

**Supply Chain Options Analysis:
PMTCT Option B+, Family Planning, Maternal,
Newborn, and Child Health Commodities**

August 2014



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SLAPS 
Systems for Improved Access
to Pharmaceuticals and Services

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ACRONYMS AND ABBREVIATIONS

3TC	lamivudine
AIDS	acquired immunodeficiency syndrome
ART	antiretroviral treatment
ARV	antiretroviral
CAPR	Centre d'Approvisionnement en Médicaments Essentiels et Consommables Médicaux de Région
CBCHS	Cameroon Baptist Convention Health Service
CENAME	Centre Nationale d'Approvisionnement en Médicaments et Consommables Médicaux Essentiels (central medical store)
CHAI	Clinton Foundation HIV/AIDS Initiative
CTA	<i>centre de traitement agréé</i> (accredited treatment center)
FBO	faith-based organization
FMNCH	family planning, maternal, newborn, and child health
FTE	full-time equivalent
Global Fund	Global Fund to Fight AIDS, Tuberculosis and Malaria
HIV	human immunodeficiency virus
IDR	internal drug returns
LMIS	logistics management information system
MHE	material-handling equipment
NACC	National AIDS Control Committee
NVP	nevirapine
PEPFAR	US President's Emergency Plan for AIDS Relief
PMTCT	prevention of mother-to-child transmission
RTG	regional technical group
SCM	supply chain management
SDP	service delivery point
SIAPS	Systems for Improved Access to Pharmaceuticals and Services
TDF	tenofovir
UNFPA	United Nations Population Fund
UPEC	<i>unité de prise en charge</i> (treatment unit)
USD	US dollars
WHO	World Health Organization
XAF	Central African CFA (Communaute Financiere Africaine BEAC francs, or CFAF)

BACKGROUND

HIV, malaria, and unintended fertility constitute barriers to the achievement of Millennium Development Goals 4, 5, and 6 in Cameroon. The national health sector strategy 2011–2015 describes control targets for these diseases, for example, elimination of mother-to-child transmission of HIV by 2015. The national strategy to scale up prevention of mother-to-child transmission (PMTCT) Option B+ is shown in Annex 5. A national facilities survey conducted in 2012 revealed the following in regard to prevention of HIV PMTCT service provision:

- PMTCT guidelines were available at less than 50% of the health facilities surveyed.
- On average, 12.3% of health facilities, mostly in Southwest, Northwest, Littoral, and Center regions, were following the new PMTCT guidelines adopted in 2010.
- Of health facilities, 46.8% (864/2,096) were providing HIV testing, prophylaxis, and antiretroviral treatment (ART) for HIV seropositive pregnant women. Unmet needs for ART for HIV-positive pregnant women varied from 53% to 66%.
- Among the 6,111 health care providers surveyed, only 55% were trained in PMTCT service provision.
- The average acceptance rate for HIV testing among pregnant women was 88% with higher rates observed in the regions of Adamawa, Centre, Littoral, Southwest, and West.

Besides infectious diseases, unintended fertility fuels a rate of population growth that is outpacing efforts to meet the social needs and to achieve national development goals. Closely spaced and ill-timed pregnancies and births contribute to high infant mortality rate, and infants of mothers who die as a result of giving birth have a greater risk of mortality and poor health status. The rate of under-five mortality in Cameroon was 95 deaths per 1,000 live births in 2012 and in the period 2007–2011 Cameroon had a reported maternal mortality ratio of 670 deaths per 100,000 live births.¹

The United Nations Population Fund (UNFPA) is the sole procurer and donor of health commodities for family planning, and maternal, new-born, and child health, which are channeled through the central medical store, CENAME (Centre Nationale d'Approvisionnement en Médicaments et Consommables Médicaux Essentiels), under the cost-recovery supply system.

The health supply system in Cameroon is organized around the pyramidal model of its public health system with three levels: central, regional, and peripheral. At the central level is CENAME, whose primary mission is to

¹ More information is available at the following link: <http://www.commonwealthhealth.org/>

- Ensure availability of all essential medicines and other health commodities as part of a cost-recovery supply system, including products for priority public health programs such as HIV and AIDs, malaria, and tuberculosis that are dispensed free of charge to end users
- Supply regional medical stores known as CAPRs (Centre d'Approvisionnement en Médicaments Essentiels et Consommables Médicaux de Région), with essential medicines and other health commodities at the best quality/price ratio
- Supply antiretroviral (ARV) medicines and other commodities for PMTCT and ART to CAPRs on a quarterly basis

CENAME receives a 10% management fee for ARVs procured with funding from the government and the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund), and a fee of 7.5% for second-line and pediatric ARVs procured with funding from the Clinton Foundation HIV/AIDS Initiative (CHAI).

There are ten regional medical stores (CAPRs), whose main mission is to supply public health facilities with essential medicines and other health commodities in a cost-recovery supply system. CAPRs are also responsible for supplying ARVs to health facilities on a monthly basis. CAPRs receive 5% management fee for all ARVs procured with Global Fund and government funds, except for the fixed-dose emtricitabine + tenofovir + efavirenz, which is not provided free, but CAPRs do not receive any management fees for ARVs procured with CHAI funding. Though CENAME supplies all categories of medicines and other health commodities to CAPRs, including ARVs, since 2012 CAPRs no longer deliver ARVs and other PMTCT commodities to either health facilities or district health offices (MSH/SIAPS 2012)..

CENAME and CAPR warehouses are owned by the government, and no rent or any other type of compensation is paid for use of these storage facilities. However, CENAME also rents storage space from the Cameroonian railway company.

RATIONALE

The purpose of this options analysis was to provide evidence for the design of interventions to strengthen the health supply system in Cameroon, which is crucial for achievement of targets, including PMTCT Option B+, and maternal and child health targets, which are stipulated in the health sector strategy.

In PMTCT Option B+, all HIV-positive pregnant women are offered lifelong ART regardless of CD4 count. Therefore, ART, family planning, maternal, newborn, and child health commodities should be continuously available at service delivery points to ensure continuation of care not only for the mother, but also for the child. The broad objective of strengthening the supply system is therefore to assure continuous availability of these commodities at health service delivery points (SDPs).

OBJECTIVES

Specific objectives of this analysis were to determine the following:

1. Optimal storage space, at all levels, required for rollout of PMTCT Option B+; warehousing, inventory, and transportation costs for rollout of PMTCT Option B+; and supply of family planning, maternal, newborn, and child health (FMNCH) commodities
2. Logistics management information requirements for rollout of PMTCT Option B+ and strengthening supply of FMNCH commodities
3. Feasible supply options for PMTCT Option B+ and ART commodities
4. Labor requirements for handling PMTCT Option B+ and ART program commodities
5. Materials handling equipment for logistics of these commodities
6. Regulations and policies that impact effective distribution of these commodities
7. Feasible options for strengthening PMTCT and ART supply chain system in Cameroon and recommendations for implementation of preferred option

APPROACH

Secondary and primary data collection was done through literature review of relevant reports, regulatory and policy documents, and administration of questionnaires. Primary data collection was carried out using a set of five questionnaires, addressed to operational staff at the target supply chain organizations at central, regional, and SDP levels in the public supply system, and at central level only for private sector logistics service providers. The questionnaires were developed for the purpose of this analysis, piloted and further customized, and then administered by trained data collectors. Warehouse storage capacity at all levels in the public health supply system was physically measured by data collectors.

The scope of the assessment included PMTCT, ART, family planning, and maternal, newborn, and child health commodities; the central warehouse (CENAME); four regional warehouses (CAPRs) in the four regions supported by the US President's Emergency Plan for AIDS Relief (PEPFAR) in Center, Littoral, Northwest, and Southwest regions; a sample of 10 district health service stores; and 30 SDPs, including ART sites and antenatal clinics that offer PMTCT service within the four regions. The SDPs included health facilities that belong to public and private health providers such as faith-based organizations (FBOs). Seven private logistics providers were also included in the analysis. A total of 52 entities across public and private sectors were surveyed (geographic locations of the SDPs are shown in Annex 7).

Primary quantitative and qualitative logistics data were entered into Census and Survey Processing System (CSPRO) software and then analyzed using Epi-Info and Microsoft Excel. Qualitative data were analyzed manually by summarizing common themes, key relevant points, and examples found in interviewee responses.

Costing Method

Audited 2013 financial statements, including balance sheets collected from CENAME and CAPRs, provided supply chain cost data. These financial statements contained total supply chain management costs for all categories of medicines and other health commodities managed by these entities, including PMTCT and ART commodities. Only staff and transport costs were reported as distinct line items in the financial statements. Given that CENAME and CAPRs have only one mandate, which is health supply chain management, all other operating costs that were not itemized in the financial statements as either staff or transport costs were lumped into a category that was labeled as "Warehousing, inventory management, overhead costs" (warehousing and other costs). These three categories of supply chain costs were then used to calculate unit costs of *staffing, transport, and warehousing and other costs*, at CENAME and CAPRs. Table 1 lists all logistics cost factors used in this analysis.

Table 1. Logistics Cost Factors

Logistics cost factors between CENAME and CAPRs
Staffing cost at CENAME was about XAF 6,177,000 per staff member per annum.
Annual warehousing, inventory management, overhead costs at CENAME were about XAF 1,066,900 per unit storage space (cubic meters).
Annual transport [fuel + fleet maintenance] at CENAME was about XAF 106,749,700.
Total annual distance traveled by CENAME to deliver commodities to the four regional CAPRs surveyed, considering monthly deliveries, is about 23,520 kilometers (km). Total distance between CENAME and three CAPRs surveyed is 980 km; CAPR Centre region is located in the same premises with CENAME.
Average monthly transport cost contribution for delivery of PMTCT and ART commodities by CENAME to each CAPR, based on 2013 financial statement, is XAF 62,270. This cost contribution is 7% of total annual transport cost at CENAME, which is based on the fact that 7% of CENAME's total storage capacity is dedicated to PMTCT and ART commodities.
Total storage surface area at CENAME is 3,795 square meters. Total storage surface area dedicated to PMTCT and ART commodities at CENAME is 254 square meters.
Logistics cost factors between CAPRs and districts
Staffing cost at CAPRs is about XAF 4,342,000 per staff member per annum.
Average annual warehousing, inventory management, and overhead costs per unit storage space at CAPRs are about XAF,110 per cubic meter.
Annual transport [fuel + fleet maintenance] at CAPRs is about XAF 7,800,000.
Average distance traveled by each district to CAPRs to collect PMTCT and ART commodities is 334 km.
Average monthly transport cost per district for PMTCT and ART commodities, as reported by interviewees, is XAF 18,585; commodities are transported by taxi or motorbikes.
Total number of districts in the four regions surveyed that have PMTCT and ART SDPs is 86. NB: Eleven districts in the four regions surveyed do not have SDPs for PMTCT and ART (CNLS).
Average storage space at CAPRs is 251.7 cubic meters, considering a usable storage height of 2.5 meters. This is about 20% of total available storage capacity at each CAPR. Total storage volume dedicated to PMTCT and ART commodities at all four CAPRs surveyed is about 1006.8 cubic meters.
Logistics cost factors between CAPRs and SDPs
Average quarterly transport cost per CAPR is XAF 482,585; this cost assumes CAPRs will deliver to the same SDPs as they did in 2013. Maximum annual transport cost per CAPR was obtained from financial statement of CAPR Northwest of XAF 9,651,625.
On average about 264 pharmacies are supplied by each CAPR under the cost-recovery supply system. These pharmacies are located at health facilities that also offer PMTCT and ART services.
Logistics costs at SDPs were not included in this analysis because these costs will be the same for all options. However, these costs will have to be added to determine total costs for the preferred option.
Costing parameters for logistics between districts and SDPs
Staffing unit cost obtained from financial statements provided by CAPRs was used to estimate costs at district stores.
Average distance traveled by SDPs to collect PMTCT and ART commodities from districts is 41.5 km. The farthest SDP from a district is about 90 km. However, transport cost for this analysis was based on the average distance traveled between district and SDPs.
Average monthly return trip transport cost per SDP is XAF 20,000. Target number of SDPs is 264 per region (or per CAPR). Commodities may be transported by taxi, motorbikes, or private vehicles.
Average number of PMTCT/ART SDPs served by one district is 12, which translates to about 10 SDPs

given an estimated 80% PMTCT coverage nationally (2010).
Average number of districts served by each CAPR is 22.

Average storage space at district store dedicated to PMTCT and ART commodities is 34.3 cubic meters. On average, total storage capacity of a district store is about 52 cubic meters. Therefore, 66% of district storage capacity is dedicated to PMTCT and ART commodities.

District store staffing, warehousing, and other logistics costs were assumed to be similar to those incurred by CAPRs in 2013. However, unit transport costs were estimated based on annual costs and average distances between districts and CAPRs, and SDPs, which were provided by respondents.

To estimate supply chain management costs contributed by PMTCT and ART commodities at CENAME and CAPRs, the fractions of total storage space at these institutions that are dedicated to these commodities were used. For example, an average of 20% of total storage surface area available at CAPRs is dedicated to PMTCT and ART commodities; therefore it was estimated that 20% of total supply chain costs of CAPRs would be contributed by logistics management of these commodities.

In addition to using cost contribution to estimate logistics costs of PMTCT and ART commodities at CENAME and CAPR levels, cost data provided by respondents at district and SDP levels was used to calculate logistics costs at these levels of the public supply system. Details of the costing factors are shown in table 1.

Annual overall operating costs and current and fixed assets at CENAME and CAPRs were extracted from the respective 2013 balance sheets and then analyzed to assess operational performance of these entities. Two metrics analyzed were “asset turnover” and “inventory turnover rate.” Whereas asset turnover measures how well available assets are utilized—that is, efficiency—inventory turnover rate (how many times inventory rotates per annum) is a measure of productivity.

Method Used to Estimate Storage Capacity Requirement

Forecast quantities of ARVs and laboratory reagents required for 2014 to 2017 were used to evaluate storage space requirements for PMTCT and ART commodities in scale-up “scenario 2,” (see National AIDS Control Committee [NACC] quantification). The forecast results are based on assumptions endorsed by the National AIDS Control Committee. In contrast, historic quantities were used to estimate storage requirement for family planning commodities.

Unit volumes, in cubic meters, were obtained from the supply chain management systems project procurement database. As much as possible, World Health Organization (WHO) prequalified formulations were selected, and when more than one WHO prequalified product with different unit volumes existed, the average was used for estimating the volume of the product. The capacity requirement for storage for each product was calculated by multiplying the annual forecast requirement by the unit volume of each product, and then summing the volume requirements for all products to estimate the total storage capacity required to hold maximum

stock levels at CENAME and CAPRs.² In cases where unit volumes were not available for a specific product and package, unit volumes from similar products and packaging were used as a proxy.

The forecast results based on scenario 2 assumptions were applied for ART and ARV requirements. The yearly forecast of quantities for family planning commodities was derived from monthly distribution, and it was kept constant for all the years. The unit volumes of family planning commodities were obtained from the 2011 US Agency for International Development contraceptive and condom catalog.

For HIV laboratory supplies, supplies, and test kits, unit volumes were not available for 13 of 204 products (6.37%). Thus, the volumes represent 94% of the HIV/AIDS products considered.

² Inventory policy at CENAME allows a maximum stock of 12 months and at CAPRs a maximum stock level of six months' supply is allowed.

BASELINE SUPPLY SYSTEM

Results of the baseline analysis are presented in two broad categories, (a) logistics capacity of public health supply system and (b) capacity of private logistics service providers.

Logistics Capacity of Public Health Supply System

Logistics Infrastructure

The public health supply system in Cameroon is made up of three tiers, including a central medical store (CENAME), 10 regional stores (CAPRS), and about 3,000 health facilities, or SDPs. However, the supply network for PMTCT commodities includes an additional tier, the district health service, making it a four-tier network (see figure 1).

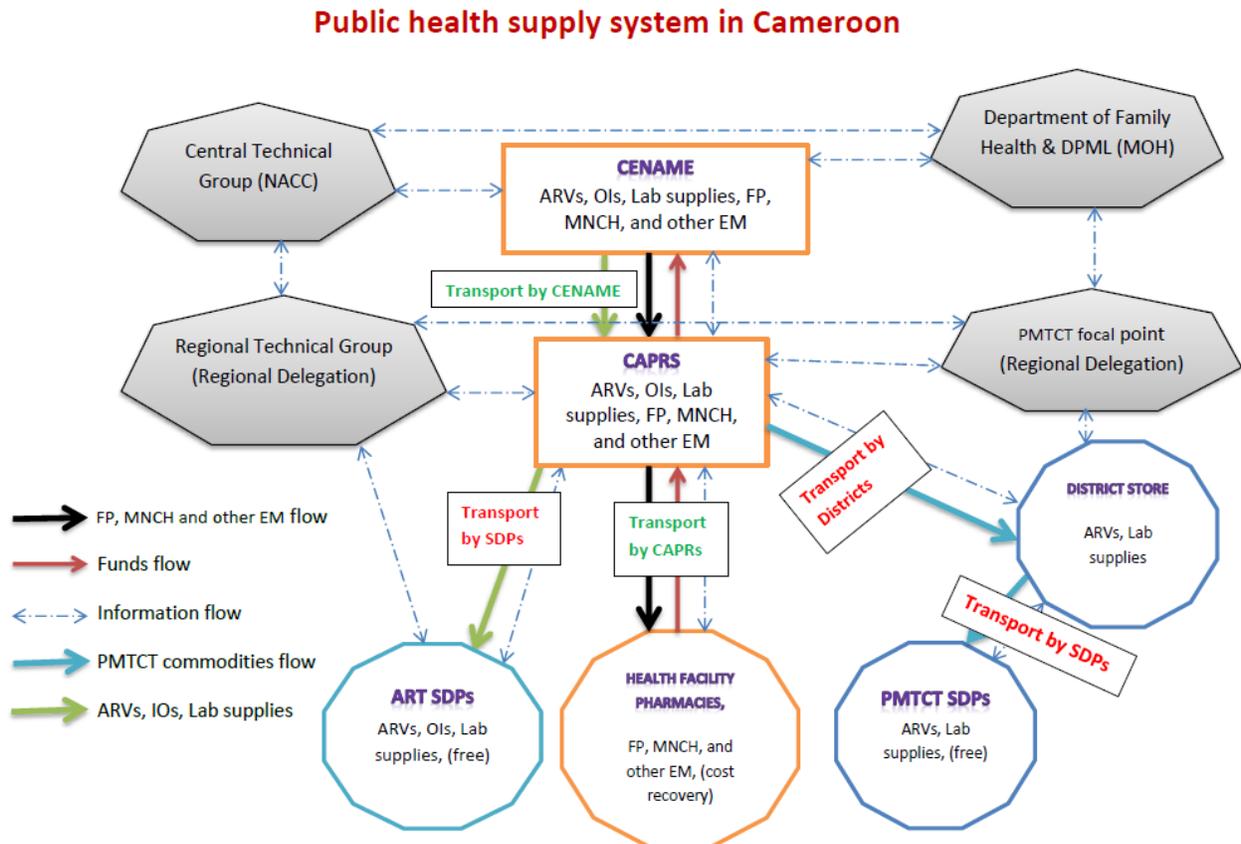


Figure 1. Public health supply system in Cameroon

At the regional level, the supply system is subdivided into three networks that supply (a) essential medicines at a fee (cost-recovery supply system), including FMNCH commodities, (b) ART commodities, and (c) PMTCT commodities. PMTCT and ART commodities are

dispensed free of charge to clients. FMNCH commodities are distributed through the cost-recovery network, and clients pay a fee for these commodities.

Whereas CENAME is responsible for warehousing and transportation to CAPRs of all categories of medicines and health products, CAPRs are responsible for these two logistics functions for all other categories of commodities—except ART and PMTCT commodities, which are not transported by CAPRs but rather have to be collected by the SDPs themselves.

CENAME and all CAPRs surveyed do not possess adequate mechanized material-handling equipment (MHE). The common type of MHE available is hand pallet trucks and hand trolleys. None of the districts surveyed has logistics MHE.

Logistics capacity is generally lacking at the district health service level. Only 1 of the 10 districts visited has a pick-up truck and that is over 15 years old. In some of the districts, staff members use their personal vehicles to transport PMTCT and ART commodities between CAPRs and treatment sites.

According to most people interviewed at the district level, district-level logistics costs linked to PMTCT and ART programs are not documented and are sometimes paid from personal funds by the staffs who manage these commodities. No official budgetary allocation is available to pay for logistics costs. Therefore, interviewees were unable to provide information on warehousing and transportation costs incurred by district health services. Structures for management of ART and PMTCT commodities are quite basic: the total storage capacity at district level on average is 52 cubic meters, and the average storage capacity dedicated to ART and PMTCT commodities is 34.3 cubic meters. Therefore, about 66% of total district storage capacity is currently dedicated to PMTCT and ART commodities.

At SDPs, which include ART sites (*unités de prise en charge* [UPECs] and *centres de traitement agréés* [CTAs]) and antenatal clinics offering PMTCT services, the average total storage space available is 41.6 cubic meters, and 19% of total available space at SDPs is dedicated to PMTCT and ARV commodities, which is about 8.0 cubic meters. A majority of SDPs surveyed complained about limited storage space and lack of shelves and cold storage facilities. In fact, they have no room to store a two months' supply of PMTCT and ART commodities at over three-quarters of the SDPs. In most SDPs, commodities are stored in the dispensing area with patient files and other documents, and the only storage space available may be a medicine cupboard of about 1 cubic meter.

In general, SDPs utilized various means to transport ART and PMTCT commodities, including taxi, rented motorbikes or vehicles, staff personal vehicles, health ambulances, and vendor-managed transport that is accompanied by SDP staff.

The logistics capacity of CENAME and the four regional warehouses (CAPRs) surveyed is summarized in table 2. Total storage surface area dedicated to PMTCT and ART commodities at the four CAPRs surveyed is 403 square meters; on average, storage surface area at CAPRs for PMTCT and ART commodities is about 20% of total. This is about 100 square meters on average per CAPR, or 250 cubic meters based on a maximum usable storage height of 2.5 meters in the absence of forklifts.

Table 2. Logistics Capacity of CENAME and Four CAPRs (Central, Littoral, Northwest, and Southwest) Regions

Entity/ resource	Total storage surface area (square meters)	Storage surface area dedicated to PMTCT and ART commodities (square meters)	Mechanized material handling equipment (number available)	Logistics management information system (paper, electronic, mixed)	Transport capacity, truck type (number functional)	Pharmaceutical waste disposal facilities	Total number of staff
CENAME	3,795	254 (7%)	Hand pallet trucks (6)	Paper and electronic systems	Heavy-weight truck (1); 2-ton pickup truck (2); container pickup truck (1)	None available; destruction by HYSACAM	90
CAPR Central	453	105 (23%)	Hand pallet trucks (2); hand trolleys (2)	Paper and electronic systems	3.5-ton truck (1); 2.5-ton truck (3)	None available; destruction by HYSACAM	33
CAPR Littoral	769.3	192.3 (25%)	Hand pallet trucks (4); hand trolleys (3)	Paper and electronic systems	2.5-ton truck (4)	None available	27
CAPR Northwest	479	70.8 (15%)	Hand trolleys (11)	Paper and electronic systems	3.5-ton truck (3); 2.5-ton truck (1)	None available	35
CAPR Southwest	193.3	34.6 (18%)	Hand pallet trucks (9); hand trolleys (1)	Paper and electronic systems	2.5-ton truck (4); 1.5-ton truck (1)	None available	22

HYASCAM = Hygiène et Salubrité du Cameroun

Inventory Replenishment System

The NACC is organized into technical groups at central and regional levels. Reports on stock status and number of patients are sent from SDPs to the regional technical groups (RTGs) on a monthly basis. The monthly report is in an NACC-prescribed format. SDP orders for ART are signed by the pharmacy attendant and by the SDP (CTA/UPEC) coordinator. The order is taken to the RTG for validation and then to the CAPR store manager for onward transmission to CENAME. Quantities of commodities supplied to SDPs are then approved by the RTGs and delivered by CENAME to CAPRs.

Regarding PMTCT, a focal person at the regional delegation of health has to approve the requisition that is prepared by the district health service officer. Reports on commodities and patients are sent to the district PMTCT focal person who in turn transmits data to the regional focal point based at the Regional Delegation of Public Health. Orders consisting of monthly stock and patient data are taken to the district health office, from which commodities are supplied based on availability of stock. The district office also makes telephone calls to the SDPs when necessary to inform them about stock availability.

Because of shortage of ARVs during the last couple of years, the NACC has rationed PMTCT and ART commodities to SDPs based solely on quantities that could be procured with insufficient funding. This push model currently used for PMTCT and ART commodity supply includes transportation by CENAME to CAPRs and then collection of commodities from CAPRs by either district health service staff for PMTCT or ART dispensing site staff for ART commodities. HIV/AIDS commodities transported by CENAME to CAPRs, either on the basis of requisitions or allocations, are received by a committee. After arrival at CAPRs, PMTCT commodities are allocated to districts, from which SDPs collect their supplies. The pharmacist who manages HIV/AIDS commodities at CAPRs has responsibility for all stock and ensures that storekeepers periodically carry out physical stock counts.

At the district level, the standard practice for supply of PMTCT commodities is through requisitions, but owing to stock shortages, resupply is by allocation based on quantities of commodities that have been collected from CAPRs.

Although some districts aim to hold “minimum stock levels” of PMTCT commodities of one month, others aim to hold three months’ stock. According to respondents, the average maximum stock level that the districts aim to hold is four months.

At the SDPs, the PMTCT nurse or Ward Charge nurse prepares the requisition, which is submitted to the director or head of the institution for approval. The requisition is then sent to the health district where it is approved by the district medical officer and supply is made. At the health district level, the staff in charge of PMTCT (*Chef bureau santé*) prepare the requisition, which is approved by the district medical officer and transmitted to the RTG’s representative who approves and transmits the order to the CAPR. Once the order is ready, the CAPR then invites each district by telephone once every month to come and collect its supplies. Regarding diagnostic tests, the distribution plan is made by district offices, and then treatment sites collect their allocated test kits from the district health office.

For ART commodities, the pharmacy technician prepares the order, which is approved by the coordinator. The order is transmitted to the RTG at the regional delegation of health for endorsement and then transmitted to CAPR, from where supplies are collected by the SDP.

Respondents at PMTCT SDPs, and at ART SDPs, named two supply sources of commodities, CAPRs and districts (figure 2). It is therefore possible that PMTCT SDPs (and ART SDPs) do receive ARVs from both CAPRs and districts and not exclusively from one of these supply sources, as officially intended, to serve the ART and PMTCT programs, respectively. However, the relative quantities of commodities received from each supply source could not be assessed.

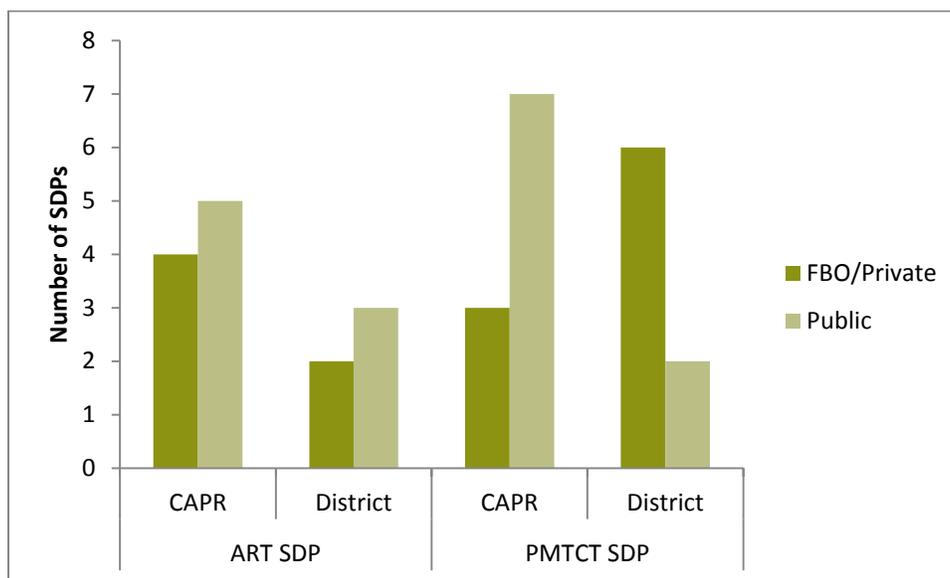


Figure 2. Supplier of PMTCT and ART commodities to SDPs as identified by respondents

Order forms for first-line ART regimens are preestablished by RTG; however, for second-line regimens, SDPs have to individually prepare their orders. Depending on the decision of the therapeutic committee, orders are placed to cover the projected number of patients to be put on ART. However, since 2011, PMTCT and ART commodities are rationed to SDPs or ordered by SDPs as emergency orders when commodities run out of stock.

Respondents at SDPs provided varied responses about the distribution model for PMTCT and ART commodities, with the majority of responses indicating a mix of push and pull models. Common responses for minimum stock level were two and three months of supply, and recurrent responses for maximum stock level were three, four, and six months of supply. One month's supply was the most frequent response for security stock level.

Data provided by respondents at SDPs show that on average each SDP has about 977 ART clients in the regions surveyed. Districts and SDPs do not have budget allocations for procurement of HIV and AIDS commodities.

In the cost-recovery supply system, FMNCH and other essential medicines are requisitioned and delivered to SDPs by a pull supply model. UNFPA is the major donor and procurer of family planning commodities in Cameroon. For example, CENAME did not purchase family planning commodities in 2013. The rule is that CAPRs may purchase FMNCH commodities locally only in situations where CENAME does not have stocks. All FMNCH commodities flow through the same channel as other essential medicines under the cost-recovery supply system. The commodities flow from CENAME, through CAPRs, and on to health facility pharmacies where they are sold to clients. However, respondents were not able to provide data on total annual quantities of FMNCH commodities supplied in 2013 at all levels of the system.

Availability and Use of Logistics Data for Decision Making

The logistics management information system (LMIS) at CENAME and the CAPRs is a mix of electronic and paper-based systems. CENAME and the CAPRs have software applications that can manage warehousing operations and inventory. The system allows capture of batch number, quantities, and expiry dates when commodities are received, stored, and issued. Quantities supplied by CENAME and the NACC may be verified by e-mail and telephone communications. Receipt documents for HIV and AIDS commodities are endorsed by CENAME, the RTG, and the CAPRs.

Warehousing and inventory management decisions include quantities to supply, storage space requirements, and allocation, taking into consideration requirements for product storage conditions. LMIS provides information about commodities likely to expire or those at risk of stock-out relative to average monthly consumption. Additional decisions made using data from LMIS are determination of overstock, stock soon to expire, and average monthly consumption. Stock card and physical quantities are reconciled on a monthly basis.

At CAPRs, in the cost-recovery supply system, data obtained from the LMIS are used during the preparation of distribution plans and schedules, taking into consideration the different transportation lines for various treatment sites and the assignment of delivery trucks according to total volume of commodities and distance to be covered. CAPR delivery trucks do not transport HIV and AIDS commodities. According to respondents, types of information shared include stock-out items, annual quantities to procure, notification of arrival of new stock at CAPRs, and report of supervision of SDP cost-recovery pharmacies. However, respondents were not able to easily provide total annual quantities of HIV and AIDS commodities handled by CAPRs in 2013.

Supply chain functions at CAPRs and related types of decisions, which are informed by data generated by the LMIS, are shown in table 3.

Table 3: Supply Chain Functions at CAPRs and Related Decisions Informed by LMIS Data

Supply chain function	Decisions informed by LMIS data
Procurement and ordering	<ul style="list-style-type: none"> • Determination of items and quantities to order based on data contained in stock cards and physical count records
Warehousing and inventory management	<ul style="list-style-type: none"> • Optimization of use of delivery trucks, taking into consideration total quantities and distance to be covered • Compartmentalization of warehouse according to donors Global Fund/PPM; PEPFAR, BIP • Stock issuance on the basis of first-expiry, first-out practice
Customs and freight clearance	Not applicable because CAPRs do not import commodities
Transportation management	<ul style="list-style-type: none"> • Distribution scheduling based on available delivery trucks, number and location of pharmacies (applicable only for cost-recovery program)

At the district level, the LMIS is solely paper based and includes dispensing registers, stock cards, and order forms. Supply management decisions made based on information generated by the LMIS include the determination of quantities to order and quantities to issue to SDPs and how to better use available storage space. Communication between CAPRs, regional delegations of health, and RTGs about movement of PMTCT and ART commodities is done by telephone and supported by the paper-based system. Although respondents at this level indicated that product batch numbers are recorded during receipt, no system is in place for tracking PMTCT commodities. In addition, annual quantities of commodities distributed or dispensed could not be obtained from the paper-based LMIS. Costs for LMIS and capacity building are not systematically captured, and therefore interviewees could not provide these costs.

Respondents at all districts surveyed are aware of the national PMTCT Option B+ scale strategy. However, none of the districts has done comprehensive quantification of the required commodities. Respondents at district level were able to give 12-month projected quantities of a few PMTCT Option B+ commodities, however. For example, respondents projected an average annual quantity of the preferred ARV regimen for PMTCT Option B+ required per SDP of 7,970 packs of 30 tablets, the range being 3,450 to 23,910 boxes of 30 tablets.

The LMIS at the SDPs surveyed is primarily paper based except at the general hospital in Yaoundé and the Catholic Hospital in Pouma, where a combination of paper and electronic systems is in use. SAGE inventory management software is used by a few of the health facility pharmacies that operate under the cost-recovery supply program run by the CAPRs.

SDPs have stock management registers that capture quantities of stock received and dispensed. Logistics decisions are made based on information obtained from stock and dispensing registers, therapeutic forms, and stock cards. These include ordering decisions such as type of commodity, quantities and when to order, and choice of supplier in the specific case of third-line ARV regimens. Ordering takes into consideration average monthly consumption, which is calculated using data contained in the item stock cards. New orders must include stock status, quantities

consumed, and number of patients. PMTCT commodities orders are based on SDP monthly activity reports.

Inventory management decisions include determination of quantities to supply and adherence to storage conditions. In the situation where commodities are rationed, patients may be given 10 days' supply of ARVs, pending receipt of additional supplies at the SDP. Although respondents indicated that these decisions are informed by data from the LMIS, none of them was able to provide the total annual quantities of HIV and AIDS commodities dispensed in the last 12 months.

In March 2014, the Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program supported the NACC by printing dispensing registers for ART SDPs in the regions surveyed. Though in use, the data captured in these registers is not being used for logistics decision making.

Logistics Information Shared among Supply Chain Actors

Types of logistics information that is shared between SDPs, CAPRs, district health offices, and partners, in order of importance, includes list of stock-out items, new arrival of HIV and AIDS commodities, annual quantities procured by SDPs, and distribution plans.

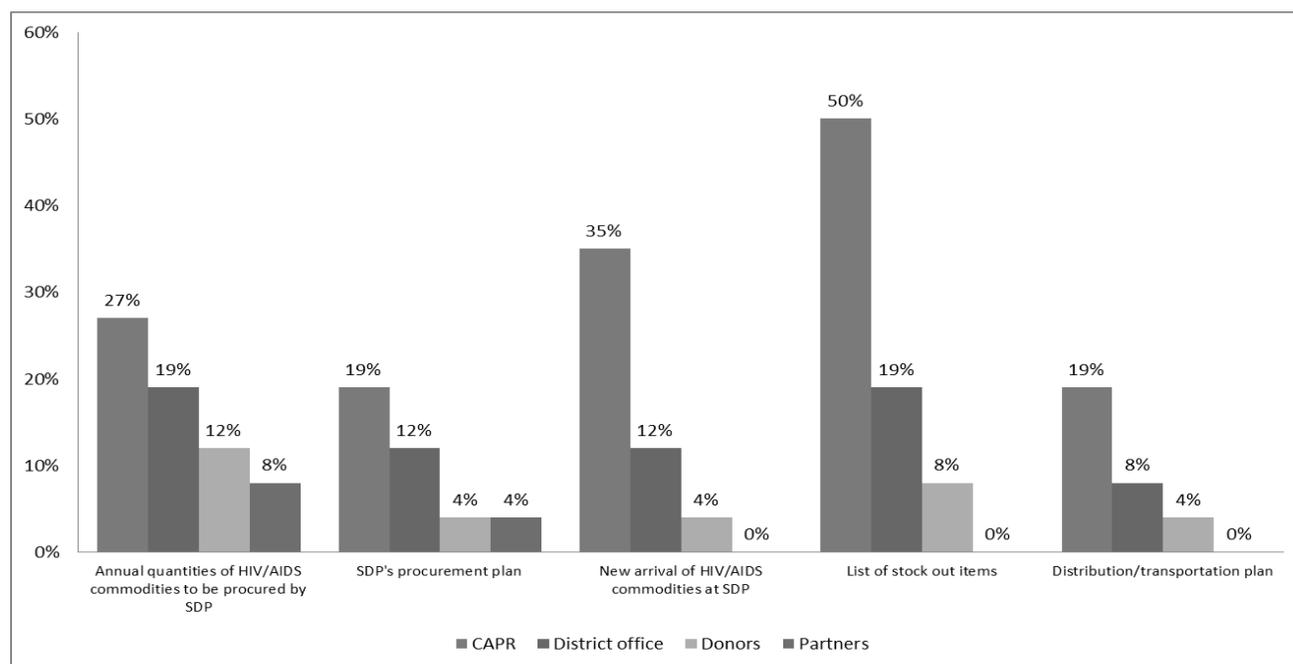


Figure 3. Type of logistics information shared among public health supply chain actors

Logistics information sharing occurs most often between SDPs and CAPRs and to a lesser extent with district health offices (figure 3). Only two logistics collaborating partners were identified by respondents at district health offices. SIAPS was identified as the only partner that collaborates

with district health authorities in warehousing and inventory management of PMTCT and ART commodities. The Cameroon Baptist Convention Health Service (CBCHS) collaborates with several districts in Northwest and Southwest regions in the logistics management of commodities for a twenty-four 24-month PMTCT Option B+ pilot covering 22 treatment sites. These two partners receive financial support from PEPFAR.

Logistics Cost Data

Logistics costs incurred by CENAME and the CAPRs were obtained from 2013 financial statements provided by the institutions. At district level, logistics cost data provided by interviewees varied significantly from one district to another. For example, only one district reported an annual procurement cost of XAF 100,000 (USD 210)³ attributed to phone calls and photocopying of requisition forms. Interviewees were not able to provide inventory management and storage costs. The average annual transportation cost reported by districts was XAF 223,000, but official financial statements were not available to confirm these costs.

SDPs estimate total annual supply chain management costs for essential medicines and PMTCT and ART commodities at XAF 2,244,000. This estimate includes costs associated with ordering, storage and inventory management, transport of commodities, LMIS, quality assurance, and capacity building for logistics staff. The maximum annual transport cost for all categories of products quoted by SDPs was XAF 660,000. According to respondents at some of the SDPs, funding for these costs is provided for in the SDP's operating budget, but this is not applicable to a majority of the SDPs surveyed.

None of the respondents at SDPs were able to provide information on annual quantities of commodities that are transported and the associated costs incurred. Therefore, total supply chain costs for the options analysis are based on the 2013 financial statements provided by CENAME and the CAPRs and transport costs provided by respondents at the district level.

Distribution and Transportation

CENAME supplies to all 10 regional warehouses (CAPRs) and to private health providers. Other consumers, such as the military hospitals, procure directly from CENAME without passing through the CAPRs. The average number of SDPs served by each CAPR is 23 ART SDPs (which may be CTAs or UPECs) and 22 districts (see maps in Annex 7).

³ January 2013 [Oanda conversion rate](#) from XAF to USD was XAF 0.0021 = USD 1.

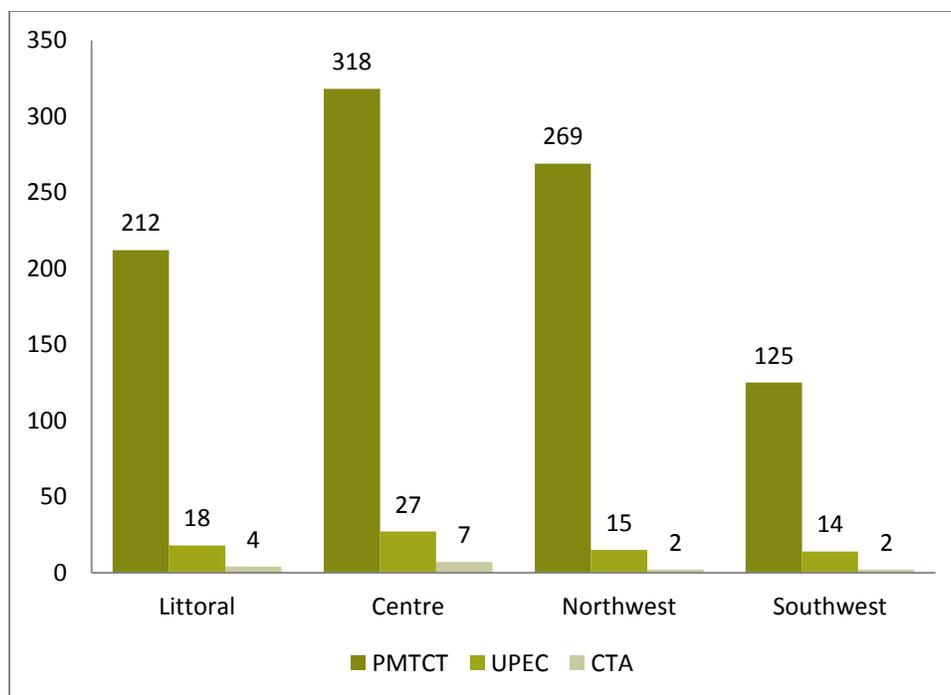


Figure 4. Number of PMTCT and ART (UPEC/CTA) SDPs per region surveyed

The average distance from CAPRs to the most distant health district office is 334 km, and the nearest district is 2.25 km. The average distance from CAPRs to the farthest SDP is 316.5 km, and the nearest is less than 1 km away.

The average fleet capacity number and vehicle age for CAPRs is four and three years, respectively. Respondents did not provide the average annual tonnage or quantities of products transported by CAPRs. None of the CAPRs has an electronic transportation management system. A paper-based system, when available, is used for distribution scheduling.

On average, district stores serve about 12 SDPs in the four regions surveyed. The longest distance between a PMTCT or ART SDP and its district office is 90 km, and the average distance is 41.5 km between the district office and SDP.

Though 50% of districts have paper-based transport management systems, none of the districts was able to provide information about approximate annual tonnage or volume of commodities transported, nor the average cost per ton transported. Only one district, of 10 surveyed in four regions, has a logistics pickup truck and that is more than 15 years old. Commodities are transported quarterly and on ad hoc basis. One respondent specified that the annual transport cost of commodities from a district store to an SDP is XAF 240,000.

Regarding SDPs, no public or FBO SDP has an electronic transport management system.

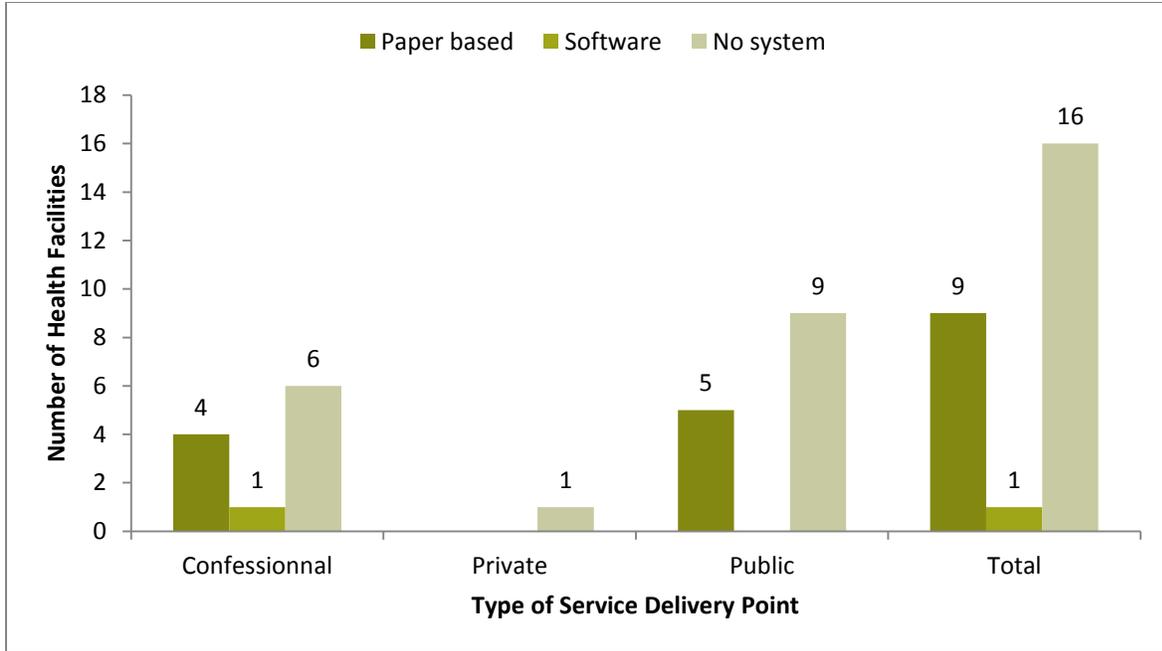


Figure 5. Type of transport management system used by SDPs

Respondents at SDPs were not able to provide data on volumes transported and associated costs. In general, SDPs used various means to transport commodities. PMTCT and ART commodities may be transported by rented motorbike or vehicles, staff personal vehicle, health ambulance, or by vendor transport accompanied by SDP staff. In the cost-recovery program, the budget allocation for transport is based on distance to be covered, which is derived from vehicle and fuel management logbooks.

Human Resources for Logistics Management

Staffing at CENAME and the four CAPRs surveyed is shown in figure 6.

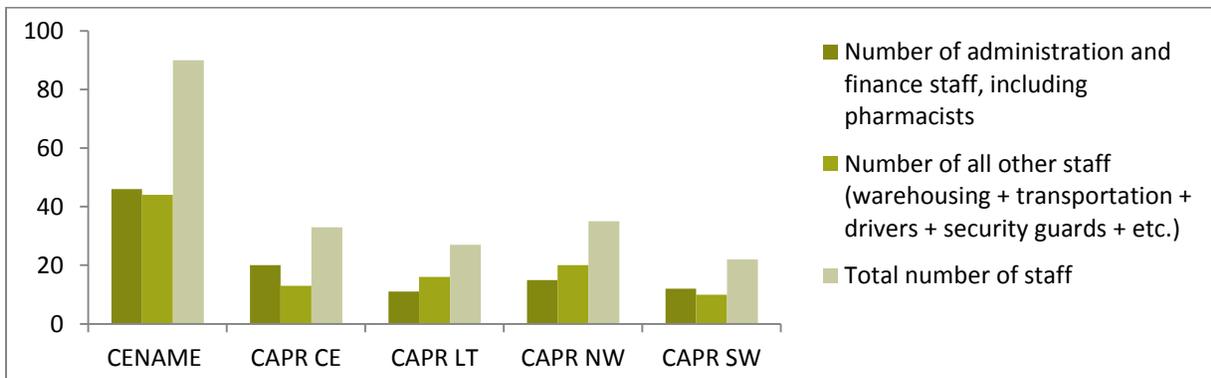


Figure 6. Staffing at CENAME and Centre, Littoral, Northwest, and Southwest CAPRs

At CAPRs, about 60% of staff who have managed supply chain functions in the last two years have received training in the functions they perform. CENAME and the four CAPRs surveyed have about the same number of administrative and finance staff as storekeepers, drivers, and security guards (figure 6).

In most districts surveyed, two staff members are responsible for PMTCT and ART logistics management including dispensing to clients. These personnel have performed the same function for more than two years, and about 50% of them have been trained in logistics management. In some districts, however, no person is dedicated to PMTCT and ART logistics. In these districts, part of the logistics functions, such as transportation of commodities from CAPRs to the district, is performed by the district health services officer when necessary.

The number of personnel managing ordering, warehousing and inventory management, transportation, and dispensing at SDPs for two consecutive years varies from one part-time to an average of two full-time equivalent (FTE), and a maximum of eight staff members reported at one FBO SDP.

Regarding staff training in procurement, warehousing and inventory management, and dispensing, the average number of trained staff is 1.5. About 25% of staff who manage logistics at SDPs have not received training in the functions they perform.

For the cost-recovery program, health committees supervise SDP pharmacies, and CAPRs also supervise these pharmacies. These pharmacies are staffed by pharmacy attendants who handle CAPR-consigned stocks of essential medicines, dispensing, and reconciling quantities and cash with CAPRs.

Reverse Logistics and Pharmaceutical Waste Management

Redistribution

In the cost-recovery program, CAPRs have established a collaboration that permits redistribution of excess or near-expiry stocks and stock borrowing between CAPRs. During supervision of health facility pharmacies, CAPR supervisors may receive overstock items and resupply them to another pharmacy. This transaction is documented in an “internal drug returns” (IDR) form. Information captured in the IDR form includes product quantity, batch number, and expiry date. The cost of transporting returns or redistribution is borne by CAPRs.

For ART and PMTCT commodities, no system is in place for redistribution or reallocation, because there is neither a policy nor a form to document this type of transaction, according to some of the respondents. In some instances where excess ARVs are supplied to SDPs, the redistribution or reallocation procedure is initiated by the coordinator of the SDP that is in need of ARVs by a formal request endorsed by the RTG. The request is presented to the coordinator of the SDP in possession of excess ARVs, typically at monthly regional coordination meetings. The RTG representative also makes the decision about reallocation to another CAPR. The cost of

transporting returns or redistribution is borne by the SDP that initiates the movement of commodities.

Responses from districts and SDPs about a reverse logistics network and practices including stock redistribution policy were diverse. According to 55% of the respondents, excess stock of PMTCT and ARV commodities are returned to the district office for redistribution to other SDPs. Regarding PMTCT, the focal person at the regional delegation of public health must endorse any redistribution. Other responses included “reallocation based on arrangements between SDPs” and “no past experience with redistribution of PMTCT and ART commodities.” The SDP may also notify CAPRs and the RTG about excess products and then liaise with the supervising district or another SDP that is short on commodities for redistribution.

In addition, quite frequently some SDPs dispense ARVs to clients coming from other SDPs for several reasons, including shortage of ARVs at a client’s habitual clinic. In other cases, PMTCT sites may loan short-expiry-date ARVs to other ART sites.

Respondents were not able to provide the average annual quantities of pharmaceuticals returned or redistributed. The chain of custody of stock is cascaded down the supply system, with each level taking responsibility for handling and costs after products are received. Cost linked to return of commodities is therefore borne by the entity that had custody of the product at the time it becomes waste.

Product Recall

In the case of excess supply, the product is returned by CAPR to CENAME. Regarding products with quality issues, a claim form is filled out and sent to the product supplier.

CAPRs may also make telephone calls to request returns, but according to respondents some of the CAPRs surveyed do not have recall forms. For the cost-recovery program, supervisors go and collect recalled products from the health facility pharmacies and CAPR pays for the associated cost. CAPRs are responsible for quantifying and returning products to CENAME.

In PMTCT and ART programs, no product recall policy exists, according to 40% of respondents. In practice, CAPRs would telephone SDPs to inform them about the recall. The SDPs make arrangements for the reverse logistics of recall products and are responsible for paying the associated transport costs.

Respondents at the district stores said the list of recalled products is prepared and endorsed by the district medical officer, who informs the regional delegation of public health that the products have been sent to the CAPR. In situations requiring product recall, about 30% of the districts would place telephone calls to the relevant SDPs and request that the products be brought back to the district health service office.

According to respondents at SDPs, CENAME has no defined recall procedure, and there are no recall forms that CAPRs and SDPs can use to collect pharmaceutical waste for destruction. Some of the respondents reported that pharmacy technicians at ART sites typically inform the

coordinator of the SDP, who in turn telephones the CAPR. In some SDPs, a claim form is completed and sent along with the product(s) to the CAPR.

In some instances when products are returned to the CAPR, the CAPR manager makes a note on the form that is presented by the pharmacy technician from a SDP and then returns the form to the technician.

SDPs use numerous options to pay for the transport cost for moving commodities in reverse logistics, including using personal staff funds or the SDP's operating funds.

Pharmaceutical Waste Management

A 2010 draft standard operating procedure exists for the destruction of expired medicines and hospital waste. According to respondents, pharmaceutical waste must be eliminated by a committee including a pharmacist.

The pharmaceutical waste elimination process begins with an inventory by the storekeeper of nonusable products. An internal committee verifies and confirms the list of items to be eliminated. A regional waste elimination committee is then convened to oversee and document the elimination process. Table 4 is a list of PMTCT products recorded at CENAME and the four CAPRs surveyed in 2013.

Table 4. List of Expired PMTCT Products from CENAME and Four CAPRs, 2013

PMTCT product	Expired quantities recorded in 2013
NVP 50, 100 mL bottle	31,726
NVP 50, 25 mL bottle	5,086
NVP 200, tablets B/60	1,162
TDF/3TC (300/300), tablets B/30	12,372

Regarding disposal of expired pharmaceuticals, respondents said the regulation requires that a record be made of the expired items and quantities and that the regional delegation of public health be informed. Most of the respondents stated that districts are required to take all pharmaceutical waste to the CAPRs for elimination by a regional waste elimination committee chaired by the governor. Additional responses indicate that pharmaceutical waste may also be destroyed by a district waste elimination committee coordinated by the divisional medical officer with the district health service officer serving as secretary of the committee. One respondent reported an incident where pharmaceutical waste from the district was rejected by the CAPR and said there is currently buildup of expired pharmaceuticals at the district office. At the time of the survey, about a third of respondents indicated availability of expired nevirapine (NVP) syrup from 2011 at district stores, but they could not provide the quantities.

At the regional level, all unusable public assets are recorded and discarded through a public commission under the supervision of the regional delegate of public health.

For the cost-recovery supply system, the list of expired pharmaceuticals is sent to the CAPR, and a team from the CAPR comes to verify and collect the waste for eventual destruction by a regional elimination committee. For PMTCT and ART commodities, the expired ARVs and the list are taken back to the CAPR or to the district office. Respondents complained of instances when the CAPR has refused to collect expired or damaged pharmaceuticals from SDPs.

In general, respondents at SDPs did not cite any regulation or policy governing pharmaceutical waste management. Common practice at this level is for SDP staff to document the expired or damaged items in the stock card and then either carry the waste to CAPRs, in the case of ART commodities, or to the district health office, in the case of PMTCT commodities. In some SDPs, the district is responsible for collecting all pharmaceutical waste. However, according to some respondents, each SDP is responsible for handling its own pharmaceutical waste.

Contaminated waste is collected by the hospital and incinerated. Expired and damaged pharmaceutical products are collected by the district health office or transported by hospital vehicle to the district health office. At central level, the national hygiene and sanitation service (Hygiène et Salubrité du Cameroun, or HYSACAM) also collects and eliminates waste from SDPs.

The regional elimination committee is made up of the governor, CAPR pharmacist, mayor, regional pharmacist, and hospital director. FBO SDPs destroy their own pharmaceutical waste, but respondents did not indicate how the waste is eliminated.

Although some respondents have not had reason to return commodities, some of them were able to provide quantities of expired pharmaceuticals and ARVs that required reverse logistics management (table 5).

Table 5. Pharmaceutical Waste and Products Requiring Reverse Logistics Management, 2013

Product that expired at SDPs	Annual quantity	Entity to whom waste sent
ARVs	1,421 boxes	CAPR
TDF/3TC	335 boxes	
Pyrimethamine	1,000 tablets	
Abacavir 300 mg tablets	11 boxes	
Nevirapine	30 boxes	District

No formal procedure exists for disposal of unusable public assets. When a vehicle is unusable, it is parked at the premises of the SDP. An expert is invited to evaluate the asset, and the management committee of the SDP makes a decision to auction the asset. The disposal of public asset at regional hospitals is managed by regional authorities.

FBO hospitals have a team responsible for assessing the value of unusable items, which are then auctioned.

Regulation and Policies That Affect Supply of HIV and AIDS Commodities

Responses about custody of stock in the distribution channel between CAPRs, district, and SDPs varied from one SDP to another. For example, it was stated that the responsibility of CAPRs ends after the commodities are delivered to, or collected by, SDPs or district health offices. Once commodities have left CAPR warehouses, in general they no longer have custody of the commodities.

In the CBCHS PMTCT pilot project, bikers deliver commodities to the nurse (PMTCT focal point) who verifies and acknowledges receipt of the commodities.

Supply Chain Management Integration and Collaboration

According to respondents at SDPs, key logistics actors—CAPRs, RTG officers or ART SDP coordinators, district health service officers, ART site pharmacy technicians, PMTCT nurses or focal person, and maternal, newborn, and child health nurses—all collaborate to some extent in the logistics functions of quantification and ordering for applicable health programs.

Respondents who are aware of the scale-up plan estimate a maximum annual client load of 288 (at public SDPs) and 700 (at FBO SDPs) (table 6).

Table 6. SDP Respondent-Projected Annual PMTCT Option B+ Client Load

Facility	Minimum clients/year	Average clients/year	Maximum clients/year
FBO	2	185.4	700
Public	130	200.5	288

Note: Only 9 of 26 SDPs provided a response to this question.

SDPs did not identify public logistics actors as collaborators in the management of warehousing and transportation of PMTCT and ART commodities. SIAPS was identified as a technical assistance collaborator in the area of warehousing, ICAP (International Centre for AIDS Prevention and Treatment) as a partner that provides registers, and CBCHS as partner collaborating in distribution of PMTCT Option B+ commodities at sites participating in the ongoing pilot project. One private SDP mentioned ESTHER (Ensemble pour une Solidarité Thérapeutique Hospitalière en Réseau) as a partner in stock management, and CHAI as a partner in PMTCT Option B+ service delivery.

In general, management of quantification, procurement, warehousing and inventory control, transportation, and pharmaceutical waste are not integrated at any (or across) levels of the PMTCT and ART supply network. For example, each district is responsible for independently managing all PMTCT and ART logistics functions. Several entities are involved in the supply network for PMTCT and ART commodities (table 7).

Table 7. PMTCT Logistics Stakeholders and Their Responsibilities

Serial number	PMTCT stakeholder	Role
1	UNICEF	Donation of commodities, exchange of best practices, and integrated supervision
2	CHAI	Donation of equipment, training, and supervision
3	CBC Health Board	Procurement, distribution, and transportation
4	ACAFEM (Cameroon association of women doctors)	Awareness campaigns
5	SIAPS	Technical support for strengthening LMIS
7	No Limit for Woman Project (NOLFOWOP)	Technical assistance for support group
9	Ahead	Psychosocial support and awareness campaigns
11	FOVO (Association of district health facilities)	Management of damages, expired products, and security boxes

CAPRs collaborate with several entities at the regional level; however, measures have only been taken to ensure effective collaboration around quantification, and procurement and ordering. The survey did not find evidence of measures taken to ensure effective collaboration in warehousing and inventory management, and pharmaceutical waste management (table 8). Regarding supply chain information sharing, all CAPRs (100%) share ARV stock-out lists with CENAME, RTGs, and NACC. This information is not shared with any of the donors and partners (table 9).

Table 8. ART and PMTCT Commodities Supply Management Collaborating Entities

Supply function	Collaborating supply chain partner(s) identified by CAPRs	Measures taken to ensure collaboration
Quantification	District Health Service, RTG, Direction de la Pharmacie, du Médicament et Laboratoire, Direction de la Santé Familiale, SDP, Conseil National de Lutte contre le SIDA, PMTCT focal point, CBCHS	National procurement coordination unit meetings
Procurement and ordering	CENAME, CTG, RTG, DLM, Direction de la Pharmacie, du Médicament et du Laboratoire, Direction de la Santé Familiale, Conseil National de Lutte contre le SIDA, PMTCT focal point	National procurement coordination unit meetings
Warehousing and inventory management	RTG, PMTCT focal point, other CAPRs	Use of LMIS software, e.g., SARI
Distribution and transportation	CENAME, transport agencies, District Health Service, SDP	No information provided by respondents
Pharmaceutical waste management	District Health Service, SDP, pharmaceutical waste elimination committee, management committee (council of community health providers, FBOs, private pharmacies); Direction Regional de la Santé Publique, Gendarmerie, Urban Community Administration, Pharmacy Council of Cameroon	No information provided by respondents

Table 9. Logistics Information Sharing between CAPRs and Other Supply Chain Entities

Type of logistics information/entity with whom information is shared	CENAME	NACC/RTG	DPML	District health office	SDP	Donors (e.g., Global Fund, PEPFAR)	HIV and AIDS technical partners
Annual quantities of HIV and AIDS commodities	50% no	75% no	75% no	50% no	75% no	100% no	100% no
CAPR procurement plans	75% yes	75% no	100% no	100% no	75% no	100% no	100% no
New arrivals of HIV and AIDS commodities at CAPR	100% yes	100% yes	75% no	75% no	75% yes	100% no	100% no
Stock-out items list	100% yes	100% yes	50% no	50% no	75% yes	100% no	100% no
Distribution/transportation plan	50% no	75% yes	100% no	50% no	75% no	100% no	100% no
Warehousing and transportation costs incurred by CENAME	100% no	100% no	100% no	100% no	100% no	100% no	100% no

Note: Yes = information is shared with entity; no = information is not shared with entity.

Patient Safety

According to respondents, CAPRs do not have any direct role in medicine use surveillance; therefore respondents were not aware of any costs associated with pharmacovigilance.

At the district level, respondents cited patient booklets, SDP registers, and activity reports as surveillance support systems. One respondent at the district level indicated that “all information on patient safety is at treatment centers”; however, SDPs are expected to prepare monthly notifications of adverse events. The average annual cost of pharmacovigilance at the district office as reported by respondents is about XAF 450,000.

Regarding adverse event reporting, SDPs complete pharmacovigilance forms, which are transmitted to CAPRs. Responses at SDPs about medicine use surveillance were varied, and it is not clear what type of medicine use surveillance system exists. Although some respondents said no defined medicine use surveillance system is in place, others described a system that includes pharmacovigilance forms that are provided to SDPs for documentation of problems. Ministry of Health staff go round regularly to collect these forms for analysis. In general, the patient verbally alerts the pharmacy attendant about any undesirable effects. Medicine use problems are handled by doctors at the SDP. Adverse events reported by SDPs are compiled at the regional delegation of health and transmitted to the department of pharmacy in the Ministry of Health (Direction de la Pharmacie, du Médicament et du Laboratoire). In situations of dispensing error, respondents

said telephone numbers are retrieved from client files and used to invite clients to return to the SDP.

One respondent mentioned that in case of undesirable effect at the PMTCT site, it is expected that the client will be sent to the ART site (UPEC).

One FBO hospital mentioned the existence of a six-member therapeutic committee that evaluates records of patients experiencing undesirable effects of medicine use. However, this committee does not have standard forms for documenting adverse medicine effects reported by patients.

Security Measures in the Supply System

Measures taken by CAPRs to secure HIV and AIDS commodities during warehousing and transportation include use of locked carriages during transportation, security guards, restricted entry to the warehouse, guard dogs, antitheft protective fences, and availability of fire extinguishers in the premises. Two of four CAPRs have installed surveillance cameras and alarm systems.

Most common security measures in use by 60% to 80% of the districts surveyed include locking transport vehicles in transit, using security guards, restricting entry to warehouses, and installing external lighting. Other security measures such as surveillance cameras, GPS, and alarm systems are not in use in many of the districts surveyed.

According to respondents, various security measures are employed in the logistics system at SDPs (figure 7).

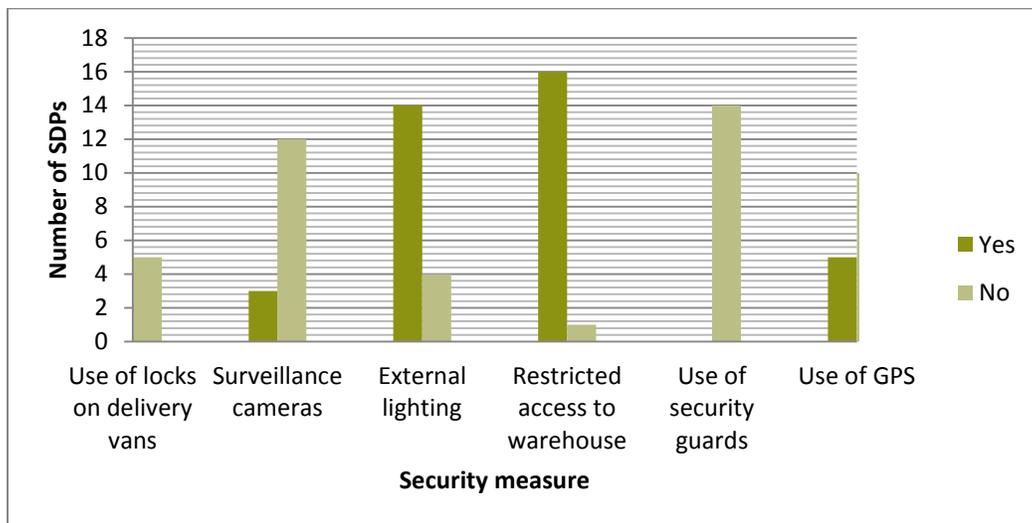


Figure 7. Security measures at SDPs

Performance of Public Health Supply System

On average, inventory turnover rate at CAPRs for all categories of commodities is 1.5 (table 10). The prescription fill rate in 2013 at SDPs reported by survey respondents was 87%, with a minimum fill rate of 60%. According to respondents at CENAME, order fill rate in 2013 was about 80%.

Table 10. Inventory Turnover Rate at CENAME and CAPR Centre, Littoral, Northwest, and Southwest, 2013

Formula/Supply chain entity	CENAME (2012)	CAPR Centre (2012)	CAPR Littoral	CAPR Northwest	CAPR Southwest
Sales revenue/average inventory valued at selling price	1.11	2.27	1.01	1.58	1.21
Cost of goods sold/average inventory valued at cost	2.31	1.87	1.00	1.41	1.16

Productivity was measured by inventory turnover rate, which was found to vary in the supply system, with the highest productivity recorded at CENAME in 2012. In 2013, CENAME and the four CAPRs surveyed were not able to fill about 10% to 20% of consumer orders. Some of the SDPs experienced stock-outs in 2013 and could not fill about 40% of prescriptions.

Asset turnover at CENAME and CAPRs, based on 2013 financial data, is shown in figure 8.

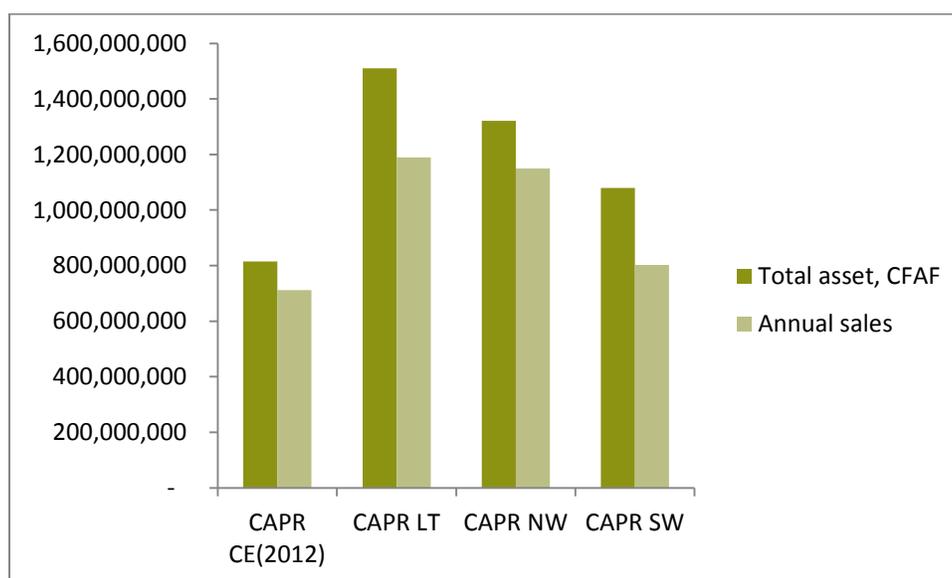


Figure 8. Asset turnover at CAPR Centre, Littoral, Northwest, and Southwest, based on 2013 balance sheets

Asset utilization at CENAME is 0.7, and ranges from 0.74 to 0.89 at the four CAPRs surveyed. Based on 2013 financial balance sheets, there is about 11% to 27% inefficiency in asset management at the public health supply entities surveyed.

The average annual warehousing, inventory management, and overhead cost per cubic meter of storage space at CAPRs in 2013 is about XAF 148,110. At, CENAME this cost is about XAF 1,066,900.

Table 11. Supply Chain Management Costs in Public Health Supply System

CAPR	Average inventory value (XAF), 2013	Staff cost	Transport cost	Total supply chain management cost
CAPR CE (2012)	286,636,461	37%	6%	103.8%
CAPR LT	444,140,734	22%	2%	69.1%
CAPR NW	545,148,105	22%	2%	68.4%
CAPR SW	250,485,389	31%	2%	62.9%
CENAME	4,486,590,849	12%	2%	240.0%

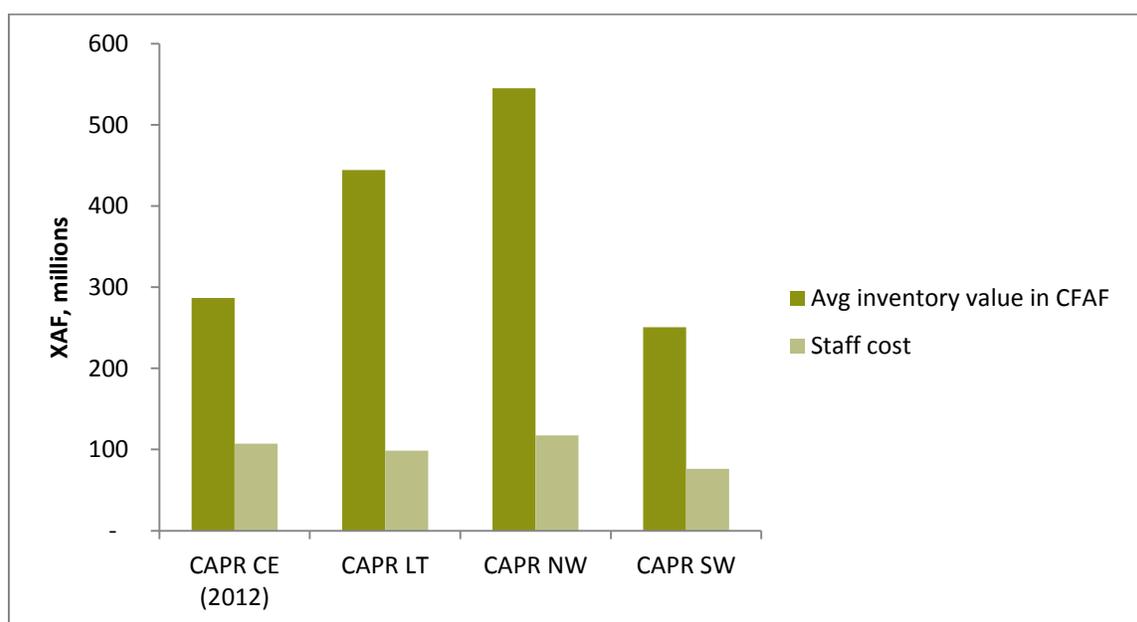


Figure 9. Staff and transport costs in 2013 at CAPRs were about 30% of average inventory value

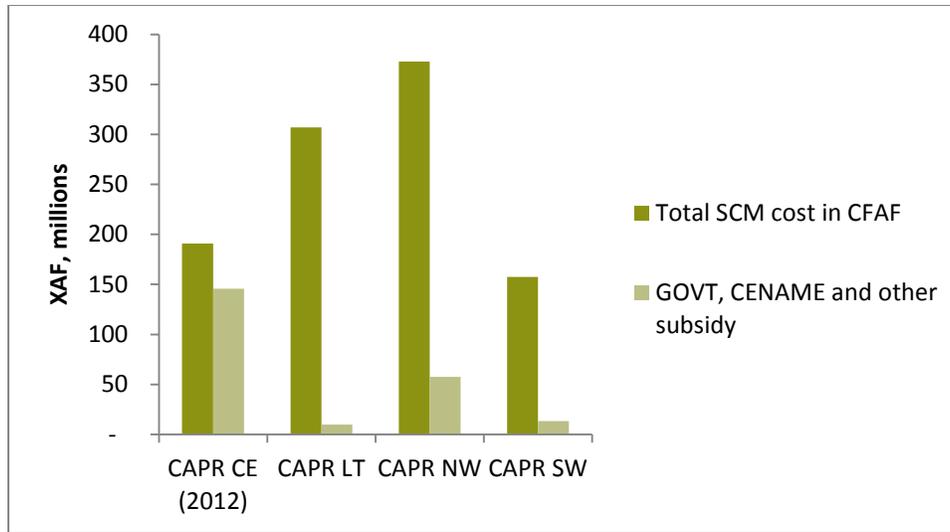


Figure 10. Financial subsidy received by CAPR Centre, Littoral, Northwest, and Southwest, 2013

Though CAPRs receive financial subsidies from government through CENAME and other sources, the amount is negligible compared to their overall supply chain management (SCM) costs (figure 10). Therefore, CAPRs are able to run because of user fees collected in the cost-recovery program.

Capacity of Private Logistics Service Providers

The capacities of seven private sector logistics providers were assessed. The assessment examined storage, transport, and pharmaceutical waste disposal capacities. The entities surveyed include DHL, MTA, UPS, Solex, Laborex, Ubipharm, and GMS. Some of these entities have storage capacity that is comparable to that of some of the CAPRs surveyed and have better transport capacity; for example, one of the providers has 12 delivery trucks up to 15 tons and 4 that are above 15 tons. Details of private sector logistics service provider capacities are included Annex 3.

Based on the results of the assessment, the private sector has logistics service capacity that can be used by the public health supply system. This capacity is currently only minimally utilized by the public health supply system.

SUPPLY SYSTEM STRENGTHENING OPTIONS ANALYSIS

Results of the assessment show that the public health supply system in Cameroon is made up of two parallel systems: the *cost-recovery supply system*, by which essential medicines and other health commodities and FMNCH commodities are supplied at a fee, and the *priority public health program supply system*, in which PMTCT and ART commodities are supplied free of charge.

Cost-Recovery Supply System

The cost-recovery supply system, based on 2013 financial data obtained from CENAME and the four CAPRs surveyed, is delivering essential medicines, including FMNCH commodities, to health facility pharmacies. However, the asset turnover rate range of 0.73 to 0.89 and the average inventory turnover rate of 1.5 point to operational inefficiency and suboptimal productivity in the system. Therefore, putting into practice corrective measures to improve efficiency and productivity in logistics operations at CENAME and the CAPRs would enhance effectiveness of this system.

Regarding interventions to improve efficiency and productivity in the cost-recovery system, attention should be given to logistics functions that had very high costs in 2013. For example, the cost category in this analysis that is labeled “warehousing, inventory management, and overhead” was XAF 1,066,900 per cubic meter at CENAME and XAF 148,110 per cubic meter on average at CAPRs. Considering scale of operations at CENAME and the CAPRs, the operational costs per unit of storage volume is expected to be lower at CENAME because of economies of scale; however, this is not the case. In fact, results of this survey show about the same number of administration and finance personnel at CENAME and the four CAPRs surveyed as personnel that are designated as storekeepers, drivers, and security guards.

Possible interventions to improve efficiency and productivity in the cost-recovery supply system include the following:

- *Logistics infrastructure:* CENAME and the CAPRs do not have adequate MHE. Use of MHE will allow storage above 2.5 meters in height, thereby increasing efficiency, and will also lead to increased productivity. An analysis of storage space requirements for 2014–2017 forecast quantities of PMTCT and ART commodities, including HIV laboratory supplies, and family planning commodities, shows that these commodities will take up about 50% of the total storage space available at CENAME (table 12). This is based on CENAME’s inventory holding practice of a 12-month supply (i.e., maximum stock level). However, if MHE is used, the total storage space taken up by these commodities would be reduced by about 20% to 25%.

Table 12. Projected Storage Volume Requirements for HIV/AIDS and Family Planning Commodities, 2014–2017

Product group	2014	2015	2016	2017
ARVs PMTCT	50	76	132	198
ARVs ART	857	887	979	1,068
Laboratory reagents and supplies (without HIV RTKs)	1,548	1,495	1,728	1,859
HIV RTKs	94	94	110	118
OI medicines	539	601	663	724
Family planning	1,681	1,681	1,681	1,681
Total volume (cubic meters)	4,769	4,834	5,293	5,648

OI = opportunistic infection; RTK = rapid test kit

- *Inventory replenishment:* CENAME is the major (sometimes sole) supplier for CAPRs; therefore a new inventory replenishment systems such as vendor-managed inventory replenishment could be explored. This system has several advantages, including better supply network visibility and increased responsiveness. This system is potentially beneficial for the cost-recovery system.
- *Availability and use of logistics data for decision making:* Though CENAME and the CAPRs all use electronic inventory management systems, these systems are not linked and little or no information is shared between supply system’s central and peripheral levels. There is great potential benefit in introducing an eLMIS system that links CENAME, the CAPRs, and health facility pharmacies and in exploring options to integrate logistics management of priority public health program commodities into one eLMIS.
- *Distribution and transportation:* Fleet capacity is weak at CENAME and the CAPRs, and transportation management systems are lacking. Additional delivery trucks, along with introduction and effective use of a reliable transport management system, will significantly contribute to increased efficiency and productivity.
- *Human resources for logistics management:* About 40% of staff at CAPRs who have been performing various logistics functions in the two years preceding this assessment are not trained in those functions. Capability-building programs for staff working at CENAME and CAPRs in key functional areas of logistic would enhance productivity.
- *Reverse logistics and pharmaceutical waste management:* Not all CAPRs have product recall forms, and reverse logistics procedure is not systematically followed in the supply system. This problem is more pronounced in the priority public health supply system, including PMTCT and ART commodities.

No standard procedure and facilities are in place for elimination of pharmaceutical waste. This problem is more pronounced at peripheral levels. Implementing effective

pharmaceutical waste management, including waste minimization strategies and elimination, would contribute to supply system efficiency and productivity.

- *Supply chain management integration/collaboration:* Although CENAME manages warehousing and transportation of commodities in the cost-recovery supply system and in the priority public health supply systems and the CAPRs manage only warehousing, these supply chain operations are not integrated. Each supply system at all levels has dedicated warehouses, and inventory management is disjointed. This situation is also reflected in the way the respective supply chain partners perform their roles; joint planning of key supply chain functions affecting cost recovery is limited, including for family planning commodities and priority public health commodities.

One impediment to integration of these two systems is the policy of providing PMTCT and ART commodities free of charge. A policy that introduces a symbolic fee for PMTCT and ART commodities would be helpful to allow integration with the cost-recovery supply system and the attendant benefit of more reliable supply of all essential medicines including PMTCT, ART, and FMNCH commodities.

In the immediate term, CENAME and the CAPRs should reevaluate SCM of FMNCH and priority public health programs, including PMTCT and ART, to ensure quantification, procurement, warehousing, inventory management, and transportation all adequately benefit from the expertise that is deployed in the cost-recovery supply system.

Regarding family planning commodities, UNFPA is the major procurer and donor. In 2013, for example, CENAME did not procure any of these commodities. Though CENAME received, and supplied through the cost-recovery supply system, donated family planning commodities, the total quantities distributed in the last 12 months could not be provided at the time of this survey; data used for this analysis were obtained from UNFPA (see annex 2). Integration of inventory management of these commodities into the cost-recovery supply system would facilitate access to logistics data and enhance supply decision making.

- *Patient safety:* According to staff who participated in this assessment, no defined medicine use surveillance system is in place. However, adverse events reported by SDPs are compiled at the regional delegation of public health and then transmitted to the department of pharmacy (DPML) of the Ministry of Health. This system needs strengthening to ensure more reliable and timely transmission of data to experts who can address medicine use issues.
- *Security measures in the supply system:* Though most of the warehouses surveyed have instituted rules restricting entry, they have neither surveillance cameras nor security guards. It is important to implement more effective security measures at warehouses in the supply system.

PMTCT and ART Supply System

Relative to the cost-recovery supply system, the PMTCT and ART supply system is disorganized at regional level, which involves CAPRs, district health offices, and SDPs. At this level, there are inadequate logistics resources and poorly defined procedures, making the “last mile” the weakest link in the current PMTCT and ART supply system.

SCM’s broad objective is to ensure continuous availability of medicines and other health commodities at SDPs. Therefore, it is important that concrete arrangements are made, including sufficient resources for managing logistics systems that move supplies from port of entry to SDPs. This is not the case for PMTCT and ART commodities supply in Cameroon. One major barrier to reliable supply of these commodities is inadequate funding, which since 2011 has resulted in perpetual shortages of ARVs, resulting in some of the SDPs surveyed being unable to fill prescriptions, with a high of about 40% unfilled prescriptions in some situations. It is crucial that government and donors find additional funds to ensure procurement of adequate quantities of PMTCT and ARV commodities.

Regarding the supply network for these commodities, several weaknesses are described from the results of this report, as described in the baseline supply system section. Based on results of this assessment, three possible options have been identified for strengthening the PMTCT and ART supply system between CAPRs and SDPs. These options are as follows:

- Option 1: Continue using the current supply system of PMTCT and ART commodities (see figure 1). In this system, districts and/or SDPs collect commodities from CAPRs.
- Option 2: Institute direct delivery of PMTCT and ART commodities to SDPs by CAPRs. In this option, districts and SDPs are not involved in transportation of PMTCT and ART commodities; instead, CAPRs warehouse and transport these commodities in the same manner as for the cost-recovery supply system.
- Option 3: Institute direct delivery of PMTCT and ART commodities to SDPs by private logistics service provider.

To facilitate decision making about which option to implement as part of efforts to strengthen the supply system and enable achievement of PMTCT Option B+ scale-up targets and to ensure supply of ARVs for the ART program, costing and analysis of the three options were carried out. For each option, the analysis takes into consideration (a) total storage space that will have to be managed in the entire network, (b) total annual distance that will be traveled for delivery of commodities, (c) total number of FTE human resources, and (d) total supply chain cost. The results of the analysis are shown in figure 11.

Figure 11 compares the three options with the baseline (current) PMTCT and ART supply system, in which districts and SDPs all collect commodities from CAPRs and deliver to SDPs.

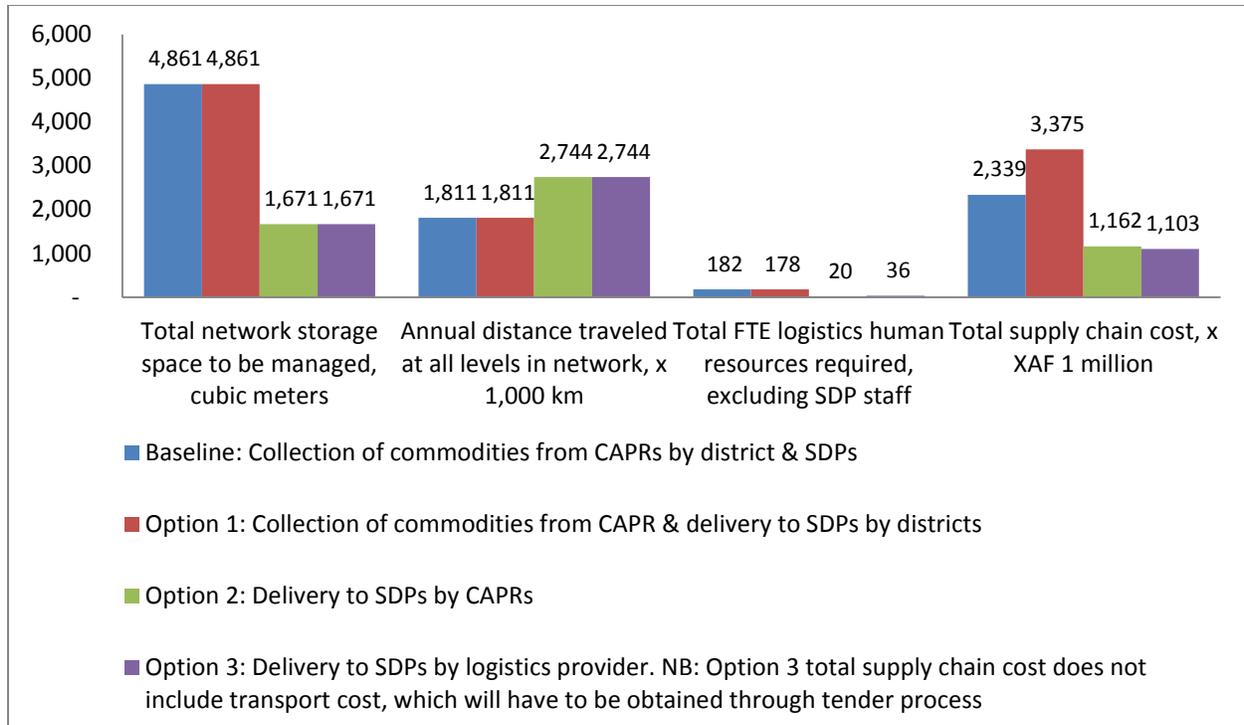


Figure 11. PMTCT and ART supply options analysis

In the baseline option, total storage space in the network supplying PMTCT and ART commodities at CENAME, CAPRs, and districts is about 4,861 cubic meters, assuming a usable maximum height of 2.5 meters in the absence of MHE.

Option 1

This option is to strengthen the existing PMTCT and ART supply system. Weaknesses in the current system will have to be addressed if option 1 is selected as the preferred option for strengthening the supply system for delivering commodities for these programs. These weaknesses include lack of funding for transportation of PMTCT commodities between CAPRs, districts, and SDPs and of ART commodities between CAPRs and SDPs. Logistics management capacity at district level is particularly weak or lacking. For example, only 1 of 10 districts surveyed in four regions has one logistics pickup truck and that is over 15 years old. Therefore, a 2.5-ton truck will be required at each of 86 districts to ensure collection of commodities from CAPRs and delivery to SDPs in the four regions surveyed. Also, the flows of commodities and logistics information between CAPRs, districts, and SDPs for PMTCT and ART programs are complicated. The LMIS is very weak or nonexistent. Data, including logistics costs, are not systematically captured. For example, no system is in place to track PMTCT and ART commodities at district and SDP levels, evidenced by the fact that respondents at these levels could not provide annual quantities of commodities distributed or dispensed, logistics costs, client numbers, and logistics performance. Therefore, a strong LMIS that connects all levels of the logistics system and introduction of SCM manuals accompanied by training and supervision are key interventions to accompany this option.

The total annual supply chain cost for strengthening and managing the PMTCT and ART supply system is about XAF 3,375,653,300 (USD 7,088,872). This total cost includes warehousing, transportation, and staffing costs at CENAME, CAPRs, and districts in the four regions surveyed. SDP logistics costs are not included in the cost analysis because they will be the same for all three options. More details, including cost factors used in the analysis, are shown in annex 4.

Option 2

In option 2, PMTCT and ART commodities are integrated into cost-recovery supply system at the level of CAPRs and then directly delivered by CAPRs to SDPs. The total supply chain cost for this option is about XAF 1,162,120,100 (USD 2,440,452). Districts, RTGs, and PMTCT focal persons will no longer handle PMTCT and ART commodities. Therefore, the LMIS will be reorganized and simplified. Logistics information will flow between SDPs, CAPRs, and CENAME as is the case in the cost-recovery program. The NACC and its RTGs, PMTCT focal persons, and district health service officers will no longer collect logistics data from SDPs, but will only communicate only with SDPs and CAPRs regarding overall supply chain performance and for purposes of forecasting requirements and communicating new protocols or information affecting PMTCT and ART logistics (see figure 12).

Direct Delivery by CAPRs: PMTCT option B+ and ART commodities

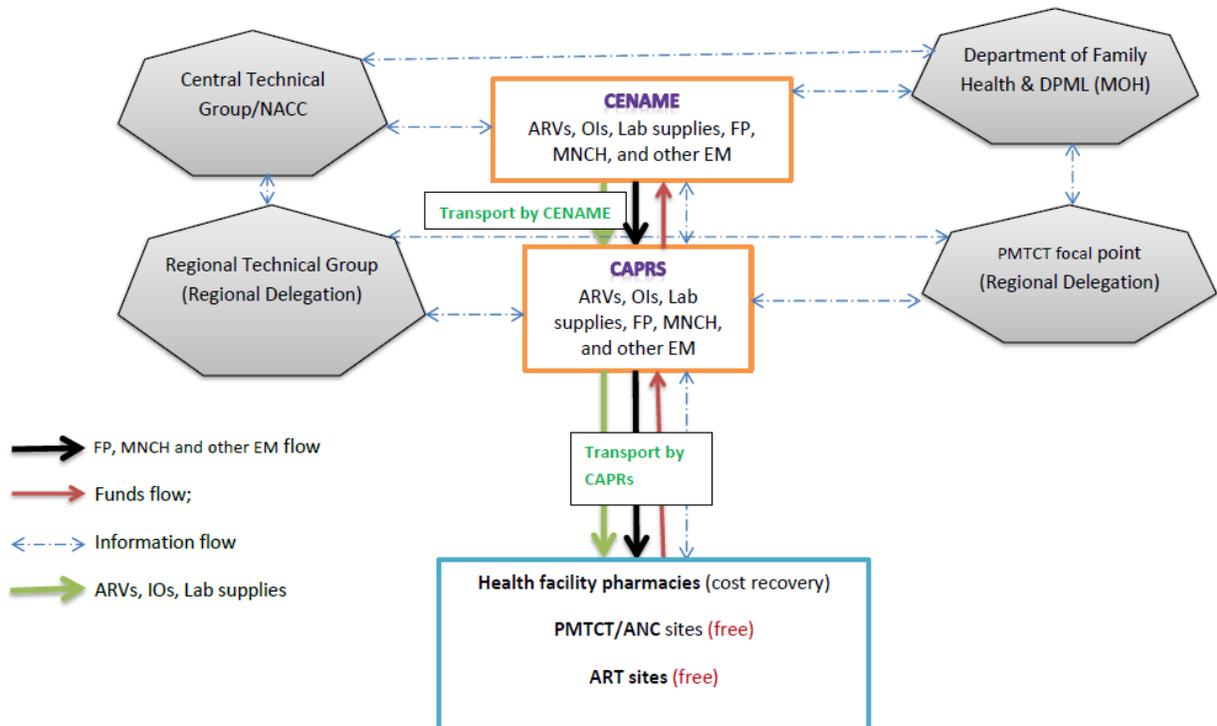


Figure 12. Option 2: Direct Delivery of PMTCT and ART commodities to SDPs by CAPRs

CENAME continues to warehouse and transport these commodities to CAPRs, and then CAPRs will not only warehouse the commodities but will also transport them to all SDPs, as is the case under the cost-recovery system. Additional transport trucks and staffs will be required to handle increase commodity volumes in the PMTCT and ART scale-up scenario.

Option 3

This option is similar to option 2, except that transportation of PMTCT and ART commodities to SDPs is contracted out to private sector logistics service provider(s). Partial total supply chain cost, which does not include transport cost, is about XAF 1,103,792,100 (USD 2,317,963). This total cost figure will increase once a transport quote is obtained from the private logistics providers and added.

Direct Delivery by private Logistics service provider: PMTCT option B+ and ART commodities

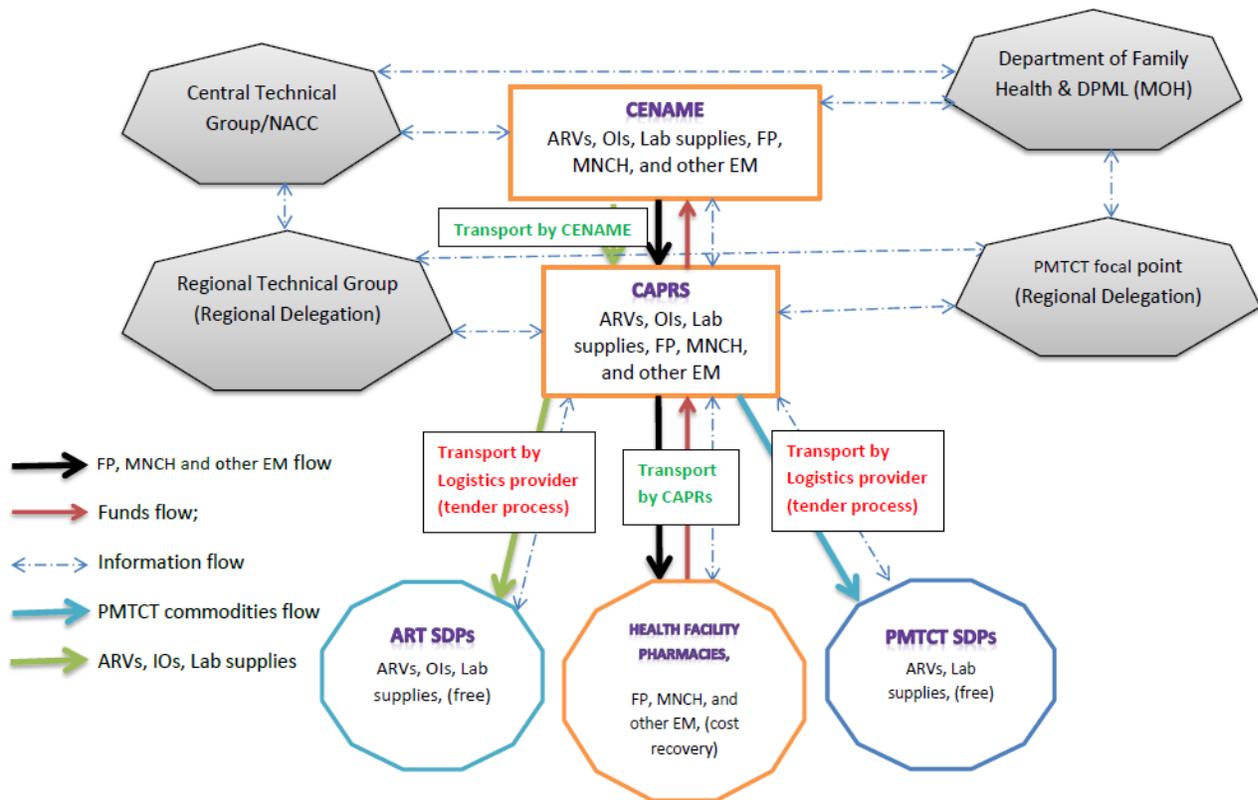


Figure 13. Option 3: Direct delivery to SDPs by private logistics service providers

Based on findings from the survey, logistics capacity exists in the commercial private sector that can serve the public health supply system. The entities surveyed include DHL, MTA, UPS, Solex, Laborex, Unipharm, and GMS. Some of these entities have storage capacity that is comparable to that of some of the CAPRs surveyed and have better transport capacity—for example, one of the providers has 12 delivery trucks up to 15 tons and 4 that are above 15 tons.

*Supply Chain Options Analysis:
PMTCT Option B+, Family Planning, Maternal, Newborn, and Child Health Commodities*

Details of private sector logistics provider capacities are included annex 3. However, in this option, CENAME will continue to warehouse and transport PMTCT and ART commodities to CAPRs, but CAPRs will only warehouse the commodities, and then the private logistics service provider will transport the commodities directly to SDPs. The districts and RTGs and PMTCT focal persons will handle neither commodities nor logistics data. The CAPRs will manage the contract with the private logistics service provider.

RECOMMENDATION

Option 2 is recommended for consideration by the Ministry of Health and its partners as a suitable option to strengthen the public supply system for effective distribution of PMTCT and ART commodities, especially in a scale-up scenario requiring larger quantities of these commodities. It will allow supply of PMTCT and ART commodities in about 1,056 SDPs across 86 districts in four regions. The annual resource requirements and total supply chain cost for implementing option 2 is XAF 1,162,120,100 (USD 2,440,452). More information about this and other possible options is provided in figure 11 and annex 4. This option is more cost-effective compared to the current supply system, option 1, and option 3; total supply chain cost of option 3 will increase once transport quotes are obtained from private sector logistics providers through tendering process.

Justification

- The current PMTCT and ART supply system is disorganized at subregional level, and there are many levels in the supply network has many levels. Total supply chain cost is very high for the current supply system, because total storage space required across all levels in the supply network is 4,861 cubic meters, compared with only 1,671 cubic meters that is in use at CENAME and the CAPRs (about a 66% reduction in total network storage space currently being managed). Considering that warehousing and staffing costs are significant cost factors, as seen in the cost-recovery supply system, this reduction will translate to about 50% cost savings for MOH.
- Optimal storage space required at CENAME to store PMTCT and ART commodities, considering 12 months' maximum stock level, corresponds to the volume equivalents of the annual forecast quantities shown in table 12.
- Currently, only 664 cubic meters of storage space (considering 2.5 meters usable height because of lack of MHE) is set aside at CENAME for PMTCT and ART commodities. Therefore, if funding is available to procure the required quantities of ARVs for PMTCT and ART programs, the current storage space dedicated to these commodities at CENAME will be inadequate. However, by increasing operational efficiency at CENAME, including better storage space utilization as a result of use of MHE, storage space will not be an issue.

CAPRs are expected to hold six months' maximum stock. Therefore, if the full forecast quantities of ARVs for these programs are financed, the current storage capacity dedicated to PMTCT and ART commodities at the four CAPRs surveyed will be adequate.

- The total annual distance to be travelled for distribution of commodities has cost and environmental implications that should be considered in the design and management of supply networks. Distance analysis is shown in annex 6. Transportation cost drivers include fuel prices, truck carriage space utilization, and total distance over which goods are transported. In settings where road conditions are poor and fuel prices are high, transport

costs generally increase with distance. The baseline and option 1 total annual distances to be travelled for delivery of commodities are about 65% lower than the total annual distances for options 2 and 3 (figure 11). However, because of high warehousing and staffing costs, the total supply chain cost for option 2 will be about 50% cheaper than the current supply system.

- In options 2 and 3, commodities will be transported to the same SDPs that are currently served by CAPRs in the cost-recovery supply system. Therefore, efficiency gains will definitely lessen transport cost increases because increased volumes after integration of PMTCT and ART commodities. Given the increased volumes to be transported by CAPRs, it will be crucial to supplement the transport capacity of CAPRs to ensure reliable delivery of commodities to SDPs. The cost of eight 2.5-ton delivery trucks has been included in the costing of option 2 shown in figure 11 and annex 4.
- Considering the cost-recovery system is effective, albeit with some inefficiencies and suboptimal productivity, it makes sense to consider integrating supply of PMTCT and ART commodities into this system.
- There is no justification why staff at SDPs and district stores should spend significant amounts of time filling in paper-based tools such as monthly activity registers, stock cards, and stock management registers, given that these data is not used for logistics decision making. In fact, data collection is a heavy burden on SDP staff, and to some extent data collection is duplicative. This introduces inefficiencies in the logistics system and contributes to increased supply chain costs. For example, in the supply network for PMTCT commodities, SDPs collect consumption data that is aggregated at the district level before transmission to the regional PMTCT focal person and on to NACC. For PMTCT and ART, no evidence was found in this survey indicating use of logistics data for decision making; supply is mainly based on availability of stock at the national level, and transportation arrangements, funding, and communication are all managed haphazardly.

Option 2 Initial Investment, Excluding Staff Salaries

Logistics costs at SDPs were not included in the analysis because these costs will be the same for all options. However, these costs will have to be included in the costing of initial investments and recurrent costs to implement the preferred option.

For option 2, the initial investment in year 1 to support PMTCT and ART supply chain, not including staff salaries, is XAF 6,432,602,800 (USD 12,733,000). Details are provided in Table 13.

Table 13. Initial Investment to Implement Option 2, Excluding Staff Salaries

Supply chain cost description	Cost, XAF	Cost, USD*
Total cost of warehousing, inventory management, and overhead at CENAME and transport (fuel and vehicle maintenance) to four CAPRs	716,022,100	1,503,650
Total cost of warehousing, inventory management, and overhead at four CAPRs and transport (fuel and vehicle maintenance) to about 1,056 SDPs	156,918,000	329,550
Cost of additional transport trucks (one heavy-duty truck for CENAME and eight 2.5-ton trucks for four CAPRs)	195,000,000	409,500
Total warehousing, inventory management, and overhead at about 1,056 SDPs; this assumes unit costs similar to those at CAPRs of XAF 148,110 per cubic meter, and average storage volume similar to average district storage capacity of 34.3 cubic meters	5,364,662,700	11,265,800
Total excluding staff salaries	6,432,602,800	12,733,000

* September 15, 2014, Oanda conversion rate from XAF to USD was XAF 505.9 = USD 1.

More details about cost factors that have been taken into consideration for calculating initial investment for option 2 are available in table 1 of the report.

Option 2 Recurrent Costs

Recurrent Costs as a Percentage of Product Value, Estimated Based on 2013 Financial Data

According to 2013 financial statements of CENAME and the four CAPRs surveyed, recurrent costs are on average about 42% of the inventory value (table 11). This covers procurement, warehousing, inventory management, and transport costs. However, based on the asset turnover rates at these institutions, the public health supply system demonstrates on average 20% inefficiency in logistics operations. Provided interventions for improving efficiency and productivity are implemented, the 2013 recurrent cost rate of 42% may be progressively cut down beginning in year 2 with potential to eliminate 20% inefficiency costs. Eventually, the recurrent costs rate may be cut to about 22% of product value by year 3 of implementation of option 2, including efficiency and productivity-enhancing interventions as recommended by this report. Interventions for improving efficiency and productivity are described in this report under the section “cost-recovery supply system.”

Evidence from other analysis shows logistics costs in Latin American Countries ranging from 18% to 35% of product value (Guasch 2011). Incomplete infrastructure and lack of competition among logistics providers were identified as contributing factors to high logistics costs. The rate was 9.5% in the United States and 8.5% in Singapore, two settings that have more developed logistics infrastructure and efficient logistics operations.

Option 2 Estimated Absolute Recurrent Logistics Costs for Year 2, Based on 2015 Forecast Quantities of Commodities

Absolute recurrent costs for year 2 of implementation of option 2 have been estimated using cost factors identified in this analysis and quantities of PMTCT and ART commodities forecast for 2015 (see NACC 2014–2017 quantification report). The total estimated recurrent cost for the entire supply system to deliver PMTCT and ART commodities in year 2 are about XAF 6,276,307,400 (USD 12,406,500).

Table 14. Logistics Costs based on 2015 Forecast Quantities of PMTCT and ART Commodities

Commodities	2015 national projected storage volume requirement* (m ³)	Volume requirement per unit HIV prevalence** (m ³)	2015 projected storage volume requirement in 4 PEPFAR-supported regions,** (m ³) [a]	Year 2 warehousing, inventory management, and overhead cost = [a] × unit costs*** (XAF) [CENAME = 1,066,900/m ³ ; CAPRs = 148,110/m ³]		Year 2 annual transport cost [fuel + maintenance]; considering inventory turnover rate = 1 (based on 2013 data)		Total
				CENAME	4 CAPRs	CENAME	4 CAPRs	
PMTCT ARVs	76	2	31	33,073,900	4,591,410	348,866	48,024	38,062,200
ART ARVs	887	19	415	442,976,880	61,495,272	4,670,300	642,900	509,785,351
HIV RTKs	94	2	44	46,943,600	6,516,840	495,165	68,163	54,023,767
OI medicines	539	11	252	269,178,870	37,368,153	2,835,941	390,387	309,773,351
Total CENAME + 4 CAPRs	1,596		743	792,173,250	109,971,675	8,350,271	1,149,474	XAF 911,644,700 (USD 1,914,455)
Total year 2 recurrent cost for about 1,056 SDPs same as year 1 (see table 13). Though PMTCT will be scaling up, the ART program will continue to operate at scale, requiring continuous delivery of commodities to all SDPs.								XAF 5,364,662,700 (USD 11,265,800)

* Based on NACC quantification report (2014); see table 12 in MSH/SIAPS PMTCT B+ supply chain options analysis report (2014).

** Estimates take into consideration regional HIV prevalence in general population (DHS 2011) and regional HIV positivity rate in pregnant women (GTC-CNLS 2013); table 15 below.

*** Warehousing, inventory management, and overhead unit costs per cubic meter at CENAME and CAPRs are shown in annex 4 of the supply chain options analysis report.

Table 15. HIV Prevalence in General Population and Positivity Rate among Pregnant Women in Cameroon

Region	HIV prevalence (%) in general population, DHS 2011	HIV positivity rate (%) in pregnant women, Annual report, GTC-CNLS, 2013
Adamaoua	5.1	6
Center	6.1	5.9
East	6.3	6.1
Extreme North	1.2	2.3
Littoral	3.9	4.2
North	2.4	2.7
North West	6.3	4.2
South	7.2	6.5
South West	5.7	5.4
West	2.8	5
Total (national)	47	48.3
Total (PEPFAR-supported regions)	22	19.7

Sources: DHS 2011 and GTC-CNLS 2013.

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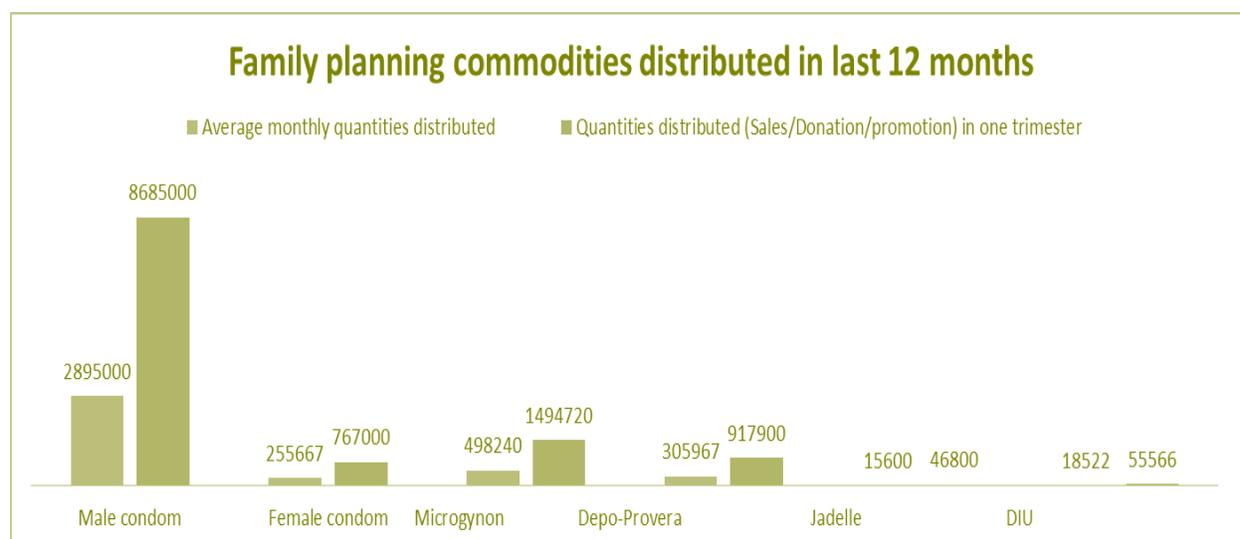
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ANNEXES

Annex 1: Generic List of FMNCH Commodities

Family planning commodities	Maternal health commodities	Newborn health commodities	Child health commodities
Emergency contraceptive pills	Magnesium Sulfate	Antenatal Corticosteroids	Amoxicillin
Female condoms	Misoprostol	Chlorhexidine	Zinc
Contraceptive implants	Oxytocin	Injectable antibiotics	Oral rehydration salts
		Resuscitation equipment	

Annex 2: Family Planning Commodities Distributed in Last 12 Months⁴



⁴ Data provided by UNFPA.

Annex 3: Private Sector Logistics Capacity

Entity/ resource	Total storage space	Mechanized MHE (type and number available)	LMIS (paper or electronic system)	Transport fleet capacity	Pharmaceutical waste disposal facilities	Integration of SCM functions	Experience handling pharmaceutic als	National network/cover age
DHL	Indicates having enough space but without precision	Lystere, chariot, transpalette	Use tracking system (not precise) and don't manage stock	None but can invest if needed	None	Storage, transport	Yes, vaccines and medicines for SANOFI	Regional capitals and various towns along the way to capital cities
MTA	50 cubic meters (25 in regions and 25 in departments)	Nothing written	Paper and electronic	<6 tonnes=12; < 15 tons=12; >15 tons=4; trucks with fridge=2	None but waste disposal with customer agreement	Transport management, inventory management, and sometimes storage	Yes, medicines and vaccines	Capitals of all 10 regions and Far North and South departments
UPS	Subcontract when needed	Chariot, elevateur, transpalette	Paper and electronic	6 tons= 3; 15 tons=2; 15 tons= subcontract	None	Storage, Transport, inventory management	Yes but just mentioned medicines and saliva for DNA tests	Regions: Centre, Littoral, Southwest, and elsewhere with subcontracts
Solex	None	Transpalette and weighter	Paper and electronic	6 tons = 5; 15 tons=6; > 15 tons=0; trucks with fridge=0; tricycles and motorcycles	None	Transport	Yes medicines for CENAME and vaccines for WHO	Capitals of all 10 regions and subcontracts in the departments were absent

Entity/ resource	Total storage space	Mechanized MHE (type and number available)	LMIS (paper or electronic system)	Transport fleet capacity	Pharmaceutical waste disposal facilities	Integration of SCM functions	Experience handling pharmaceutic als	National network/cover age
Laborex	Central level: 37.5 cubic meters; Branch: space not specified	Chariot pouvant eleve la charge 12 m du sol, transpalette	Electronic (software AS400)	2 big trucks, 2 cars coaster, 2 cars Hiaces, 18 pickup Toyota Hilux (avec fourgon)	Contract with GMC (Groupe Marine Cameroun)	Storage, inventory, management, transport	All pharma- ceuticals with exclusion of those needing cold chain	4 satellites in Douala for Littoral and SW; Yaoundé for Centre, South and East; Bafoussam for west, and NW; Garoua for Adamawa, North and Far North
Ubipharm	Douala: 50 cubic meters Yaoundé: 20 cubic meters Ngaoundéré: 20 cubic meters	Chariot, transpalette	Electronic	3 tons × 19= 57 tons	Yes	Inventory management	All pharmaceutic als including those needing cold chain	3 satellites in Douala, Yaoundé and Ngaoundéré. Covers all the country
GMS	12 square meters/ 18 cubic meters	Chariot elevateur, transpalette	Paper	6 tons= 2; 15 tons=1; 15 tons=0	No, work with local Council	Storage, transport, management	Products related to malaria mass campaign	Ten regions and 12 departments

*Supply Chain Options Analysis:
PMTCT Option B+, Family Planning, Maternal, Newborn, and Child Health Commodities*

Annex 4: Public Health Supply System Strengthening Options Analysis Framework

Leg in supply network/option	Baseline [cost-recovery]	Baseline [PMTCT+ART]	Option 1 [PMTCT&ART]	Option 2 [PMTCT&ART]	Option 3 [PMTCT&ART]
CENAME to CAPR (Is leg necessary? Yes/No)	<u>Yes: Total annual cost = XAF 10,082,704,000:</u> Transport [fuel + maintenance] = XAF 106,749,700 Staffing cost, 86 FTE [6,177,000 Frs/staff/annum] = XAF 531,222,000 Warehousing, inventory management, and overhead costs for storage capacity of 8,852.5 cubic meters [at 1,066,900 XAF/m3] = 9,444,732,300 Frs MHE costs included in warehousing costs.	<u>Yes: Total annual cost = XAF 740,730,105:</u> Transport [fuel + maintenance] = XAF 7,472,475 Staffing cost, 4 FTE [6,177,000 Frs/staff/annum] = XAF 24,708,000 Warehousing, inventory management, and overhead costs for storage capacity of 664.12 cubic meters [at 1,066,900 Frs/m3] = 708,549,630 Frs MHE cost included in warehousing costs.	<u>Yes: Total annual cost = XAF 740,730,105:</u> Transport [fuel + maintenance] = XAF 7,472,475 Staffing cost, 4 FTE [6,177,000 Frs/staff/annum] = XAF 24,708,000 Warehousing, inventory management, and overhead costs for storage capacity of 664.12 m3 [at 1,066,900 Frs/m3] = 708,549,630 Frs MHE costs included in warehousing costs.	<u>Yes: Total annual cost = XAF 740,730,105:</u> Transport [fuel + maintenance] = XAF 7,472,475 Staffing cost, 4 FTE [6,177,000 Frs/staff/annum] = XAF 24,708,000 Warehousing, inventory management, and overhead costs for storage capacity of 664.12 cubic meters [at 1,066,900 Frs/m3] = 708,549,630 Frs MHE costs included in warehousing costs.	<u>Yes: Total annual cost = XAF 740,730,105:</u> Transport [fuel + maintenance] = XAF 7,472,475 Staffing cost, 4 FTE [6,177,000 Frs/staff/annum] = XAF 24,708,000 Warehousing, inventory management, and overhead costs for storage capacity of 664.12 cubic meters [at 1,066,900 Frs/m3] = 708,549,630 Frs MHE costs included in warehousing costs.
CAPR to district (Is leg necessary? Yes/No)	<u>No: Total supply chain cost = 0:</u> CAPRs currently do not deliver essential medicines to district health offices.	<u>Yes: Districts collect PMTCT commodities from CAPRs. Total supply chain cost = XAF 203,033,200:</u> Transport [fuel + maintenance] = XAF 19,180,000 Staffing cost = [2 FTE per CAPR x 4] = 8 FTE [4,342,000 Frs/staff/annum] = 34,736,000 Frs Warehousing,	<u>Yes: Districts collect PMTCT and ART commodities from CAPRs. Total supply chain cost = XAF 203,033,200:</u> Reimburse transport cost incurred by districts, estimated at XAF 19,180,000 CFAF Staffing cost = 2 FTE per CAPR x 4] = 8 FTE [4,342,000 Frs/staff/annum] =	<u>No: Total supply chain cost = 0</u>	<u>No: Total supply chain cost = 0</u>

Leg in supply network/option	Baseline [cost-recovery]	Baseline [PMTCT+ART]	Option 1 [PMTCT&ART]	Option 2 [PMTCT&ART]	Option 3 [PMTCT&ART]
		inventory management, and overhead costs for storage capacity of 1006.8 cubic meters [at rate of 148,110 Frs/m3] = 149,117,200 MHE costs included in warehousing costs. No formal funding arrangements for transport and warehousing costs.	34,736,000 Frs Warehousing, inventory management, and overhead costs for storage capacity of 1006.8 cubic meters [at rate of 148,110 Frs/m3] = 149,117,200 MHE costs included in warehousing costs. Formalize funding arrangements with districts for transport and warehousing costs.		
District to SDPs (Is leg necessary? Yes/No)	No: Districts currently do not deliver essential medicines to SDPs. Total supply chain cost = 0	<u>Yes: PMTCT focal point/nurse collects commodities from districts. Total supply chain cost = XAF 1,320,390,000:</u>	<u>Yes: Districts deliver PMTCT and ART commodities to SDPs. Total supply chain cost = XAF 1,066,890,000:</u>	No: Total supply chain cost = 0	No: Total supply chain cost = 0
		Transport by commercial commuter means = XAF 63,360,000; Staffing cost = [2FTE/District x 86 = 172 FTE] [4,342,000 Frs/staff/annum] = 746,824,000 Frs Warehousing, inventory management, and overhead costs for	Transport [fuel + maintenance] = XAF 7,800,000 Staffing cost = [2FTE/District x 86] = 172 FTE [4,342,000 Frs/staff/annum] = 746,824,000 Frs Warehousing, inventory management, and overhead costs for storage capacity of		

*Supply Chain Options Analysis:
PMTCT Option B+, Family Planning, Maternal, Newborn, and Child Health Commodities*

Leg in supply network/option	Baseline [cost-recovery]	Baseline [PMTCT+ART]	Option 1 [PMTCT&ART]	Option 2 [PMTCT&ART]	Option 3 [PMTCT&ART]
		<p>storage capacity of 2161 cubic meters [at rate of 148,110 Frs/m3] = 320,066,000 Frs</p> <p>MHE costs are included in warehousing costs. Currently, there are no formal funding arrangements for transport and warehousing costs. Eleven districts in the four regions do not have SDPs for PMTCT and ART (see CNLS database).</p>	<p>2161 cubic meters [at rate of 148,110 Frs/m3] = 320,066,000 Frs</p> <p>MHE costs are included in warehousing costs. Will require formalizing funding arrangements with districts for transport and warehousing.</p>		
CAPR to SDPs (Is leg necessary? Yes/No)	<p><u>Yes: CAPRs deliver essential medicines to all SDP pharmacies. Total supply chain cost = XAF 1,002,721,000:</u></p> <p>Transport cost = XAF 33,468,000 Staffing cost: 24 FTE per CAPR x 4 = 96 FTE [4,342,000 Frs/staff/annum] = XAF 416,832,000 Warehousing, inventory management, and overhead costs for storage capacity of 3,729.8 cubic meters;</p>	<p><u>Total supply chain cost = 0</u></p> <p>No: CAPRs currently do not deliver PMTCT and ART commodities to SDPs.</p>	<p><u>No: Total supply chain cost = 0</u></p>	<p><u>Yes: CAPRs deliver PMTCT and ART commodities to SDPs. Total supply chain cost = XAF 226,390,000:</u></p> <p>Transport cost = XAF 7,800,000 Staffing cost: 4 FTE per CAPR x 4 = 16 FTE [4,342,000 Frs/staff/annum] = 69,472,000 Warehousing, inventory management, and overhead costs for</p>	<p><u>Yes: Total supply chain cost =XAF 288,062,000:</u></p> <p>Transport cost will depend on result of tender. Staffing cost at CAPR + 3 PL = [(2 x 4) + (2 per route x 3 routes per region x 4)] = 32 FTE [4,342,000 Frs/staff/annum] = 138,944,000 Frs Warehousing, inventory management, and overhead costs for storage capacity of</p>

Leg in supply network/option	Baseline [cost-recovery]	Baseline [PMTCT+ART]	Option 1 [PMTCT&ART]	Option 2 [PMTCT&ART]	Option 3 [PMTCT&ART]
	[at rate of 148,110 Frs/m3] = 552,421,000 Frs MHE costs are included in warehousing costs.			storage capacity of 1,006.8 cubic meters [at rate of 148,110 Frs/m3] = 149,118,000 Frs MHE costs are included in warehousing costs.	1,006.8 cubic meters [at rate of 148,110 Frs/m3] = 149,118,000 Frs MHEt costs are included in warehousing costs.
Entity delivering commodities from CAPR to SDPs	CAPR	SDP and District Health Service	District Health Service	CAPR	Private logistics service provider
Total channel storage space to be managed, cubic meters	12,582.30	4,860.92	4,860.91	1,670.92	1,670.92
Number of levels requiring MHE	2	3	3	2	2
Total annual distance covered for delivery at all levels of option, km	2,744,352	1,811,712	1,811,712	2,744,352	2,744,352

*Supply Chain Options Analysis:
PMTCT Option B+, Family Planning, Maternal, Newborn, and Child Health Commodities*

Leg in supply network/option	Baseline [cost-recovery]	Baseline [PMTCT+ART]	Option 1 [PMTCT&ART]	Option 2 [PMTCT&ART]	Option 3 [PMTCT&ART]
Total transport capacity required between CENAME and SDP	<p>CENAME: Heavy weight truck >15 tons (1); 2-ton pickup truck (2); Container pickup truck (1)</p> <p>CAPR CE: 3.5-ton truck (1); 2.5-ton truck (3)</p> <p>CAPR LT: 2.5-ton truck (4)</p> <p>CAPR NW: 3.5-ton truck (3); 2.5-ton truck (1)</p> <p>CAPR SW: 2.5-ton truck (4); 1.5-ton truck (1)</p> <p><i>NB: only functional vehicles, which are not fully depreciated, were counted.</i></p>	<p>1 heavy weight truck >15 tons at CENAME.</p> <p>Est. total cost = XAF 75,000,000</p>	<p>One heavy weight truck for CENAME</p> <p>XAF 75,000,000; 86 2.5-ton trucks provided to districts:</p> <p>86 × 15,000,000 = XAF 1,290,000,000</p> <p>Est total cost = 1,365,000,000</p>	<p>One heavy weight truck for CENAME:</p> <p>XAF 75,000,000; four 2.5-ton trucks provided to CAPRs: 8 × 15,000,000 = XAF 120,000,000</p> <p>Est. total cost = 195,000,000</p>	<p>One heavy weight truck for CENAME: XAF 75,000,000; Private logistics service providers are contracted to use own fleet.</p> <p>Est. total transport cost = 75,000,000 + transport cost obtained by tender</p>
Total FTE human resources required, including two dispensers/SDP	<p>2,294</p> <p>[182 + 2,112 pharmacy attendants & storekeepers]</p>	<p>2,294</p> <p>[182 + 2,112 ARV dispensers & storekeepers]</p>	<p>2,290</p> <p>[178 + 2,112 ARV dispensers & storekeepers]</p>	<p>2,132</p> <p>[20 + 2,112 ARV dispensers & storekeepers]</p>	<p>2,148</p> <p>[36 + 2,112 ARV dispensers & storekeepers]</p>
Total supply chain (SC) cost (does not include SDP costs, because they will be the same for all options)	<p>Total SC cost figure does not include value of delivery trucks/fleet owned by CENAME and CAPRs. Total SC cost = XAF 11,085,425,000</p>	<p>Total SC cost = XAF 2,339,153,300</p>	<p>Total SC cost = XAF 3,375,653,300</p>	<p>Total SC cost = XAF 1,162,120,100</p>	<p>Partial total SC cost = XAF 1,103,792,100</p> <p><i>Cost figure does not include transport cost, which will depend on results of tender.</i></p>

Annex 5: Cameroon National Scale-up Plan for PMTCT Option B+

Phase	Description	Implementation status	Arrangement for supply of commodities
Phase 1: Oct 2013 to OCT 2015	Pilot involving 22 sites in two regions NW and SW	By CBCHB, and ongoing	CENAME - CBCHB - DISTRICT - PMTCT B+ pilot sites in NW and SW
Phase 2: Jan–Jun 2014	158 ART sites offer PMTCT B+ as mentors in 10 regions	Not started	Not defined
Phase 3: Jul–Dec 2014	320 additional sites selected from high-volume antenatal clinics in 10 regions; total = 500 sites	Not started	Not defined
Phase 4: Jan–Dec 2015	1,000 additional sites in 10 regions; total = 1,500 sites	Not started	Not defined
Phase 5: Jan–Dec 2016	1,000 additional sites in 10 regions; total = 2,500 sites	Not started	Not defined
Phase 6: Jan–Dec 2017	Remaining health facilities that offer MNCH services (about 500 sites); total = 3,000 sites	Not started	Not defined

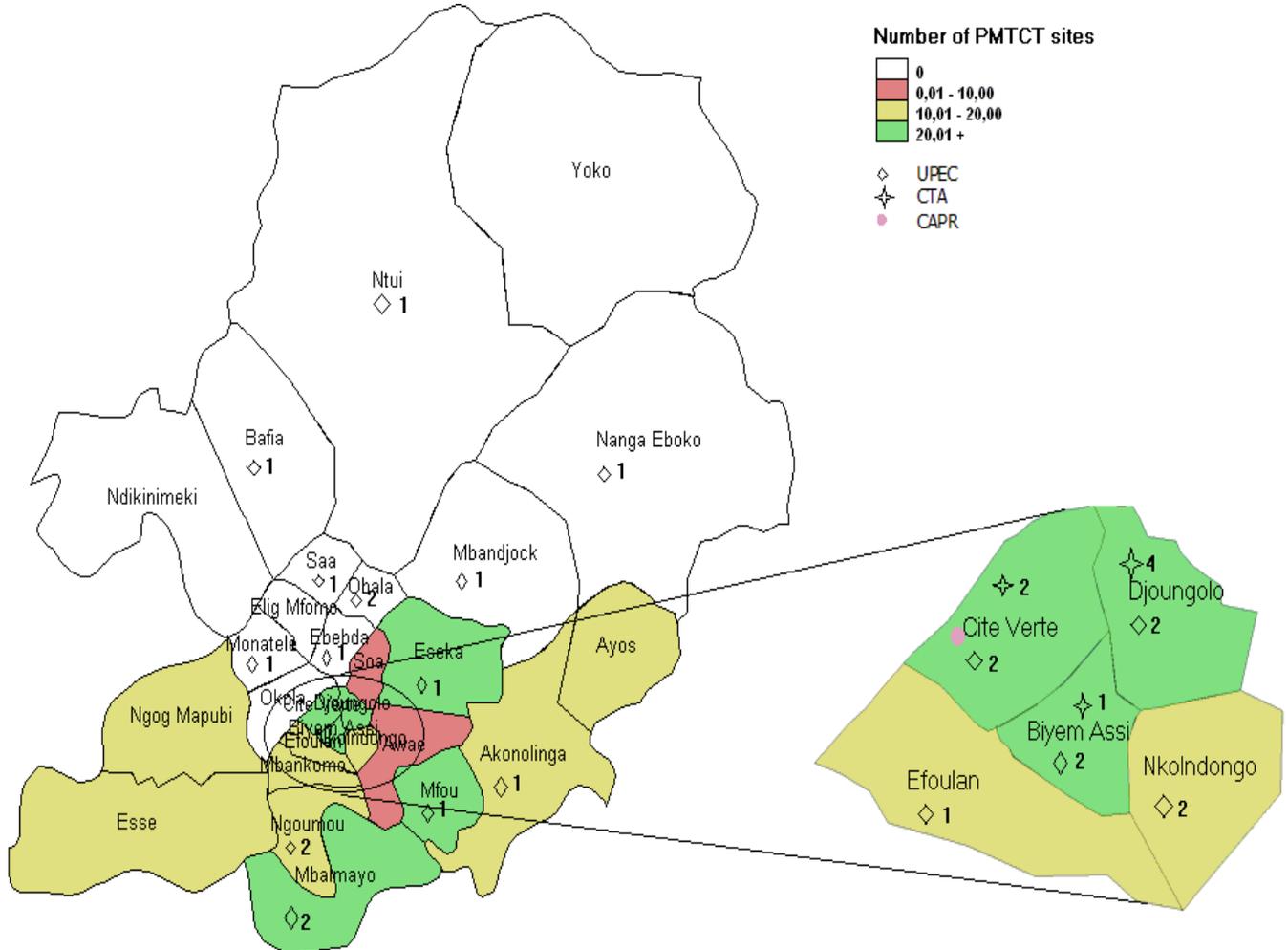
Prerequisites to progress to next phase include availability of diagnostic tests, ARVs in sufficient quantities with three months security stock, and human resources for training

Annex 6: Distance Analysis

Delivery leg in supply network	Average distance, km	Number of deliveries per year	Total annual distance traveled for deliveries, km
CENAME to CAPRs [To three CAPRs surveyed; CAPR Centre is located on same premises as CENAME]	980	12	23,520
CAPRs to Districts [4 CAPRs & 86 Districts]	334	12	689,376
District to SDP [264 SDPs]	41.5	12	1,051,776
CAPRs to SDP [264 SDPs/CAPR]	316.5	4	2,673,792

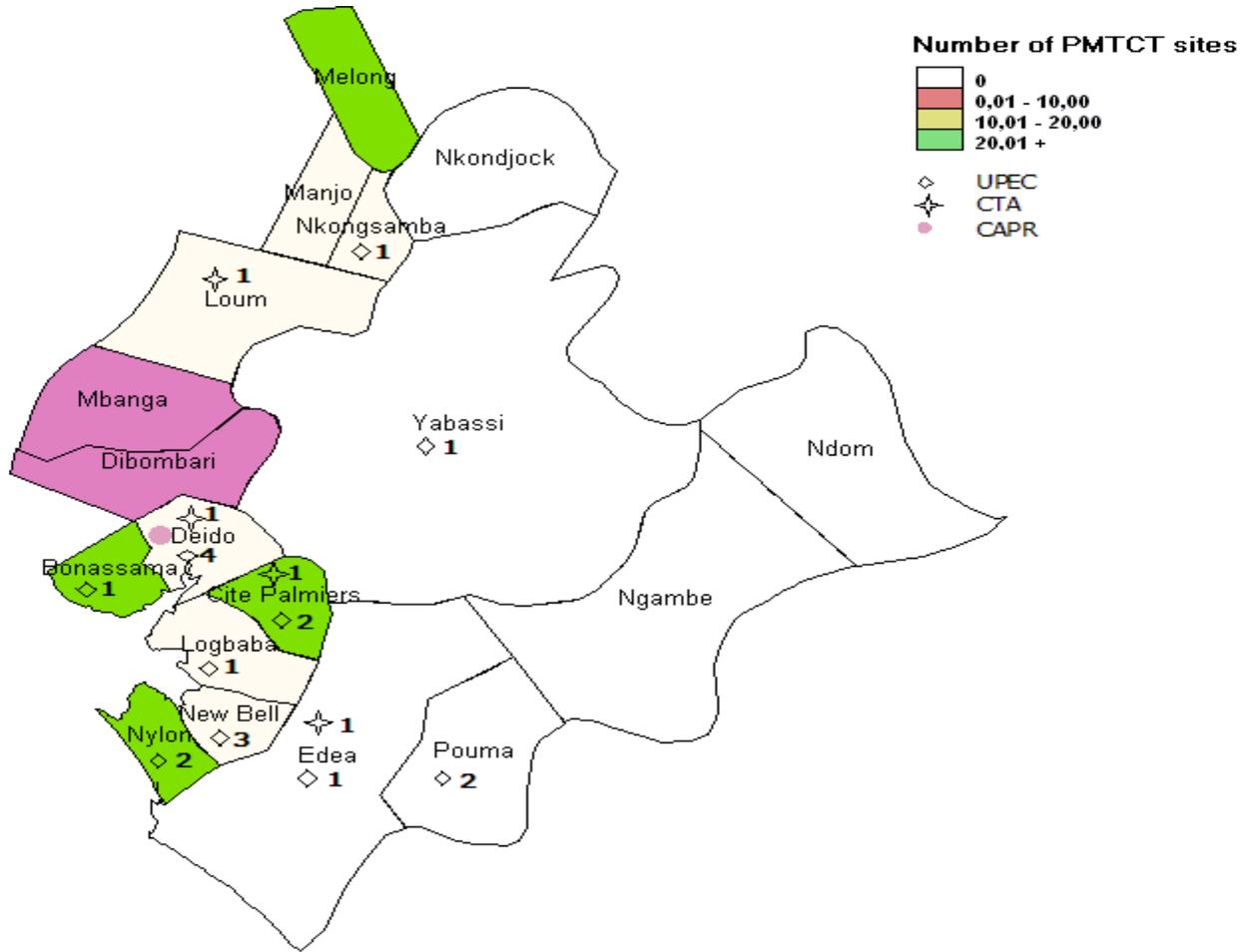
Annex 7: Locations of PMTCT and ART SDPs in Each of the Four Regions Surveyed and CAPRs⁵

Centre Region

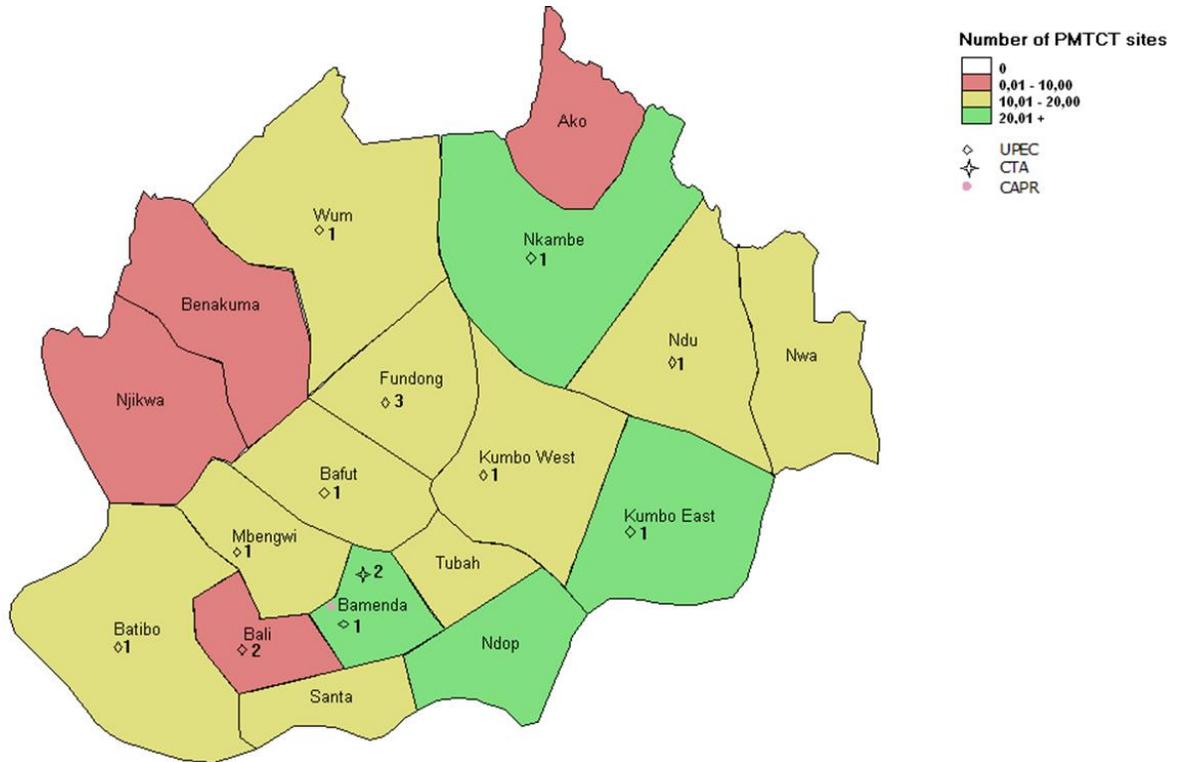


⁵ Maps produced using Google Maps Engine.

Littoral Region



Northwest Region



Southwest Region

