Coordinator	State MOH—Anambra
Rahila Telfim	RH/Family Planning Coordinator	State MOH—Jos
Rejoice Bala Aliyu	RH/Family Planning Coordinator	State MOH—Gombe
Richard Ainsworth	Acting Country Director	SCMS and USAID DELIVER PROJECT
Somoye O. O.	RH/Family Planning Coordinator	State MOH—Ogun
Temitope Bombata	Logistics Consultant	FMOH
Ugochukwu Alex	Logistics Consultant	FMOH

Appendix C

Real Estate Appraiser Assessment

VAL/ABJ/USAID/065/10/2010/JGO.

10th November, 2010.

Logistic Advisor,
Public Health,
USAID/Delivery Project. JSI,
Gwandal Centre,
Plot 1015, Fria Close,
Wuse II, Abuja.

Dear Sir,

RE: CAPITAL VALUATION OF DESIGNATED SPACE WITHIN THE REPRODUCTIVE HEALTH AND MALARIA CONTROL UNIT OFFICES IN ANAMBRA STATE SECRETARIAT COMPLEX, AWKA, KEBBI AND LAGOS STATES.

In accordance with your recent verbal instruction, namely, to carry out a detailed inspection for the valuation of designated space within the Reproductive Health Unit offices in Anambra State Secretariat Complex, Awka, Kebbi and Lagos States to enable us advise you on the Market Values of the respective spaces, we have undertaken our inspection and now have the pleasure to report as follows: -

DATE OF INSPECTION: A comprehensive inspection of the properties was undertaken on the 29th day of October, 2010. This therefore, constitutes the effective date for this valuation to which all future references to value should be addressed.

ANAMBRA STATE

DESIGNATED SPACE WITHIN THE REPRODUCTIVE HEALTH UNIT OFFICE IN ANAMBRA STATE SECRETARIAT COMPLEX AWKA.

SITUATION: The subject property consists of an institutional development popularly known as Anambra State Secretariat situated on the right flank of Secretariat road when approach from Aroma junction, Secretariat Road is a tarred neighbourhood access which takes its source from Enugu-Onitsha Expressway by Aroma junction and terminates at a close, Enugu-Onitsha Expressway on the other hand is a trunk 'A' all-season thoroughfare which connects Enugu with Onitsha. Awka is the capital of Anambra State and is popular for being the host of the Nnamdi Azikiwe University. Municipal facilities such as roads, electricity and telecommunication services are provided in the vicinity.

SITE: The site on which the subject property is situated is irregular in shape. It is delineated along its perimeter {boundary} lines with sandcrete blockwalls. Access into the site is via 2 No double-leaf metal gates which open onto Secretariat Road. The un-built area of the site is paved majority in mass concrete. The site as at our inspection appears firm, level and well drained.

DESCRIPTION: Our value opinion is hinged on 3 No. lettable spaces in the Reproductive Health Unit office within Anambra State Secretariat premises. For the purposes of this report, each lettable space has been classified into alphabets A, B, & C with the following effective areas.

A =0.90 square meters

B =0.52 square meters

C =0.52 square meters

Total Area = 1.94 square meters

SERVICES: Electricity supply from the national grid is connected to the subject property. Water supply is facilitated with the provision of borehole facility installed with overhead water storage tanks and other accessories. Soil effluent and waste water are discharged into septic tanks and soakaway pits provided on site, while surface water is channeled into public drain.

TENURE: We did not sight the original title documents to the property, we however reckon that the enduring tenure is leasehold, good and marketable.

We have thus presumed that the enduring tenure is unencumbered in any manner whatsoever, except the limitations imposed by the Land Use Decree of 1978. {Now CAP 202 Laws of the Federation, 1990} .

VALUE OPINION: WE ARE OF THE OPINION that the MARKET VALUE of the aforementioned space {1.94 square meters} within the **Reproductive Health Unit office in Anambra State Secretariat Complex, Awka, Anambra State** herein described and on the basis state below, was as at the 29th day of October, 2010 in the region of ₦29,100.00 {Twenty Nine Thousand Naira Only}.

DESIGNATED SPACE MATERNAL & CHILD HEALTH CENTRE {MCH}, OGIDI, IDEMILI NORTH LOCAL GOVERNMENT AREA, ANAMBRA STATE.

SITUATION: The subject property consists of an institutional development located at Maternal and Child Health Centre {MCH}, Ogidi, Idemili North Local Government Area Quarters Road when approached from Awka-Onitsha Old Road. Local Government Area Quarters Road is an untarred neighbourhood access which takes its source from Awka-Onitsha old Road on one end and leads into the Local Government Secretariat Quarters. Awka-Onitsha old Road is a tarred all-season thoroughfare which links Nkpor with Awka {see locational map}. Ogidi is the head quarters of Idemili Local Government Area, Anambra State. It is also best known for its mid July annual Nwafor Festival. Municipal facilities such as roads, electricity and telecommunication services are provided in the vicinity.

SITE: The site on which the subject property situates is irregular in shape. It is delineated along its perimeter {boundary} lines. The un-built area of the site is unpaired. The site as at our inspection appears firm, level and well drained.

DESCRIPTION: Our value opinion is hinged on 2 No lettable spaces within MCH Ogidi {i.e MCH Ogidi storage space} both of which are located within the MCH Ogidi premises. For the purpose of this report, each lettable space has been classified into alphabets A, & B with the following net lettable areas.

A {MCH Ogidi}	=0.10 square meters
B {Idemili North LGA}	=0.28 square meters
C	=0.52 square meters

Total Area = 0.38 square meters

SERVICES: Electricity supply from the national grid is connected to the subject property. Water supply is facilitated with the provision of borehole facility installed with overhead water storage tanks and other accessories. Soil effluent and waste water are discharged into septic tanks and soakaway pits provided on site, while surface water is channeled into public drain.

TENURE: We did not sight the original title documents to the property, we however reckon that the enduring tenure is leasehold, good and marketable.

We have thus presumed that the enduring tenure is unencumbered in any manner whatsoever, except the limitations imposed by the Land Use Decree of 1978. {Now CAP 202 Laws of the Federation, 1990} .

VALUE OPINION: WE ARE OF THE OPINION that the VALUE Market Value of the aforementioned space {0.38 square meters} in **Maternal & Child Health Centre {MCH} Ogidi, Idemili North Local Government Area, Anambra State** herein described and on the basis state below was as at the 29th day of October, 2010 in the region of ₦5,700.00 (Five Thousand Seven Hundred)

KEBBI STATE

MALARIA CONTROL UNIT, BIRNIN KEBBI.

SITUATION: The subject properties, 3No. Warehouses situates at Malaria Control Unit in Birnin Kebbi, along Haliru Abdu Road which connects the Cabinet roundabout on Cabinet road. The property lies to the right immediately after the popular Sir Yahaya Memorial Hospital. Landmarks with the immediate precinct of the appraised property includes a Police Station, Union Bank Plc, World Health Organization {WHO}, Ministry of Culture, Emir of Birnin Kebbi's Palace. The neighbourhood is

the planned medium density residential cum commercial area serviced with functional public infrastructural facilities such as mains water, electricity, telecommunication services, central sewer and a good network of tarred access roads.

MALARIA CONTROL UNIT, ARGUNGU, KEBBI STATE.

Properties in Argungu situate at the Argungu Local Government Secretariat which lies along Ahmadu Bello Way connecting Kyanga road that leads to the popular Argungu fishing festival venue. The Secretariat lies on the right hand corner of the roundabout that connects Ahmadu Bello Way and Kyanga road. PHC Argungu situates at Hospital Road which connects Kyanga Road and Kanta Road, the hospital lies at the right hand corner along Kanta Road. Landmarks within the immediate precinct include Central Mosque, UBA, NYSC Secretariat, Ministry of Justice, Oceanic Bank Plc, Nigerian Security and Civil Defense Corps. The neighbourhood is the planned medium density residential cum commercial area, serviced with functional public infrastructural facilities such as mains water, electricity, telecommunication services, central sewer system and a good network of tarred access roads.

SITE:

The sites are rectangular shaped and covers a land area of approximately 86.5, 23.87, 12.9 square metres for Birnin Kebbi, Argungu Local Government Secretariat and PHC health center respectively. The surroundings are unpaved. The sites appears firm, relatively level and well drained.

DESCRIPTION:

BIRNIN KEBBI WAREHOUSE

Construction is of sandcrete blocks, rendered smooth and painted on both faces in emulsion paints. Roof is pitched type, framed of timber trusses and clad with longspan aluminium roofing sheets and concealed in parapet walls. Ceiling is of hard boards. Doors are of glass casement models at the entrance. Windows are of glass casement models. Flooring is finished throughout in cement screed.

ARGUNGU SECRETARIAT WAREHOUSE

Construction is of sandcrete block work, rendered smooth and painted on both faces in emulsion paints. Roof is pitched type, framed of timber trusses and clad with corrugated iron sheets. Ceiling is of hard boards. Doors are of steel models at the entrance windows are also of steel models. Flooring is finished throughout in cement screed.

PHC ARGUNGU

Construction is of sandcrete block work, rendered smooth and painted on both faces in emulsion paints. Roof is pitched type, framed of timber trusses. Ceiling is of hard boards. Doors are of flush models at the entrance whilst windows are of louver blades. Flooring is finished throughout in cement screed.

ACCOMMODATION:

BIRNIN KEBBI WAREHOUSE

This affords Lettable floor space of 68.1 square meters.

ARGUNGU SECRETARIAT WAREHOUSE

This affords Lettable floor space of 17.16 square meters

PHC ARGUNGU

This affords Lettable floor space of 17.16 square meters.

SERVICES: Mains water, electricity and telephone services are connected to the subject property whilst sewage effluents discharge into the septic tanks and soakaway pits provided for the neighbourhood.

VALUATION: WE ARE OF THE OPINION that the VALUE Market Value of the aforementioned space {86.5 square meters} at the **Birnin kebbi Warehouse in Kebbi State** herein described and on the basis stated below was as at the 29th day of October, 2010 in the region of ₦13,000,000.00 (Thirteen million Naira Only)

WE ARE OF THE OPINION that the VALUE Market Value of the aforementioned space {23.87 square meters} in the **Argungu Local Government Secretariat, Kebbi State** herein described and on the basis stated below was as at the 29th day of October, 2010 in the region of ₦3,500,000.00 (Three Million, Five Hundred Thousand Naira Only)

WE ARE OF THE OPINION that the VALUE Market Value of the aforementioned space {12.9 square meters} in the **PHC Health Centre in Kebbi State** herein described and on the basis state below was as at the 29th day of October, 2010 in the region of ₦2,500,000.00 (Two Million, Five Hundred Thousand Naira Only)

WAREHOUSE BELONGING TO CENTRAL CONTRACEPTIVE LOCATED AT FEDERAL MEDICAL STORES, OSHODI, LAGOS.

SITUATION: The subject warehouse situates and municipally known as Central Contraceptives Warehouse, Federal Medical Stores Compound, Oshodi, Lagos.

Federal Medical Stores is situated along Agege Motor Road by Cappa Bus stop behind NITEL Training Center.

Central Contraceptives Warehouse is one the warehouse buildings within Federal Medical Stores Compound. On entering the compound the subject situates close to the left.

The property situates within low density industrial neighborhood characterized by warehouses, office block and few blocks of flats. Access Roads are tarred except Federal Medical Stores compound.

SITE: The site on which the property situates is Federal Government owned. It is delineated and fenced.

TITLE: We did not sight the original title document however we were however informed that the title is good and marketable.

DESCRIPTION: Development on site is a warehouse and office.
The building covers an approximate land area of 335 square meters. The main entrance door opens to a reception from where the warehouse and office can be accessed.

Construction is with sandcrete block walls smoothly rendered and emulsion painted surface. The floor is reinforced concrete slab finished.

The entrance doors are double leaf wooden panel type which opens to a roller shutter and an anti-burglar motorised steel gate. All windows consist mainly of

louvre blade glazed aluminum type. All windows are further protected with internal anti – burglary bars.

The ceiling is finished with asbestos type. The roof is covered with long span aluminum sheet.

SECURITY HOUSE: It covers approximately 6.65 square meters. Construction is similar to the generator house.

SERVICES: Electricity and water are connected to the premises from the public supply mains. Soil effluents and waste water are discharged into septic tanks and soak away pits located within the premises.

VALUE OPINION: *WE ARE OF THE OPINION that the MARKET VALUE of the subject property belonging to Central Contraceptives Warehouse, Federal Medical Stores Compound, Oshodi, Lagos on the basis herein described was as at the 29th day of October 2010 in the sum of ₦55,610,000.00 (Fifty Five Million Six Hundred and Ten Thousand Naira) only.*

CONDITION: Our survey was limited to the mere visual inspection of the subject property. We did not carry out any structural survey neither have we tested any of the services installation and as such unable to comment in these regard. The buildings appears structurally sound and in a good state of repairs and decorative condition. We have noted these details in making this Valuation.

INFORMATION: Details of the information given in this report have been obtained as follows:
Description: Physical inspection of the subject property.
Site: Measurement taken on site.
Title: As detailed under title above.

ASSUMPTIONS: In valuing the properties, we have assumed.

- i. That the information, which we have been supplied, is correct.
- ii. That the title to the property is good and marketable. However, we did not conduct any legal search on same.
- iii. That the property is free from all onerous restriction or charges.
- iv. That the property is not adversely affected by or subject to compulsory acquisition, road widening, new road proposal and planning regulations.

BASIS OF VALUATION: We have adopted the Market Value basis with recourse to the direct market comparison approach in arriving at our opinion of the Market Value of the subject properties. The Market Basis gives the price, which an interest might reasonably be expected to realize when offered for sale by Private Treaty assuming:

- i) A willing buyer;
- ii) A reasonable period within which to negotiate the sale taking into account the nature of the property and the state of the market;
- iii) Values will remain static throughout the period;
- iv) The property will be freely exposed to the market;
- v) No account is to be taken of an additional bid by a special purchaser;
- vi) No account is to be taken of expenses of realization, which may arise in the event of a disposal.

Furthermore, we have also taken cognizance and adjusted adequately for the difficulties and peculiar problems associated with foreclosures and realization of mortgages in the Nigerian Property Market before arriving at the forced sale value of the property.

In accordance with our standard practice, we must state that this valuation certificate is for the use of the person to whom it is addressed and not for any other third party.

No allowance has been made for the expense of realization or for taxation that may arise in the event of a disposal.

If our opinion of value is to be disclosed to persons other than the addressee of this certificate the context and other assumptions contained in this report must be stated.

The presentation of this report transfers no right whatsoever to any party to publish or reproduce any portion of it without the written consent of OSAS & OSEJI.

Yours faithfully,

OSAS & OSEJI

Summary of Values

S/NO	Location	Market Value N
1	Anambra State Secretariat Complex, Awka, Anambra State	29, 100.00
2	Maternal & Child Health Centre (MCH) Ogidi, Idemili North Local Government Area, Anambra State	5,700.00
3	Warehouse in Kebbi State	13,000,000.00
4	Argungu Local Government Secretariat, Kebbi State	3,500,000.00
5	PHC Health Centre in Kebbi State	2,500,000.00
6	Central Contraceptives Warehouse, Federal Medical Stores Compound, Oshodi, Lagos	55,610,000.00
TOTAL		N74,644,800.00

Appendix D

Contraceptive Commodities Throughput

September 2009–October 2010

Commodity	Units	Value (\$)	Volume (m ³)	Weight (kg)
Depo-Provera	314,000	220,091	96.56	5,181
Exluton/Microlut	92,000	14,785	28.37	8,357
Female condom	312,000	194,043	38.38	3,526
Implanon	4,500	91,388	7.00	0
Intrauterine contraceptive device	45,644	14,102	9.36	685
Jadelle	3,060	65,085	0.24	35
Lo-Femenal	0	0	0	0
Male condom	18,700,000	365,166	319.46	63,892
Microgynon	19,000	6,082	4.60	170
Noristerat	0	0	0	0
Total	19,490,204	970,742	504	81,844

Annual throughput for the CLMS is the number of units of contraceptive commodities that pass through the in-country supply chain, which is represented in value, volume, and weight.

Appendix E

Local Government Areas with Active Family Planning Programs

November/December 2010

State	No. LGAs	No. LGAs w/Active Distribution of Contraceptives	State	No. LGAs	No. LGAs w/Active Distribution of Contraceptives
ABIA	17	13	KANO	44	
ADAMAWA	21	21	KATSINA	34	34
AKWA IBOM	31	20	KEBBI	21	21
ANAMBRA	21	10	KOGI	21	13
BAUCHI	20	20	KWARA	16	9
BAYELSA	8	8	LAGOS	20	20
BENUE	23	11	NASARAWA	13	10
BORNO	27		NIGER	25	20
CROSS RIVER	18	16	OGUN	20	
DELTA	25	21	ONDO	18	11
EBONYI	13	13	OSUN	30	26
EDO	18	7	OYO	33	32
EKITI	16	5	PLATEAU	17	17
ENUGU	17	9	RIVERS	23	18
FCT	6	6	SOKOTO	23	23
GOMBE	11	10	TARABA	16	16
IMO	27	15	YOBE	17	17
JIGAWA*	27	n/a	ZAMFARA*	14	n/a
KADUNA	23				
Total LGAs	774				
No. LGAs Reporting	619	492			
Percentage of LGAs Reporting	89%	79%			

Note: Empty cells indicate states that did not report data.

*Jigawa and Zamfara states did not order contraceptives through the CLMS at the time of this study.

Appendix F

Contraceptive Dispense Rate and Annual Client Visits Estimate

September 2009–October 2010

Commodity Type	Annual Units Dispensed	Number of Units Dispensed per Client Visit	Total Client Visits	Sampled SDP Client Visits
Oral contraceptives	111,000	3	37,000	2,112
Injection	314,000	1	314,000	16,840
Female condom	312,000	12	26,000	95
Implants	7,560	1	7,560	8,244
Intrauterine contraceptive device	45,644	1	45,644	1,639
Male condom	18,700,000	12	1,558,333	3,494
Total	19,490,204		1,988,537	32,424

Note: Dispense rate refers to number of units dispensed to client each time a client visits a clinic; this does not refer to the number of units dispensed to the client per year, nor to the useful life of the commodity.

Appendix G

Estimated Supply Chain Costing Metrics

Total Estimated Supply Chain Costs as Percentage of Throughput Value—\$970,000

Tier	Procurement	Storage	Transportation	Management	Total
Tier 1	7.0	4.9	-	0.2	12.2
Tier 2	0.1	6.3	4.8	8.4	19.5
Tier 3	2.4	12.2	51.0	35.4	101.0
Tier 4	10.5	89.0	32.1	36.1	167.7
Total	20.1	112.4	87.8	80.1	300.3

Total Estimated Supply Chain Costs as Percentage of Throughput Volume—504 m³

Tier	Procurement	Storage	Transportation	Management	Total
Tier 1	13,483	9,524	-	408	23,414
Tier 2	186	12,098	9,189	16,134	37,608
Tier 3	4,678	23,450	98,188	68,167	194,483
Tier 4	20,286	171,327	61,798	69,507	322,919
Total	38,633	216,399	169,175	154,217	578,423

Total Estimated Supply Chain Costs as Percentage of Throughput Weight—81,844 kg

Tier	Procurement	Storage	Transportation	Management	Total
Tier 1	83	59	-	3	144
Tier 2	1	74	57	99	232
Tier 3	29	144	605	420	1,198
Tier 4	125	1,055	381	428	1,989
Total	238	1,333	1,042	950	3,562

Total Estimated Supply Chain Costs (\$) Per Unit of Throughput—19,490,204

Tier	Procurement	Storage	Transportation	Management	Total
Tier 1	0.0035	0.0025	-	0.0001	0.0061
Tier 2	0.0000	0.0031	0.0024	0.0042	0.0097
Tier 3	0.0012	0.0061	0.0254	0.0176	0.0503
Tier 4	0.0052	0.0503	0.0160	0.0180	0.0895
Total	0.0100	0.0620	0.0437	0.0399	0.1556

Appendix H

International Comparisons

To estimate the supply chain costs to meet the Millennium Development Goals, a survey of the international health supply chain costs was undertaken at the same time the costing work was being done for the World Health Organization (WHO). According to the survey results, few public health supply chain cost studies have been done. The following table highlights findings from selected countries where studies were carried out for contraceptive or essential health commodities supply chains.

Summary of Cost Estimates for Select Countries by Product Group

Country	Product	Selected Logistics Cost*	Procurement	Storage	Distribution	Management (incl LMIS)	Note
Bangladesh	Contraceptives	1%			✓		Bangladesh contracts out 50% of its distribution to private transport providers (from USAID DELIVER PROJECT data)
Uganda	Contraceptives	3%			✓		Transport study (Abdallah, Healey, and O’Hearn 2002)
Zimbabwe	Condoms	12%			✓	✓	DTTU excludes MOH staff costs (Bunde et al. 2007)
Ghana	Essential health commodities	13%	✓	✓	✓	✓	Health Supply Chain Costing Study (Huff-Rouselle and Raja 2002)
Honduras	Essential drugs	6.5%			✓		Nongovernmental organization distribution costs (Gribble et al. 2006)

Note: The costs shown for each country relate to the functions indicated (✓).

Source: Sarley, Allain, and Akkihal. 2009

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