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THE WORLD MEDICINES SITUATION 2011

STORAGE AND SUPPLY CHAIN MANAGEMENT

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The World Medicines Situation 2011

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SUMMARY

- Even though service levels at health facilities remain low, warehousing and distribution costs are a substantial part (up to 16%) of the medicines budget in low- and middle-income countries.
- A variety of institutional and physical structures involving public, private and nongovernmental organization actors exist for warehousing and distribution of medicines.
- Duplication and fragmentation still exist in the public sector distribution system due to vertical programme design but physical integration is under way in many countries.
- Governments are providing more autonomy to distribution organizations, such as the central medical stores. They are also contracting out transport to achieve efficiency and scope economies by consolidating loads from different clients destined for the same end-point whenever possible.
- Storage capacities and conditions are inadequate at the peripheral level in many countries.
- Many countries are shifting from push to pull distribution systems – thereby creating the need for health facility data for distribution planning and ordering.
- Distribution in the private sector is effective, except in remote areas, but the distribution margins are often very high. There is increasing pressure on these distribution margins, resulting in consolidation in many countries.
- Singular government-run medicine distribution systems are slowly giving way to pluralistic distribution structures where the private sector wholesalers and distributors play a stronger role.
- Sustained investments and increased efficiency are needed to make distribution systems effective and sustainable in the public and private sectors.

17.1 BACKGROUND/INTRODUCTION

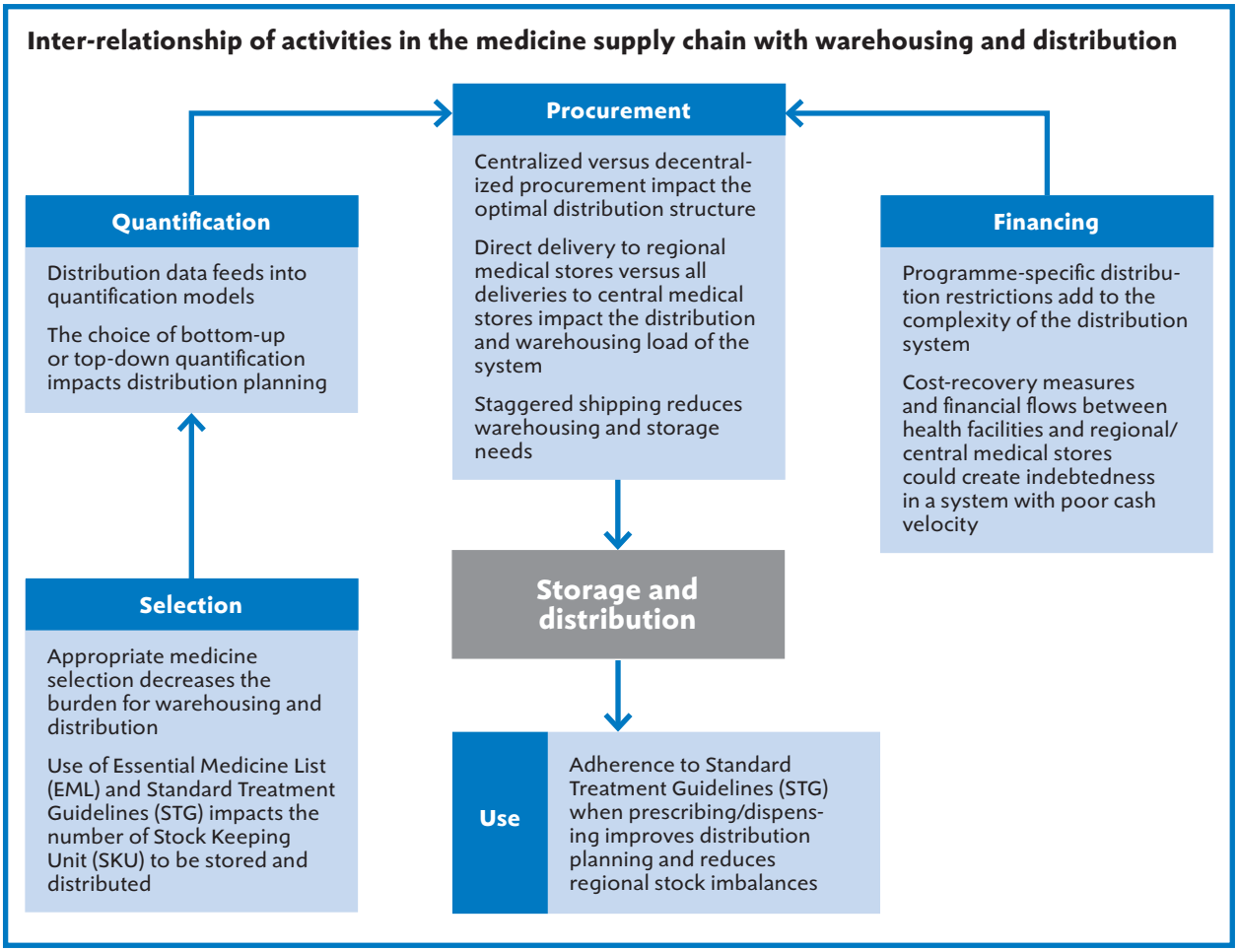
The distribution of medicines is the process by which they are transported from a central warehouse to storage depots and health facilities. A well designed medicines supply system ensures that procurement, warehousing and transportation are seamlessly linked to form a network that can deliver the requested medicines to health facilities and pharmacies in good time, in the correct quantities and at the lowest possible cost. In order to guarantee that the quality of the medicines distributed is preserved, the distribution system also has to ensure that good storage and distribution practices are maintained throughout the distribution chain (*1,2*).

Figure 17.1 shows the inter-relationships between warehousing and distribution relative to other activities in the medicines supply chain, such as product selection, quantification, procurement, financing and use. It is important to view warehousing and distribution in the context of a holistic medicine supply chain, as short-sighted decisions on other activities can severely impact or undermine the effectiveness and efficiency of the warehousing and distribution functions.

A single central warehouse cannot always distribute efficiently to all health facilities and so it is necessary to have a tiered distribution network, with storage and distribution at multiple levels. In distribution systems with multiple levels, effective management of ordering, receipt, storage, distribution and resupply at each level of the distribution network becomes

FIGURE **17.1**

Inter-relationship of activities in the medicine supply chain with warehousing and distribution



crucial to ensuring consistent and timely supply of essential medicines to health facilities and clinics. This requires efficient logistics management capacity at each level of the distribution system.

An ineffective or poorly designed distribution system is likely to cause stock-outs at health facilities despite the availability of stock at the central warehouse.

In many public sector programmes, the system for warehousing and distribution of medicines is often a major constraint on efforts to meet the health-care needs of large sectors of the population, particularly in rural areas. An ineffective or poorly designed distribution system is likely to cause stock-outs at health facilities despite the availability of stock at the central warehouse. On the other hand, an inefficient distribution system can result in an increase in the system's financing requirements, making it unsustainable over time. A balanced approach that acknowledges the current state of technical capacity, administrative structures and resource availability should guide the proper design and operation of a distribution system.

17.2 CURRENT SITUATION

In most low- and middle-income countries, public, private and nongovernmental organizations (NGOs) co-exist as channels of distribution for medicines, with various interconnected flows between the three channels. In Organisation for Economic Co-operation and Development (OECD) countries, medicines are distributed largely through the use of private sector distributors, whereas in a number of low-income countries the distribution of medicines is carried out primarily by the government and NGO sector. Figure 17.2 illustrates the commonly observed structures for distribution in the private, public and NGO sectors in low- and middle-income countries.

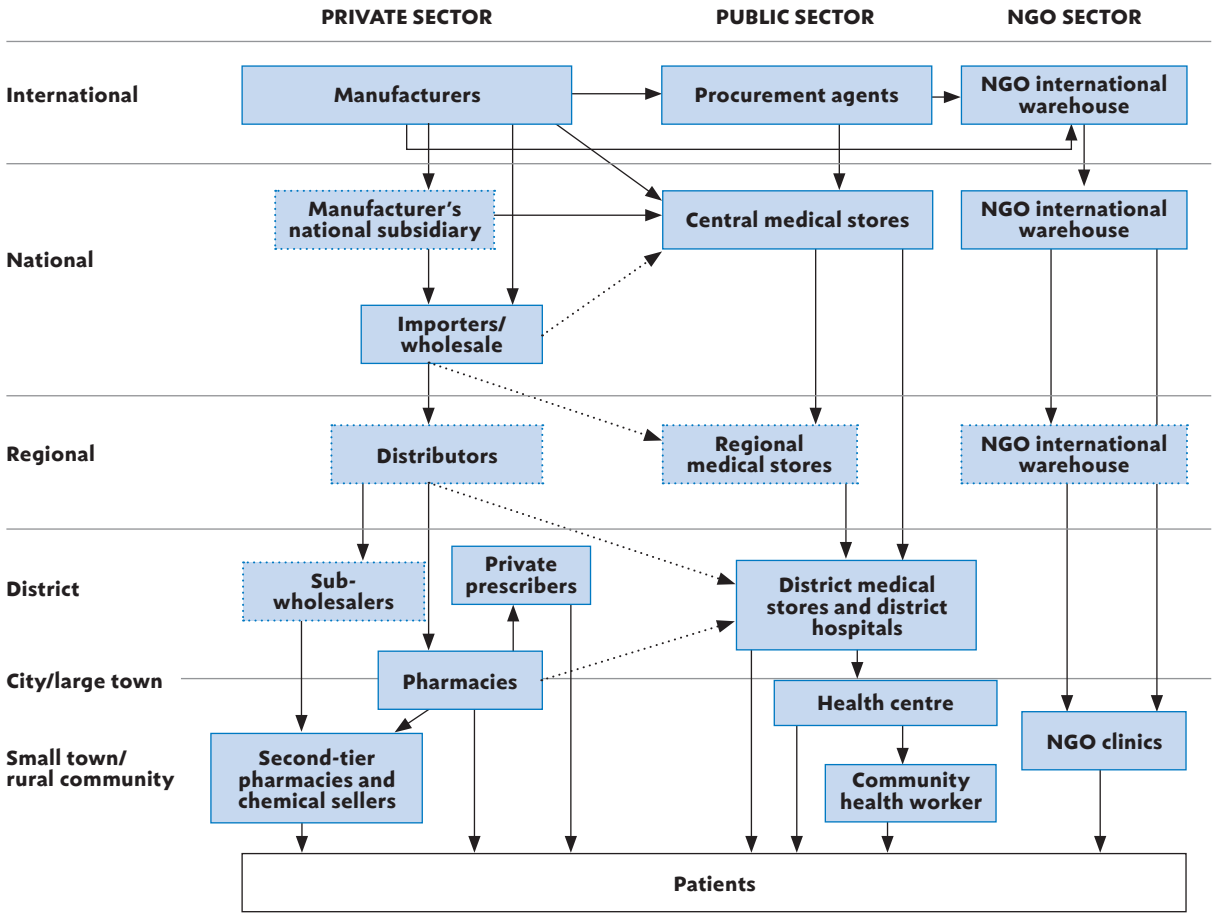
Although pharmaceutical distribution is organized in slightly different ways in different countries (*3*), most primary health facilities and private retail pharmacies cannot keep a large quantity of medicines in stock. Instead they rely on obtaining their supplies periodically from district or regional warehouses in the public sector, and from private wholesalers and distributors in the private sector. This leads to multiple tiers of storage and distribution between the manufacturer and the patient at the end of the supply chain. The number of entities involved at different layers of the distribution system, their ownership and governance structure (publicly owned, privately owned or public-private partnerships) and the roles they play vary considerably from one country to another. Determining the optimum number of levels in the distribution system depends on geographical factors, the population to be served, variability in demand, and the availability of storage space, maintenance staff and transport facilities.

In most developed countries, there are a few privately owned national wholesalers who maintain a stock of the full range of pharmaceutical products from multiple manufacturers and distribute to clinics, hospitals and pharmacies. Such wholesalers make deliveries to retail pharmacies several times a day (*4*).

In low-income countries, especially in sub-Saharan Africa, the predominant public distribution model involves the government distributing the medicines to health facilities using a central medical store (CMS), regional or district stores and a government/CMS owned transport fleet. Additionally, in the public sector run pharmaceutical provision system, procurement and distribution are often organized as separate functions, decoupled from each other, with a limited and infrequent flow of information between them, especially for the procurement of medicines for heath programmes funded by donors (AIDS, malaria, tuberculosis (TB), vaccines, reproductive health). Indeed, WHO-supported surveys carried out over the

FIGURE **17.2**

Distribution network for essential medicines in the public, private and NGO channels in developing countries



past four years in 16 African countries[1] on mapping of partners and financial flows in the medicines supply system (5) highlighted that an average of 77.96% of funding partners use international procurement agencies to purchase medicines with warehousing and distribution performed by the public distribution system or by a private/NGO distribution system. Thus, in addition to CMS, medicines procurement in the countries studied is undertaken by an average of 19 different procurement agencies.

Moreover, surveys also highlighted that there is no national coordination mechanism/structure in place to share financial or logistical information among funding partners, programmes, national regulatory authorities and CMS, except in two countries for antiretrovirals (ARVs) and artemisinin combination therapies (ACTs) (5). This situation does not allow for the establishment of a national procurement and distribution plan that is coordinated, coherent and efficient.

[1] Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, the Congo, Democratic Republic of the Congo, Ghana, Madagascar, Mali, Nigeria, Rwanda, Senegal, Sudan, United Republic of Tanzania, Zambia.

17.2.1 Public sector distribution system

The typical structure for distribution of medicines in the public sector consists of a CMS which serves as the primary warehousing and distribution point in the medicines supply chain. In Francophone Africa the equivalent organization is called the Centrale d'Achat de Médicaments Essentiels because its main function is to procure medicines on behalf of the ministry of health. The CMS of 21 Francophone countries in Africa and the Indian Ocean[1] are members of ACAME, Association Africaine des Centrales d'Achat de Médicaments Essentiels, which was established in July 1996 with a mandate to contribute to improving the performance of CMS.

Depending upon the geography and the number of health facilities in a country, either regional stores (RS) or district-level stores (DS) serve as the second or third level distribution points. Table 17.1 shows the number of central, regional and district stores in 12 African countries for the public distribution of essential medicines (*5*).

In many developing countries, in addition to the principal public CMS and designated regional or district stores, there are a larger number of primary and secondary distribution locations due to product- or programme-specific vertical supply chains set up by various funding partners, as shown in Table 17.2.

Most of these additional storage locations are depots belonging to the partners. An average of only 52% of partners uses the CMS as the primary storage entity. These additional storage locations have contributed to making the medicines supply system very complex in these countries – increasing the difficulty in coordinating the management of medicines procurement and distribution at all levels of the supply chain and leading to a greater risk of stock-out or overstock and product expiry. Figure 17.3 shows the complexity of the medicines supply system in the Democratic Republic of the Congo.

TABLE **17.1** **Number of storage locations in public sector chains in selected countries (*5*)**

Country	Central medical stores	Regional stores	District stores
Burundi	1	17	
Burkina Faso	1	7	63
Cameroon	1	10	
Chad	1	22	
The Congo	1		41
Democratic Republic of the Congo	2	15	228
Ghana	1	5	
Mali	1	5	49
Rwanda	1		30
Senegal	1	11	63
United Republic of Tanzania	1	8	
Zambia	1		72

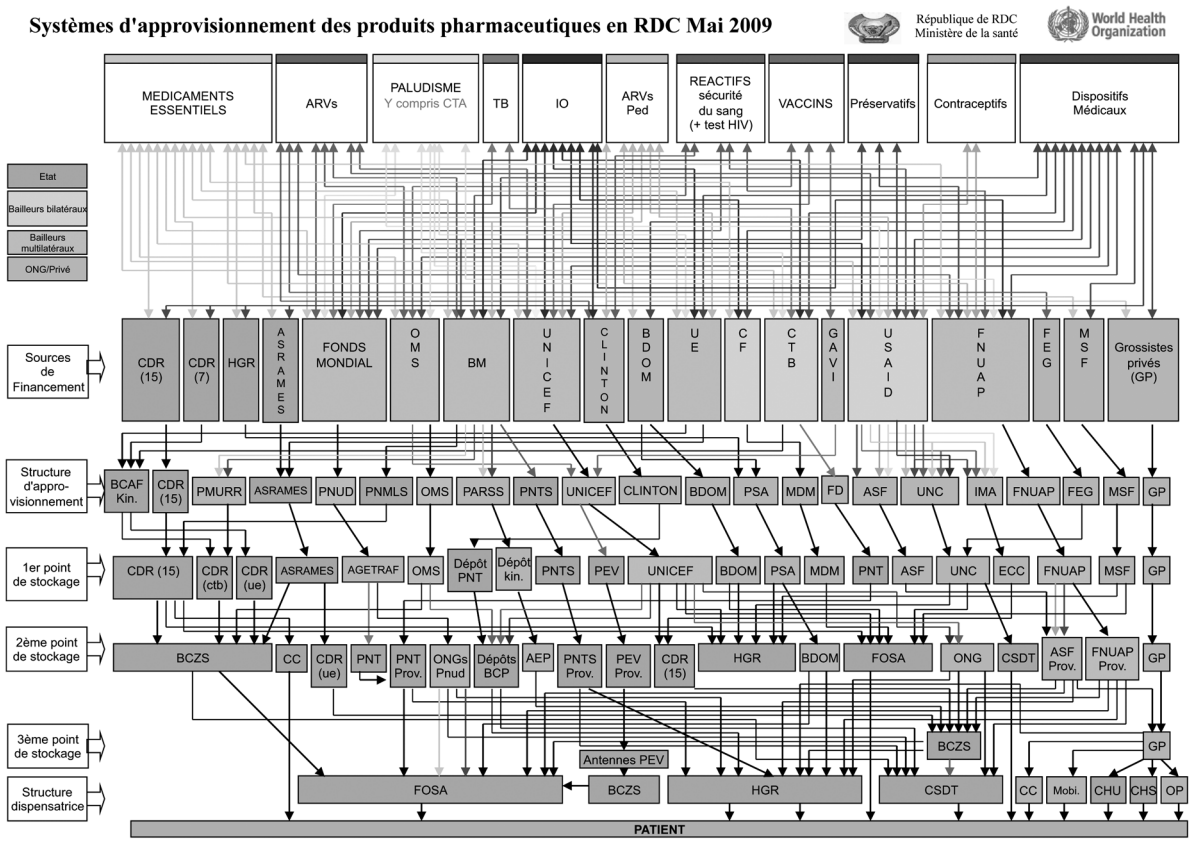
[1] ACAME members: Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, the Congo, Côte d'Ivoire, Democratic Republic of the Congo, Gabon, Guinea, Guinea Bissau, Madagascar, Mali, Mauritania, Niger, Rwanda, Senegal, Togo, Tunisia.

TABLE **17.2** **Primary and secondary storage entities in public sector supply chains in selected countries (*5,6*)**

Country	Public storage locations		Additional storage locations	
	1st tier	2nd tier	1st tier	2nd tier
Burundi	CMS	RS	14	7
Burkina Faso	CMS	RS	6	1
Cameroon	CMS	RS	2	1
Chad	CMS	RS	8	7
The Congo-	CMS	DS	13	3
Democratic Republic of the Congo	CMS	RS	16	13
Ghana	CMS	RS		
Mali	CMS	RS	8	4
Rwanda	CMS	DS	6	2
Senegal	CMS	RS	6	1
United Republic of Tanzania	CMS	RS	7	2
Zambia	CMS	DS	7	2

FIGURE **17.3**

Map of the medicines supply system in the Democratic Republic of the Congo (*5*)



In most public sector distribution systems a multi-tiered distribution network is mapped directly to the administrative structure of the health system for convenience of administration and governance, instead of having a design based on technical or operational considerations.

In most countries, CMS ensure the delivery to the regional level but the district level and health facilities may have to use their own means to pick up their products from the higher level.

Two main approaches are used to distribute stock from the higher level store to a lower level store or health facility. In a **push** system, the CMS or the regional or district store determines what quantities of medicines are to be issued to each lower level store or the health facility, based on centrally estimated allocation quantities. In a **pull** system, each health facility (or store) determines the medicines requirements to be requisitioned or bought (in a cost recovery system) from the higher level warehouse. A pull system uses local information about demand, which often does not reach the CMS and depends on good decision-making ability and accountability at the decentralized level. A push system is robust to weak order and stock management capabilities at the lowest level of the distribution system. It also enables more equitable rationing decisions when there is scarcity of stock, but needs to have a very good logistics management information system in place with data consolidation at each level.

The push system is generally used for the distribution of medicines from vertical programmes and in countries where the funding of medicines is ensured by the government and managed at the central level. For countries where there is a cost recovery system in place (most of the Francophone countries in Africa), the pull system is used.

The choice of a push or pull system depends largely on in-country capacity to conduct stock planning and forecasting at each level of the supply chain as well as the level of maturity of the supply chain.

The choice of a push or a pull system depends largely on in-country capacity to conduct stock planning and forecasting at each level of the supply chain as well as the level of maturity of the supply chain. Often a combination of push and pull systems is used in which the regional or district stores pull stock from the CMS but then in turn use push-based allocation to distribute stock to the health facilities. Such an arrangement is currently used in multiple countries as it acknowledges the lack of stock planning capacity at the health facility level while achieving the benefits of the pull system for the primary leg of distribution (i.e. from CMS to district or regional stores).

Another important variable in the design of the distribution system is the resupply interval. In distribution models such as the ones currently in use in Kenya or The Gambia, each health facility receives a delivery of stock every three months. This ensures the transport cost of the distribution system is reduced. A more frequent resupply interval is used in three-tiered distribution models, such as in the United Republic of Tanzania or Zambia, where delivery from the CMS to the health facilities through DS is once a month. Although more frequent resupply intervals lead to higher transport costs, they also result in a shorter forecast horizon for the health facilities, thereby allowing for better stock management and a lower chance of stock-outs.

The quantity of stock held at each tier is based on a system of minimum-maximum rules for each level. Under such a system, orders are placed by the health facilities or lower level stores at regular intervals, but a product is ordered only if it has reached its minimum stock level; products reaching the minimum stock level are ordered/resupplied to the maximum stock level. Although most countries surveyed have some form of minimum-maximum rule, strict adherence to the ordering rules remains poor.

TABLE **17.3**

Typology of different distribution models used in public sector distribution for essential medicines (*5*,*6*,*7*)

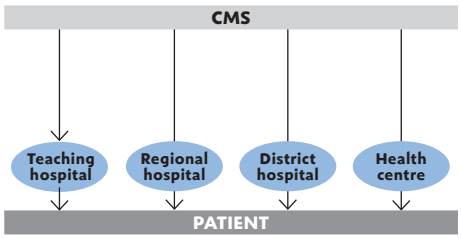
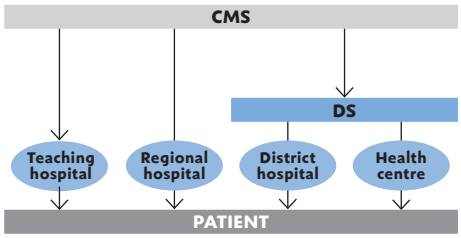
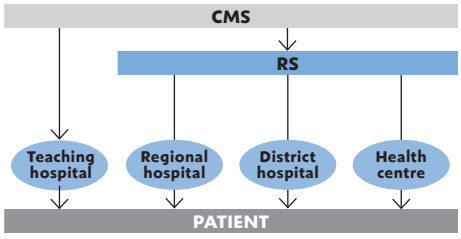
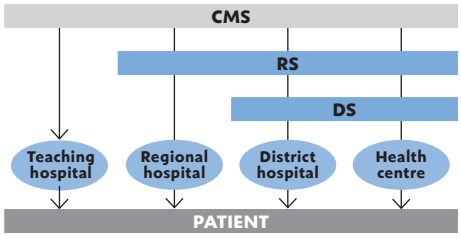
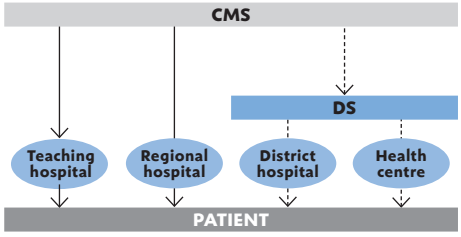
Distribution model	Country example	Key advantages	Key disadvantages
CMS to Health Facility 	Kenya	Better visibility of consumption data at CMS Lower total stock in the system Less reliance on district or regional store stock planning capacity	Higher transport costs Lower frequency of delivery Many health facilities not reachable using formal transport
CMS to DS to Health Facility 	The Congo, Rwanda, Zambia	Stock positioned closer to health facilities Relies on DS stock planning capacity	Lower visibility of consumption data at CMS Greater risks of pilferage and theft due to large stocks at DS
CMS to RS to Health Facility 	Burundi, Cameroon, Chad, The Gambia, Ghana	Few RS easier to manage than a larger number of DS	Lead time from RS to health facilities can be long
CMS to RS to DS to Health Facility 	Burkina Faso, Democratic Republic of Congo, Mali, Senegal	Except for DRC, RS is a branch of CMS, thus better visibility of consumption data at CMS level Stock positioned closer to health facilities Relies on district or regional store stock planning capacity More frequent deliveries	More total stock in the system
CMS to DS to Health Facility with DS as pass-through 	United Republic of Tanzania	Combines the primary transport cost benefits of DS model with the other benefits of the direct to health facility model	Relies on health facilities estimating their needs and placing orders to the CMS

TABLE **17.4** **Logistics cost in public sector supply chains in selected countries (*8*)**

Country	Product	Logistics cost as a % of stock value
Bangladesh	Contraceptives	1%
Malawi	ACT	18%
Uganda	Contraceptives	3%
Nigeria	ARVs	4.8%
Liberia[a]	Bed nets	44%
Zimbabwe	Condoms	12%
Ghana[a]	Essential health commodities	13%
Egypt		6%
Zambia[a]	ARVs	16.1% rural, 9.0% to 10.4% urban
Honduras	Essential drugs	6.5%

[a] Costs in these countries include administrative costs related to procurement in addition to storage, handling and distribution costs

Warehousing and distribution costs often account for a large part of a country's medicines budget.

Warehousing and distribution costs often account for a large part of a country's medicines budget. When designing and managing supply chains for medicines, stakeholders are often faced with the competing demands of improved service level at the health facilities (higher availability, more frequent delivery) and lower distribution costs. This makes it harder to compare distribution costs across programmes with varying service levels. A recent survey by Sarley et al. in 2009 (*8*) of existing studies on distribution costs in public health supply chains found that the distribution cost estimates varied from 13% of product cost for essential health commodities in Ghana to 44% of the value of the bed nets for a bed net delivery project in Liberia. Analysis conducted in Zambia concluded that the distribution cost for ARVs was 16.1% to rural health facilities and was 9.0% to 10.4% for urban health facilities.

Logistics costs are funded either by the public budget or, for countries where the cost-recovery system is in place (most of the Francophone countries), by the margins applied to define the selling price.

However, logistics costs for the distribution of medicines of vertical programmes are often not clearly identified, and in many cases do not exist in either the public budget for medicines or in the funding provided by partners (*5*,*6*). Moreover, when funding for distribution exists, it is difficult to know if the amount has been calculated based on an efficient methodology. In many cases, the risk of stock-out is high because the funding for distribution is either not available or may be insufficient.

Additionally, in countries where a cost recovery system is in place, when vertically funded programmes do not provide adequate funds for the existing systems, the distribution of the medicines involved tends to be funded through resources taken from the margins of the overall medicines distribution system. This practice can undermine the financial viability of distribution systems and force them to raise the prices of the other essential medicines being distributed – thereby making them less affordable.

Results of the in-depth assessment of the medicines supply carried out in six sub-Saharan African countries over four years (2007–2010) show that the average of the mean percentages of availability of a basket of essential medicines in these countries is 82.82% at CMS, 84.33% at RS, 91.31% at DS and 77.93% at the health facilities level (*6*). The basket of essential medicines used in this survey included basic essential medicines, antiretrovirals, TB medicines, ACTs, vaccines, contraceptives and diagnostic tests for HIV. The increasing avail-

ability of medicines, in particular those funded by donors, shows that predictably access to medicines is linked to access to funds. Unfortunately, the vertical approach used for funding medicines supports the emergence of disparities and inequalities in access to medicines between the different categories of products.

The distribution system also has to ensure that good storage practices are maintained in order to guarantee the quality of the medicines throughout the distribution chain.

The distribution system also has to ensure that good storage practices are maintained in order to guarantee the quality of the medicines throughout the distribution chain. However, while storage conditions may be adequate at the CMS, they are often sub-optimal at the peripheral level. On average only 45% of health facilities had good storage conditions in the six sub-Saharan African countries studied and only 6.14% of them had adequate storage areas. Storage capacity was also reported to be inadequate at all levels: none of the CMS had adequate storage capacity; and for RS, DS and heath facilities, the average percentage of structures that had adequate storage capacity was 31.4%, 23.7% and 41.4% respectively (*6*).

17.2.2 Private sector

Distribution in the private sector is carried out through a network of importers, wholesalers, sub-wholesalers, and pharmacies and drug stores. Pharmaceutical importers and wholesalers form the link between pharmaceutical manufacturers (located outside or within the country) and retail pharmacy outlets, dispensing doctors and hospitals in the country.

Pharmaceutical wholesalers provide both a distribution and stockholding function. This enables retail pharmacies to be supplied with products in the quantities they require to meet their daily needs, while ensuring that pharmacies do not have to maintain large stocks of a wide range of pharmaceuticals. Retail pharmacists and dispensing doctors then keep a working stock of medicines. Full-line wholesalers stock a full range of pharmaceutical products and short-line wholesalers sell only a restricted range of the faster-moving products.

The number of wholesalers varies in each country depending on the size of the market, government regulation and political economics. In Uganda, there are over 100 officially registered importers/distributors, and 12–14 "industry leaders." In Nigeria, there are 292 licensed medical importers. In Zambia, there are over 30 licensed wholesalers, but of these only 5 or 6 account for a large part of the volume. Fewer licensed wholesalers/importers exist in Francophone African countries. There are an average of 5 wholesalers/importers per country, except for Burundi, Mali and Rwanda for which there are 14, 23 and 32 respectively (*5,7*). Kyrgyzstan is reported to have over 200 wholesalers but again around 10 of them are the volume leaders. In comparison, in most OECD countries there are 3–5 large wholesalers who supply to all retail pharmacies several times a day (*7*).

In most low- and middle-income countries, including the ones where there are a large number of importers and wholesalers, the wholesalers exercise some degree of market power over retail pharmacies. At the time of product registration, regulatory authorities need a single in-country entity to file for registration to ensure that the responsibility for safety, efficacy and quality is with a single entity. In cases where the manufacturer has an in-country subsidiary, the manufacturer's subsidiary becomes the registering entity. However, when the manufacturer does not have an in-country subsidiary, the importer acting as the manufacturer's agent registers the product and thus may become a monopolistic importer.

Wholesalers rely on three primary methods of distribution – delivery by wholesaler vehicle, delivery by private courier, and customer pick-up. While distribution by wholesaler vehicles is typically concentrated in the capital cities and principal towns, some wholesalers use

smaller vans to distribute beyond the main roads and into more rural areas. Some wholesalers also leverage public transport, such as mini-buses, for sending their products to customers who are located farther away (way-bill). Staff from pharmacies or drug stores located in smaller towns and rural areas often travel into urban areas to pick up their stock either directly from the wholesalers or from sub-wholesalers.

Although distribution in the private sector may be effective in ensuring product availability, except for in remote areas, the distribution margins are often very high (*9*). The linkages among retail, wholesale, and manufacturer prices of essential drugs continue to be of considerable interest in the access-to-medicines debate. The evidence of direct relationships among prices at different levels of exchange becomes increasingly difficult to evaluate without considering the structure and costs of the supply chain (*10*).

17.2.3 NGO and faith-based sector

In many countries, NGOs and faith-based organizations (FBOs) also act as important sources of medicine supply and distribution. Although the share of overall health service provision and essential medicines provision by NGOs and FBOs varies considerably between countries, according to 2004 estimates an average of 43% of the rural population is served by 15 faith-based drug distribution organizations (with the range varying from 25% to 60%) (*11*).

A range of distribution options are used by FBOs but the two most common are:

- Hospitals, clinics and health posts pick up their orders using their own transport from the distribution warehouse of the FBO.

TABLE **17.5**

Customer base of NGO and FBO drug distribution organizations in 11 sub-Saharan African countries in 2003 (*11*)

Country	NGO or FBO medicines distribution entity	No. of member hospitals	No. of member health care centres	No. of member health posts	No. of non-member customers	Total no. of customers in 2003
Cameroon	CAP/EPC	8	32			40
Cameroon	CBC	2	21	40	10	73
Cameroon	EEC	5	8	34	0	47
Cameroon	OCASC	10	200			210
Cameroon	OSEELC	3	0	10	15	28
Cameroon	PCC	6	14			20
D.R. Congo	ECC/DOM	12	75	600	2513	3200
Ghana	CDC	31	60	6	20	117
Kenya	MEDS	66	153	385	396	1000
Malawi	CHAM	20	129			149
Nigeria	CHANpharm	150	1200	500	70	1920
Rwanda	BUFMAR	13	95		9	117
South Africa	AMFA	23	0			23
Tanzania	CSSC	0	29			29
Uganda	JMS	114	346		711	1171
Zambia	CHAZ	34	58	5	28	125
Total no. of customers		**497**	**2420**	**1580**	**3772**	**8269**

TABLE **17.6** **Drug distribution/delivery services by FBO distribution organizations (*11*)**

Customer's own arrangement	62%
Courier services	44%
Drug supply organization delivery services	31%
Direct delivery services	18%

- Hospitals, clinics and health posts submit orders electronically or by phone and the FBO arranges for delivery using their own or contracted transport.

In practice, most FBOs use a combination of the two approaches and some also use private couriers for delivery to their customers. In a multi-country study of FBO supply systems in sub-Saharan Africa published in 2006, four drug distribution models were identified (see Table 17.6).

17.3 TRENDS OVER THE PAST 5–10 YEARS

Over the past decade, the effectiveness and efficiency of medicine distribution systems have received considerable attention. Several factors seem to be driving this trend:

- the considerable increase in funding available for procuring medicines, particularly for priority diseases, has highlighted the weakness of medicines supply systems as they struggle to cope with this significant increase in activity and funding;
- the large number of funders and the fragmentation of their activities has contributed to more complex supply systems in countries and underlined the need for better coordination among technical and financial partners and with the ministry of health;
- improvements in procurement and financing have meant that the availability of stock at CMS has increased – together with the realization that simply having more medicines will do little to mitigate the problem of stock-outs for patients unless the supply chain is efficient.

More widely available information about the availability of medicines at the health facility level (*9*) and the incidence of stock-outs has led to advocacy campaigns in pursuit of greater accountability on distribution aspects of the medicine supply system. Increased technical assistance from WHO, the USAID/DELIVER Project, the Partnership for Supply Chain Management, ACAME and Management Sciences for Health/Strengthening Pharmaceutical Systems (MSH/SPS) has led to a focus on strengthening the in-country pharmaceutical distribution system. Financing for health system improvement projects from global health funders such as the GAVI Alliance, the Global Fund and the World Bank has opened new avenues of resources for investments in the distribution system. The creation of the Supply Chain Management System – a unique partnership of public and private entities for improving supply chains for HIV medicines within the US President's Emergency Plan for AIDS Relief (PEPFAR) was an indication of the high-level commitment to issues of procurement, storage and distribution in the health sector. Even though it was focused only on HIV commodities, it enhanced the importance of storage, distribution and transport issues for policy advocacy and for financing from other large donors.

17.3.1 Parastatal, semi-autonomous central medical stores

In a fully government run central medical stores (CMS) the managers often face severe challenges in improving the operational performance of the storage and distribution system. While they often have difficulty hiring people with business experience and skills because of the poor wages and incentive systems in the public sector, they also often lack the authority to remove incompetent workers (*4*).

Many governments have granted autonomous or semi-autonomous status to their CMS with increased financial and managerial autonomy (*12*), and sign agreements with CMS organizations to define the tasks and duties of each party. These changes have been part of a wider effort to incorporate private sector management features in public sector medicines supply chains (*13*).

TABLE **17.7** **Impact of autonomous/semi-autonomous CMS on operational performance (*12*)**

Management aspect	Burkina Faso		Cameroon		Senegal	
	Pre	Post	Pre	Post	Pre	Post
Drug selection	-1	2	-1	2	-1	1
Quantification	NIA	2	-1	1	-2	0
Supplier selection,monitoring	-2	2	1	1	-2	0
Procurement	-1	1	0	1	-1	0
Inventory management	0	1	1	1	-1	1
Storage	0	2	0	2	-1	-1
Dispatch and delivery	0	1	1	2	-1	1
AVERAGE SCORE	-0.6	1.6	0.1	1.4	-1.3	0.3

Note: Key to performance ratings: -2=very poor; -1=poor; 0=adequate; 1=good/moderate improvement; 2=very good/substantial improvement; NIA=no information available.

A large number of countries, including Benin, Burkina Faso, Cameroon, the Congo, Democratic Republic of the Congo, Ghana, Guinea, Kenya, Mali, Nigeria, Rwanda, Senegal, Sudan, the United Republic of Tanzania, Togo, Tunisia, Uganda, Yemen, Zambia and Zimbabwe, have created autonomous or semi-autonomous medical stores, creating more agility and flexibility in the medicines distribution system.

17.3.2 Computerization

A large number of CMS in sub-Saharan Africa (e.g. the United Republic of Tanzania, Zambia and the majority of Francophone countries) now have warehouse management systems (WMS) to provide computerized process management and inventory control at the CMS but also at the RS for some of these countries. Such CMS systems support tasks such as ordering, receiving, put-away, replenishment, picking/packing, shipping, cycle counting, and inventory control aim to reduce lead times, increase storage capacity and improve labour productivity at the CMS.

The majority of the 21 CMS members of ACAME use the same software for warehouse management in order to facilitate exchange of information (price, logistics information, dashboard…). This harmonization of the software has enabled ACAME to organize pooled

training of staff of several CMS. In Burkina Faso, the regional stores, which are branches of the CMS, all use the same software and are connected online with CMS for sharing logistics management information.

17.3.3 Decentralized procurement at lower levels of the distribution system

Inability to procure medicines for distribution from the CMS has also prompted some countries to decentralize drug procurement to lower levels of the distribution system. Providing some degree of autonomy in purchasing to the health facilities, district or regional medical stores increases the speed and flexibility of procurement but entails the loss of the price advantages from central procurement and makes it difficult to monitor quality.

For example, in Ghana health facilities fund their medicines through cost recovery from clients and procure their supplies from either the higher levels of the supply system (RS or CMS) or from the private market if not available at the higher levels (*13*). Guatemala has an 'open contract' system whereby the national government contracts with medicine suppliers to provide specific medicines on demand from local administrative levels at a tendered fixed price (including transportation costs) (*14*). Such systems allow the health facilities to decide on quantities and to order their medicines from one of often several optional suppliers. And since the prices are pre-established it does not compromise the large quantity discounting and other scale efficiencies that the government gets from central procurement. Ghana has also attempted to create a central price contract, local ordering and delivery system under its National Health Insurance System (*13*).

17.3.4 Integrated physical distribution of verticalized programmes

There is growing awareness among disease-specific vertical programmes that the distribution of their products cannot be conducted in isolation from the overall national distribution system.

There is a growing awareness among disease-specific vertical programmes that the distribution of their products cannot be conducted in isolation from the overall national distribution system and that the integration of physical infrastructure, such as trucks and warehousing space, will benefit distribution efficiency and long-term sustainability. For example, in the United Republic of Tanzania, about 61% of partners use the Medical Stores Department (MSD) as the first point of warehousing, 29% use their own storage facilities and 10% send products directly to the health facilities. In Cameroon, 77% of partners use the CMS (CENAME) to purchase medicines they finance and 86.7% of them use the public distribution system (SYNAME) to distribute medicines. In Burkina Faso, while only 35.7 % of partners use the CMS (CAMEG) to buy medicines, this purchase accounts for more than 55.8% of the total value of funding by partners. Many countries where specific programmes had set up parallel distribution systems are now trying to integrate the physical logistics of distribution for different vertical programmes.

However, the information reporting needs of the programmes are very different and they remain highly verticalized. And not all countries have taken steps towards physical integration of distribution. For example, in Nigeria most of the medicines and other products procured by partners are distributed by privately contracted agents and the donors themselves. Only 29% of the products procured by partners are distributed through government structures.

17.3.5 From push to pull distribution and greater reliance on demand data

Countries that now have well-trained staff at the lower levels of the distribution system have started to implement a true pull distribution system based on stock status and consumption at the health facility. As pull distribution requires the staff at the lower levels in the distribution system to determine how much of each product to order, this has further highlighted the need for timely and accurate data on stocks and medicines consumption. A large number of the countries which provided input for this work either already have some form of a Logistics Management Information System (LMIS) or are in the process of implementing one. In-depth assessment of the public medicines supply chain of six sub-Saharan African countries (*6*) shows that LMIS is available in 100% of CMS studied, 82.5% of RS, 88.87% of DS and 57.2% of heath facilities. In most countries studied, LMIS data are currently recorded through a software system at the central and sometimes regional level, and on store ledgers, stock control cards and requisition forms at the district and health facility level. However, reporting such data to the higher levels of the distribution system for better supply planning is often difficult. In the six countries studied, only 46% of health facilities collect logistics data and send this information to the higher levels, 50.67% of DS and 74.08% of RS (*5*). The main difficulties in implementing a functional LMIS are the existence of a different LMIS for each programme; the increasing complexity of donor reporting requirements; and the burden for the health professional in maintaining multiple systems. Harmonization and standardization of logistics data to be recorded are prerequisites for a functional and efficient integrated LMIS.

A push from large donors, such as the Global Fund and PEPFAR, to use consumption data for national quantification has led to new initiatives to replace antiquated paper-based stock requisition systems with computerized forms and electronic ordering in some countries. Similar initiatives for electronically recording and reporting of immunization clients are helping in better managing and tracking vaccine inventory across the supply chain.

Countries that lack well trained staff at health facilities and districts and usually rely more on trained staff at the central or regional medical store level continue to use a push system. This is also the case in those countries that have a skeletal health staff at primary health centre level and want to minimize the pharmaceutical stock management workload of lower-level staff.

17.3.6 Distribution model design being decoupled from administrative structure

Many countries are now realizing that the perceived operational management convenience from using a distribution system that reflects the administrative and governance structures is limited and that the resulting losses in efficiency are large. Several initiatives are under way to design distribution systems based on geography, demand, storage and other technical conditions.

Several initiatives are under way to design distribution systems based on geography, demand, storage and other technical conditions.

For example, in Zambia districts currently carry stock and decide the quantity of resupply from the CMS based on the aggregate consumption of all health facilities in the district. This design matches the administrative structure of the Ministry of Health where the District Health Management Team (DHMT) is responsible for all health facilities in the district. Since the district communicates only its resupply quantity to the CMS, there are no data at the central level on consumption or stock levels at each facility. Under a new pilot programme the districts no longer hold stock for lower levels, but are solely a pass-through for distributing drugs which are packaged at the CMS specifically for each health facility. In

this large-scale randomized pilot study, the district acting as a pass-through system experienced better availability of essential medicines as compared to the current system or a system with enhanced stock management capacity. ARV supply programmes in multiple countries use a similar system for supply of ARVs to antiretroviral therapy (ART) sites. Such arrangements for achieving optimized transport costs without holding stock at a regional point are a common feature of commercial sector supply chains (*15*,*16*).

When health facilities have extremely poor capacity to manage the storage and ordering of medicine, a supply system where the district or regional delivery team visits the health facilities to replenish serves as a potential solution.

When health facilities have extremely poor capacity to manage the storage and ordering of medicines, a supply system where the district or regional delivery team visits the health facilities to replenish serves as a potential solution. Zimbabwe has implemented a Delivery Team Topping Up (DTTU) system in which, instead of health facilities doing stock management and ordering, a delivery truck loaded with supplies arrives at the health facility, counts the stock, and tops up inventory levels accordingly (*17*). This decouples the loci of the ordering decision from the administrative structure. The delivery team makes the ordering decision based on consumption and stock status at the health facility. In 2009, John Snow Inc. reported that the stock-out rates for nevirapine tablets decreased from 33% to 2% after the DTTU system was implemented.

17.3.7 Outsourced transport

A shortage of functioning transport is a key challenge for the public sector distribution system, both from the CMS to the regional or district stores and even more from the district/regional store to the health facility level. The availability of vehicles for distribution of medicines is limited due to lack of transport planning, poor vehicle maintenance and non-compliance with vehicle use policy within the public sector distribution system. Some countries such as Kenya have contracted a third party transport company instead of using a CMS fleet of vehicles to distribute stock to the health facilities. The Gambia has outsourced its transport function to an NGO that maintains a vehicle fleet and charges the Government on a Cost per Kilometer (CPK) basis. In some geographies and contexts, a third party logistics provider can offer higher frequency of delivery at better rates if contracting and service level agreements can be appropriately structured. Such initiatives require ongoing monitoring of the transportation contractor and enforcing the pre-established performance standards, activities which are not always easy within the public sector.

17.3.8 Trends in the private distribution market

The private distribution market is going through a period of consolidation as manufacturers have increased demand on their wholesaler/distributors and smaller marginal wholesalers have limited access to inexpensive sources of capital needed to improve both the reach and efficiency of distribution. In countries where wholesaling is very fragmented, consolidation of wholesaling is being driven by policy measures such as enforcing better distribution practices and stricter information reporting requirements. For instance, in China when a nationwide "Good Supply Practice" (GSP) enforcement campaign was launched in 2004, the number of pharmaceutical wholesalers dropped from 16 000 to 7445. As government and international donor-run programmes become aware that a large public infrastructure for medicine distribution is not sustainable in the long run, they are starting to realize that having a healthy and robust wholesaling and distribution system within the private sector could help achieve many public health distribution objectives more sustainably.

At the same time, both pharmaceutical companies and policy-makers are paying greater attention to wholesale and distribution margins. Some countries, such as India and South

Africa, regulate the wholesale and distributor margins in a similar way to markets in the European Union. This has increased the use of logistics service providers and created new initiatives, such as regional distribution hubs.

17.3.9 Trends in NGO/FBO distribution

A large number of faith-based distribution organizations that previously received their medicines through donations of medicines or financial support for capitalization have now established themselves as recipients of long-term external donor support. This has enabled them to build better storage and distribution systems.

17.4 FUTURE CHALLENGES AND ISSUES

- Efforts to increase the effectiveness and efficiency of distribution systems will become more important over the next decade as the cost of disease programmes escalates and sources of financing are constrained. Countries will have to make their distribution systems more sustainable by using consumption and stock status data to optimize efficiency and create integrated logistics platforms for distribution of medicines.
- In-country distribution systems that are still at an early stage of improvement will face the challenge of cost containment and long-term sustainability relatively early in their development. In such countries large investments are still needed to improve distribution. If implemented too early, cost containment could put these distribution systems in jeopardy. It also becomes imperative to examine the role of the private sector wholesalers and distributors in achieving higher service levels in public health facilities.
- Medicine availability indicators at the point of dispensing are very successfully captured using the WHO/Health Action International (HAI) survey methodology. The WHO in-depth assessment of the medicines supply system survey measures the performance of structures (for the different processes of the medicines management cycle) at different levels in the supply chain (CMS, RS, DS, clinic etc.) including stock availability. Measurement of stock availability at the central, regional or health facility level is not carried out systematically and routinely. Gathering evidence on stock at each level in the distribution system and consumption at the health facility level will be crucial in efforts to understand the best distribution system structure for each country and context and to better manage the supply chain.
- The shift in the burden of disease from communicable to non-communicable diseases in low- and middle-income countries will require a different supply chain and distribution planning system. Maintaining an inventory of several categories of medicines using specific tools for the various stocks will be expensive. To manage the resupply of a limited number of medications for chronic diseases requires that the health-care workers and clinicians adhere to standard treatment guidelines. Some of the medicines for chronic diseases may also require controlled temperature distribution, placing an additional strain on already weak and severely constrained cold or controlled temperature distribution chains in most countries.
- Opportunities may exist to improve distribution through public-private partnerships or by outsourcing select functions to the private sector, but this will require strong institutional contracting capacity within ministries of health. Efforts to improve distribution through procurement of auxiliary services from the private sector will require greater trust between the private sector logistical service providers and the ministries of health.

- Preservation of the quality of medicines throughout the supply chain can occur only if the structures involved are in compliance with good distribution practice (GDP). Compliance of structures with GDP at all levels of the supply chain can be achieved through adequate human, material and financial investments and strong and continuous training of staff (*18*).

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ABBREVIATIONS

ACAME	Association Africaine des Centrales d'Achat de Médicaments Essentiels (African Association of Central Medical Stores for Essential Medicines)
ACT	Artemisinin combination therapy
ART	Antiretroviral therapy
ARV	Antiretroviral
CMS	Central medical stores
CPK	Cost per Kilometer
DHMT	District Health Management Team
DRC	Democratic Republic of the Congo
DS	District (medical) store
DTTU	Delivery Team Topping Up
FBO	Faith-based organization
GAVI	The GAVI Alliance
GDP	Good Distribution Practice
GSP	Good Supply Practice
HAI	Health Action International
LMIS	Logistics Management Information System
MSD	Medical Stores Department

MSH/SPS	Management Sciences for Health/Strengthening Pharmaceutical Systems
NGO	Nongovernmental organization
OECD	Organisation for Economic Co-operation and Development
PEPFAR	US President's Emergency Programme for AIDS Relief
RS	Regional (medical) stores
TB	Tuberculosis
WMS	Warehouse management system