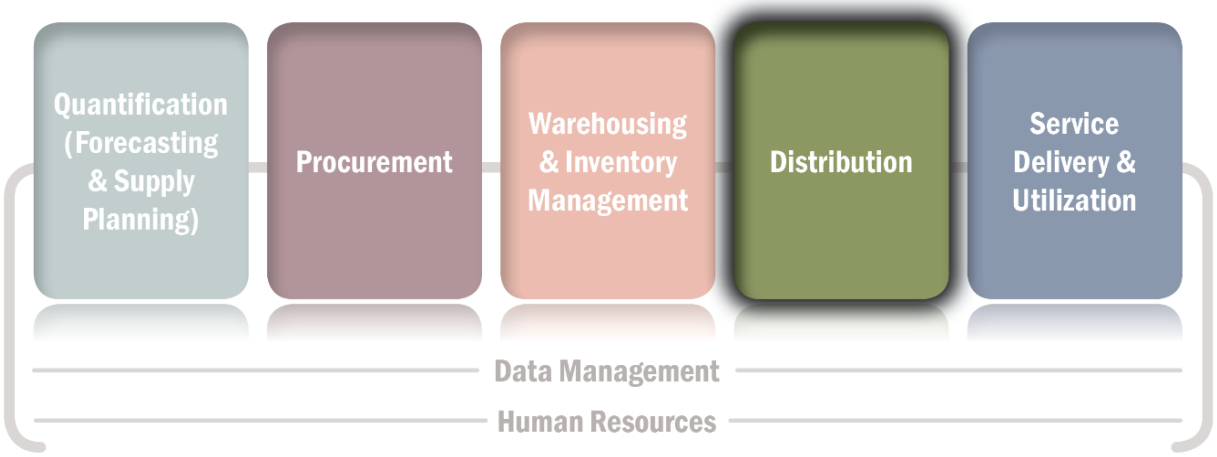
Promising Practices
DISTRIBUTION

Brief #4 in the *Promising Practices in Supply Chain Management* Series



INSIDE

This brief is part of the *Promising Practices in Supply Chain Management* series, developed by the Supply and Awareness Technical Reference Team (TRT) of the UN Commission on Life-Saving Commodities for Women's and Children's Health (the Commission or UNCoLSC). As part of the Every Woman Every Child movement and efforts to meet the health-related Millennium Development Goals by 2015 and beyond, the Commission is leading activities to reduce barriers that block access to essential health commodities. The Supply and Awareness TRT developed this set of briefs on promising practices in supply chain management to guide countries in identifying and addressing key bottlenecks in the supply and distribution of the Commission's 13 life-saving commodities across the reproductive, maternal, neonatal, and child health continuum of care.

This series of briefs has been developed for use by in-country stakeholders. The briefs provide both *proven* and *promising* practices that may be used to address specific supply chain barriers faced by each country.

- *Proven practices* are defined as interventions with proven outcomes in improving health commodity supply chains in low- and middle-income countries tested using experimental or quasi-experimental evaluation designs. Examples of proven practices are identified by this symbol throughout these briefs.

- *Promising practices* are defined as interventions showing progress toward improving health commodity supply chains in low- and middle-income countries.

To view all the briefs in the Promising Practices in Supply Chain Management Series, visit http://siapsprogram.org/publication/promising-practices-in-supply-chain-management

The organizations that participated in the development of these briefs are: Systems for Improved Access to Pharmaceuticals and Services (SIAPS), VillageReach, John Snow, Inc. (JSI), United Nations Population Fund, US Agency for International Development (USAID), Imperial Health Sciences, People that Deliver, mHealth Alliance, Merck for Mothers, United Nations Children's Fund, Clinton Health Access Initiative, Population Services International, and PATH.

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Abbreviations and Acronyms

ADP	Accenture Development Partners	LMU	logistics management unit
ARV	antiretroviral	MSD	Medical Stores Department
DLS	Dedicated Logistics System	NACA	National Agency for the Control of AIDS
DTTU	Delivery Team Topping Up	NDoH	National Department of Health
EWEC	Every Woman Every Child	R&R	reporting and requisition
Global Fund	Global Fund to Fight AIDS, Tuberculosis, and Malaria	SDP	service delivery point
IP	implementing partner	SIAPS	Systems for Improved Access to Pharmaceuticals and Services
JSI	John Snow, Inc.	TRT	Technical Reference Team
LMIS	Logistics Management Information System	USAID	US Agency for International Development
		VMI	vendor-managed inventory

Background

Having efficient and reliable processes to distribute appropriate commodities from central warehouses to service delivery points (SDPs) is a critical part of effective supply chain management, yet many low- and middle-income countries face numerous challenges with their commodity distribution systems. To increase access to the underutilized commodities prioritized by the UN Commission on Life-Saving Commodities, distribution bottlenecks throughout the in-country supply chain should be addressed to ensure that commodities reach the points of service delivery.

When working properly, distribution ensures the delivery of commodities from the highest level of the supply chain to the locations where the commodities are distributed directly to those who need them. This involves multiple methods of transportation, from refrigerated trucks moving commodities from central medical stores, to district warehouses, to community health workers transporting commodities from rural health centers to community clinics by foot or by bicycle. But distribution is not only about the delivery of commodities to SDPs. Effective distribution is highly dependent on other functions of the supply chain working in an efficient and integrated manner. For example, supply chain managers should receive reliable logistics data to procure an appropriate amount of each commodity, plan delivery cycles, and ensure an adequate supply is delivered to each SDP.

Effective distribution is dependent on reliable transportation, cold chain capacity, timely flow of information for planning, adequate human resources, and sufficient financial resources to support distribution-related costs. Every Woman Every Child (EWEC) countries currently experience a number of barriers and challenges to improving commodity distribution, including the lack of reliable transportation, long distances to health centers, changing commodity demand, poor distribution planning, and lack of reliable and timely data. These barriers are not easy to overcome, as many of them are complex and interrelated. Furthermore, the sheer volume of commodities that the health system distributes is growing exponentially, often far beyond the management capacity of the public health system. Such barriers, and the corresponding promising practices that address them, are described in the table below. For more information on the cross-cutting issue of data management, please see the *Promising Practices in Data Management* brief.

Barriers	Description	Promising Practices that Address the Barriers
Limited transportation infrastructure	Availability, reliability, and quality of transport infrastructure and services, especially at the last mile as well as maintenance of cold chain during distribution for temperature sensitive and cold chain dependent commodities.	• Level jumping • Distribution outsourcing • Vendor-managed inventory
Long distances to resupply points	Distance between health centers and resupply points and between community health workers and health centers. This problem is exacerbated when systems are set up according to administrative boundaries/reporting lines rather than by distance, topography, or population density.	• Level jumping • Distribution outsourcing • Vendor-managed Inventory
Poor distribution planning	Ad-hoc distribution strategies and poor distribution planning with limited incentives for timely distribution.	• Level jumping • Distribution outsourcing • Vendor-managed inventory • Top-up or informed push system with direct delivery to health facilities
Changing commodity needs	Constantly changing environments, including commodity demand that changes with seasonal peaks and lulls in disease incidence, create complications in accurately determining commodity needs.	• Vendor-managed inventory • Top-up or informed push system with direct delivery to health facilities
Poor data access	Poor data management and/or lack of sufficient stock at higher levels of distribution leading to inadequate stock distributed.	• Top-up or informed push system with direct delivery to health facilities

Some of the most promising practices in distribution are described below. No single solution will work for every country or for most countries. Simple variations to the current models will not be enough to create substantial change or keep up with the ever-growing distribution needs of most countries. Many countries have successfully experimented with ways to adapt best practices from other sectors to address their distribution challenges and are redesigning their distribution systems in innovative ways, some of which are highlighted as examples.

Top-Up or Informed Push System with Direct Delivery to Health Facilities

To address barriers in distribution planning, data access, and changing commodity needs

A top-up or informed push system is a method whereby commodities are distributed on predetermined delivery schedules without an order from the lower levels of the supply chain. Unlike a pull system, in which the lower levels must determine their commodity needs and have a way of notifying the higher levels of the supply chain of their order, this system "tops-up" or "pushes" commodities to the health facility. Delivery trucks are often loaded with a pre-determined quantity of commodities based on population or previous usage information. For this system to work well, it often includes a direct delivery component whereby health facilities are visited at regular intervals to count stock levels and top-up the commodities needed. The specific quantity of commodity left at (or removed from) each facility is usually based on a number of factors, including stock on hand, losses and adjustments, and days of stock-out since last delivery. For countries struggling with information flow, a "top-up" or informed push process eliminates reliance on the SDP to order the correct amount of stock.

The advantages of this system often include improving the schedule or regularity of distribution, reductions in stock-out rates, and improvements in reporting rates. Because the top-up or informed push system relies on trained delivery teams to collect data on consumption and stock levels, it does not require extensive training and supervision of health facility staff in tasks, such as data entry and resupply calculations. However, the top-up or informed push system requires a large amount of up-front investments in reliable vehicles, drivers and technical staff, and does not eliminate the need for ongoing costs, such as vehicle maintenance, fuel, and ongoing training of delivery teams. Despite these investments, costing studies have found the system is more cost-effective, in many cases less expensive than the current common model of having each administrative layer of the supply chain responsible for delivering commodities to the level below.

When should a top-up or informed push system be considered?

A top-up or informed push system works best for a limited number of commodities that have relatively steady demand and when adequate stock is available to meet that demand. The exact number of commodities that can be effectively managed with an informed push system is unknown, but some suggest using 55 commodities or less. The top-up or informed push system often uses minimum and maximum stock requirements, which are set in advance. The distribution team then tops up SDPs that are below the stock minimum and removes stock from SDPs that are above the stock maximum. This works well with preventative health commodities, such as vaccines or family planning supplies where the need is fixed and can be predicted based on population data. Commodities with variable demand are less conducive to a system with predetermined minimum/maximum stock levels. Moreover, in a top-up or informed push system, decisions on how much stock an SDP receives are made on site. Therefore, situations where rationing decisions must be made at higher levels of the supply chain because there is not adequate supply to meet demand may not be conducive to a top-up or informed push system. However, the system may be modified to include rationing, if needed.

Like all practices described in this brief, a top-up or informed push system cannot function properly in the midst of a broken system. A combination of improvements in delivery, human resources, data

collection, and management are all needed to make the informed push or top-up system successful. All examples described below include direct delivery to SDPs. It is possible to have an informed push system without changing how commodities are delivered. However, without distribution directly to the SDP, other distribution barriers, such as lack of transport at the lower levels of the supply chain, may continue to hinder product availability. Combining an informed push supply model with distribution directly to the SDP helps to holistically address data access challenges, human resource constraints, and transport limitations. In addition, the highlighted examples employ dedicated logistics personnel who are responsible for planning the distribution of commodities, collecting commodities from the warehouse, conducting physical counts on arrival at the SDP, and collecting data on stock levels and consumption of commodities. In many cases, these staff are also trained to provide supervision at the health center or they may travel with a supervisor when they conduct distributions. This integration of specialized logistics personnel—and the impact that they can have on the overall efficiency of the supply chain—is explored in more depth in the *Promising Practices in Human Resources* brief.

ZIMBABWE

In 2002, USAID (through the USAID | DELIVER PROJECT) conducted an assessment to determine why HIV and AIDS-related commodities were unavailable at rural SDPs despite adequate stock in central warehouses. After concluding that the problem derived from the health system's inability to successfully carry out necessary supply chain functions, the USAID | DELIVER PROJECT recommended implementing a "Delivery Team Topping Up" (DTTU) system. Under the system, delivery trucks are filled with a fixed quantity of commodities, usually based on past consumption data, which are delivered directly to the SDP. The drivers, or other staff members, use on-site data to determine resupply quantities and help reconcile inventories. They then top-up stock at each SDP to meet demand until the next scheduled delivery. A 2007 evaluation showed that the DTTU system had achieved 95% coverage of all SDPs for condoms and contraceptives, with stock-out rates below 5% for these products. Based on this success, the DTTU has added more commodities (it now manages 21) and is currently computerized. Initially, the SDP order quantities were documented on a paper delivery/receipt voucher. In 2008, software called AutoDRV was implemented to automate data capture and order calculations. AutoDRV also uploads directly to the central level top-up system, minimizing data entry and transmission errors.

DTTU can be implemented despite challenging contexts that hinder operation of an effective public health supply chain. Implementation of the DTTU system in Zimbabwe has been carried out by six partners that have distinct roles and responsibilities essential to the successful execution of the distribution system. Partners have made special investments to ensure that reliable vehicles, drivers, technical staff members, or a combination of them directly provide facilities with the health products they need to serve clients. The DTTU system has been duplicated in Zimbabwe for other commodities, as ZIP (Zimbabwe Informed Push). Similar systems are being rolled out in Liberia and Nigeria.

To learn more:

- Delivery Team Topping Up: Bringing About Reliable Distribution in Difficult Environments
- Zimbabwe: Supply Chain Costing of Health Commodities
- Measuring Cost to Optimize Health Commodity Delivery in Zimbabwe
- 10 Years of Delivery Team Topping Up (pages 9-10)

MOZAMBIQUE

In 2002, the Foundation for Community Development, VillageReach, and the Mozambican Ministry of Health launched the Dedicated Logistics System (DLS) for vaccines and related supplies to improve the availability of vaccines in Northern Mozambique. Similar to the DTTU system, the DLS is run by the Provincial Health Departments. It is organized around provincial-level logistics teams of three to four people, called Field Coordinators, who manage the distribution system and are responsible for delivering vaccines to all health centers in a delivery zone. Using provincial vehicles and provincial staff, the delivery teams transport vaccines, propane, medicines, and other essential commodities directly to SDPs. During the delivery, field coordinators collect data on vaccine supplies, stock-outs, vaccines administered, and cold chain maintenance to inform forecasting and logistics management. The DLS now operates in four provinces of Mozambique, serving just over 400 health centers, and is staffed and managed by provincial government personnel.

Institutionalizing a new delivery system like the DLS has not been easy and has required significant leadership to be successful. The position of field coordinator is a not an established post in the provincial health system, so provincial immunization staff have had to change their job duties to make time to participate in monthly delivery routes for two weeks per month. Vehicles are shared across multiple programs at the provincial office, making it difficult to find vehicles that can be dedicated to vaccine distribution for long periods. Some provinces rely on shared vehicles, which may delay distribution each month, while others have worked with partners and donors to secure specialized transport for vaccine distribution. Budgets for fuel and per diems to support the delivery teams were not initially factored into provincial budgets, since responsibility for the distribution of vaccines was, by policy, allocated across multiple levels of government. In some cases provinces have been able to start incorporating these costs into their budgets, while in other cases they rely on partners to help support the distribution expenses.

The system has also had to adapt to address specific management and policy concerns. For example, districts initially felt left out of the DLS. It is their mandate to be responsible for vaccine distribution but the DLS takes away the delivery aspect of their role. To address this, district vaccine managers are picked up during the delivery route and participate in distributions to ensure that district-level supervision and data collection are completed. A 2008 evaluation showed that the DLS dramatically improved coverage rates, resulting in a 93% coverage rate for all vaccinations given to children age 24 to 34 months in the intervention province.

To learn more:

- Evaluation of the Project to Support PAV (Expanded Program on Immunization) in Northern Mozambique, 2001-2008: An Independent Review for VillageReach with Program and Policy Recommendations.
- Comparison of Costs Incurred in Dedicated and Diffused Vaccine Logistics Systems

SENEGAL

From 2009 to 2012, Project Optimize and the Senegalese Ministry of Health partnered to undertake a number of supply chain improvements and demonstration projects, including an informed push system for vaccine delivery known as "moving warehouse." Prior to this project, vaccine distribution happened from the bottom up, with nurses from health posts responsible for traveling to district headquarters to pick up supplies and, in turn, district teams responsible for going to regional warehouses to collect supplies. Funds for transportation and per diems were not always available, leading to frequent missed trips and stock-outs.

The moving warehouse was established to deliver vaccines, essential medicines, reproductive health commodities, and HIV, malaria, and tuberculosis medicines directly to SDPs. In addition, the moving warehouse was responsible for numerous other transportation activities, such as collecting full safety boxes from SDPs, distributing monitoring forms, records, etc. to SDPs, transporting supervisors from higher levels to the SDPs, and transporting cold chain equipment.

The decision on which commodities to include in the project came partly from concerns that eliminating the district store would pose a threat to the district's income, which comes in part from a cost recovery model. In this model, patients are charged for certain commodities and the district is reimbursed by the SDP based on how many commodities are sold. Because the commodities are predominately donated, the cost reimbursed is used to fund other programs. To mitigate this challenge, it was decided that moving warehouse would deal only with commodities that are provided to patients for free and thus not affect the cost recovery model.

The moving warehouse (made of up of one large truck and one pickup) delivers on three separate delivery circuits; completing the delivery circuits takes from two days to one week. During the shorter delivery circuit (up to three days), vaccines are stored in a 170-liter Aircontainer Bigbox that can keep commodities cold for two and one-half days. On the longer delivery circuit (up to one week), a Dometic RCW 4/30 is used in addition to the Aircontainer Bigbox, which can keep commodities cold for four and one-half days. Delivery trucks were also equipped with laptop computers and an internet connection allowing staff to access the Logistics Management Information System (LMIS) and update vaccine stock information.

The moving warehouse improved its reliability in completing delivery circuits throughout the pilot, nearing 100% by the end of 2012. As a result, general vaccine availability was at the appropriate level in four out of five pilot districts. In addition, the pilot was successful in maintaining a consistent cold chain; vaccines were kept between 2°C and 8°C 84% of the time in the RCW 4/30 containers, and 89% of the time in the Bigbox containers. During the pilot, overall annual supply chain costs increased, but cost per vaccine remained steady.

In 2012, Senegal also piloted an informed push system for family planning commodities, using similar principles to the moving warehouse for vaccines. During the six-month pilot program, stock-outs were eliminated and there were marked increases in the use of intrauterine devices, injectables, pills, and implants. The Government of Senegal is now scaling up the distribution system.

To learn more:

- Optimize Senegal Report

Level Jumping: Direct Delivery and Cross-Docking

To address difficulty with transportation infrastructure and long distances at the lower levels of the supply chain as well as poor distribution planning

The informed push system highlighted in this brief includes a concept that is sometimes called "level jumping" or "level skipping." In many countries, supply chains follow the administrative structure of the health system, with each administrative level storing commodities and taking responsibility for delivering supplies to the level below. Yet the resources available for commodity distribution tend to decrease at each level of the health system, meaning that the system becomes more and more ad-hoc and commodity availability may decrease. To address this, many countries have adopted level jumping, which involves determining which levels actually need to hold and manage stock and bypassing those that do not create a more efficient system. Level jumping helps address challenges with availability, reliability, and quality of transport infrastructure and services, especially at the last mile.

The promising practices highlighted below include direct delivery (where commodities are delivered directly from central level warehouses to SDPs) and cross-docking (where orders are filled and packed for SDPs at the central level, then sent to a collection or redistribution point before being sent to SDPs). Both direct delivery and cross-docking have the potential to reduce delivery times and increase stock availability, but neither are without trade-offs. For examples, when levels are eliminated, the remaining levels need to increase their order processing and delivery capacity.

When should level jumping be considered?

When considering a level jumping approach, it should not be assumed that less is always more or that fewer levels is always more efficient. Instead, clear processes should be used to determine which levels actually add value to the distribution process, ideally through supply chain modeling or network optimization. Through modeling analyses, supply chain decision makers can evaluate potential distribution networks by creating scenarios with varying system tiers, number of facilities, location of facilities, and service areas to determine the most cost-effective network.

TANZANIA

Prior to 2010, commodities in Tanzania were transported from the Medical Stores Department (MSD) to District Medical Offices. District Medical Offices were then responsible for delivering commodities to the health facilities in their districts. Due to delayed deliveries, stock wastage, and stock-outs, the Ministry of Health and Social Welfare instructed the MSD to conduct a pilot study in Tanga Region to test changing to a direct delivery system. In this new model, health centers were still responsible for submitting reporting and requisition (R&R) forms to the district to determine how much of each commodity was needed. The MSD then packed each order per health facility and delivered the order directly to the health center instead of sending it to the district. To plan the optimal distribution route for this pilot, MSD worked with Accenture Development Partners (ADP) to develop a distribution planning tool to assist with the budgeting, planning, and business case for this new direct distribution model.

The pilot was successful in creating only a slight improvement in delivery times and order fulfillment. MSD maintained a 65% fulfillment rate during the pilot. In many cases, the challenges did not have anything to do with direct delivery, but were indicative of zonal-wide stock-outs or shortages of certain commodities during the pilot period. Moreover, commodity budget allocations at health facilities were not reflective of the population served by the facilities. In other cases, the challenges were due to a shortage of human resources or transport available during the pilot period. Despite these challenges, the pilot did increase MSD's ownership, accountability, and insight into the situation at lower levels of the supply chain. For example, once MSD was responsible for delivery, it was discovered that budget was being allocated and orders fulfilled for 45 non-operational facilities (facilities that were not yet built, facilities that were not staffed, etc.). In addition, health center staff felt a more direct connection to the MSD, which helped them understand the importance of submitting their R&R forms on time.

Overall, the direct delivery pilot was received positively, and the Government of Tanzania approved the expansion of direct delivery across the country. The first phase included rolling out direct delivery to just one region in each of the nine MSD zones, with full rollout to all facilities after testing in the first nine regions. To make this move from a pilot in one region to a national rollout, the Government of Tanzania again enlisted a number of partners. The USAID | DELIVER PROJECT helped to do supply chain modeling with MSD to help them plan the most cost-effective rollout of the direct delivery system and to build capacity for route planning. ADP brought in the Coca-Cola Company, with support from Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) and the Bill & Melinda Gates Foundation, to address the change management, human resource, and supply and demand planning needed to optimize the system during national expansion. Although this project has had some major successes—such as reducing lead time for deliveries by as much as 25 days and improving the relationship and connection between MSD and its customers—a complete systems approach is needed to increase the impact on overall commodity availability. The project continues to work on forecast demand and accuracy, human resource performance, and additional route planning and optimization to bring further improvements to Tanzania's medicines supply chain.

To learn more:

- Medical Supply Solutions in Tanzania Overview
- MSD Direct Delivery Tanga Pilot
- Coca-Cola and the Global Fund Announce Partnership to Help Bring Critical Medicines to Remote Regions

ZAMBIA

In Zambia, distribution from the district level to the health centers is challenging because of small orders needed at numerous facilities, long distances, and roads that require off-road vehicles to navigate. In addition, districts have historically had the responsibility for ordering, storing, and managing commodities for the health centers in their area. In 2009, in order to address the bottlenecks associated with distribution, the Ministry of Health, Crown Agents, and the USAID | DELIVER PROJECT implemented the Essential Drugs Public Pilot program. As part of the pilot, eight districts implemented a model in which storage and management of commodities for health facilities at the district level were eliminated. Instead, the district store became a "cross-dock" or point of transit where it received pre-packaged shipments from the central level warehouse that were then delivered to health facilities without any changes to the order. Health facilities were responsible for filling out commodity orders and sending them to the district. The district again acted as a point of transit for orders, sending them to the central warehouse without making any changes.

Although the districts were still responsible for making sure that health facilities received the commodities, they were no longer responsible for managing how many commodities the health facility received. The research done during the pilot period showed that even this small change of "level jumping" without direct delivery made a significant difference in commodity availability. The districts where cross-docking was implemented showed large improvements over the control districts in the reduction of stock-outs for all commodities. For example, pediatric artemisinin-based combination therapy was stocked-out an average of 29 days in comparison districts while only stocked-out for an average of five days in the districts where cross-docking was implemented. Similar patterns were true for other tracer commodities. Other measures of supply chain effectiveness, such as storage and reporting rates, also improved in the implementation districts. Finally, researchers estimate that if the model were to be implemented district wide, under-five mortality would decrease by 21% and over-five mortality would decrease by 25%.

To learn more:

- World Bank Policy Note: Enhancing Public Supply Chain Management in Zambia
- Tanzania: 2020 Supply Chain Modeling

Distribution Outsourcing

To address difficulty with transportation infrastructure, long distances, and poor distribution planning

For countries struggling to find the transport and personnel capacity to run a successful distribution system, outsourcing distribution to a private provider that specializes in transport may be an option. Outsourcing distribution does not eliminate the government's role in distribution but rather shifts it from managing transportation to monitoring, evaluation, and actively managing a relationship with a third party provider. Sufficient capacity in the government is needed to manage contracts, provide oversight and quality assurance, and ensure adequate financing and regular payments. This requires upfront investment in training and capacity building. Some governments have chosen to outsource multiple functions of the supply chain, such as warehousing and distribution, to the same third party provider.

A major advantage of outsourcing distribution is gaining the expertise and infrastructure of a company that specializes in transportation and distribution. In addition, private sector companies may have more resources to make upfront investments in equipment and infrastructure that the government cannot afford. Multi-year agreements allow private sector companies to make these investments by ensuring their return on investment through guaranteed business and contracts.

Distribution outsourcing, however, cannot solve all distribution challenges. Private transport companies may not have the capacity or interest to deliver to rural and hard-to-reach areas due to the costs and investments needed, leaving the health sector responsible for finding ways to reach these sites. The local private sector is often fragmented and disorganized, making it hard for governments to identify appropriate partners to meet their needs at a reasonable cost.

When should distribution outsourcing be considered?

Outsourcing distribution only works when there is a high level of trust and transparency between the government and the third party provider. When entering into an agreement for outsourced distribution, private transport companies are often worried about receiving guaranteed and regular payments. In return, governments are concerned about holding the third-party provider accountable for reliable and timely delivery. Addressing these concerns and building a relationship upfront are critical for success. Transparency in selecting the third party provider is also essential to avoid corruption or favoritism (or the perception thereof) in the selection of third party providers.

In addition, outsourced distribution only works if the rest of the supply chain is functioning well. Private sector companies rely on proper procurement and supply planning to distribute the correct amount of commodities in a timely manner. The government should ensure that orders are ready on schedule and provide clear direction on where and what to transport. Without such preconditions in place, many private sector transport companies may not be willing or able to provide a high level of service. Despite these challenges, distribution outsourcing is gaining popularity in many low- and middle-income countries, with large corporate partners like Coca Cola, United Parcel Service, and others looking for ways to support governments with the transition from government-run transport networks to partnerships with the private sector.

SOUTH AFRICA

South Africa's National Department of Health (NDoH) operates the largest antiretroviral (ARV) treatment program in the world, with more than two million patients on treatment at more than 3,000 public health facilities across the country. The previous model for pharmaceutical storage and transport was decentralized and managed by each of the nine Provincial Depots, which were responsible for delivering stock to district stores and facilities. The system experienced significant challenges with delayed deliveries, expired stock, and stock-outs at the lower levels.

The NDoH applied for and receive a grant from the Global Fund to pilot an outsourcing model through a public-private partnership. In this partnership, ARVs procured by the NDoH through the Global Fund are managed from a central stockholding point by a private provider and are distributed directly to health facilities, with replenishment to the Provincial Depots, as needed. Imperial Health Sciences (Imperial) was selected after a competitive tender process to take responsibility for inventory and stock management, order processing, cold chain storage, and normal and emergency deliveries to health facilities from November 2012 to October 2014. All the medicines (currently 26 first- and second-line ARVs) are stored at Imperial's warehouse and are distributed throughout the nine provinces. During this pilot, Imperial has met a number of key performance indicators, including normal orders dispatched within three working days, emergency orders dispatched within 24 hours, and timely submission of stock and delivery reports to the NDoH. The program has faced challenges getting started. Some facilities are located in rural or high-risk areas making unplanned deliveries unfeasible. For these facilities, a weekly order and delivery schedule was created to ensure that facilities receive their stock on time. There have also been instances where suppliers sent short-dated stock that facilities did not accept, and times where miscommunications led to incorrect orders, and occasionally to stock returns.

Overall though, the system has increased ARV availability at the health facility level, and the NDoH has made all payments within 30 days of being invoiced. The success of this program is due in part to the availability of outside funding specifically for this purpose, strong political will and commitment from NDoH, and pre-established capacity of Imperial that has reduced the time and resources needed for successful startup.

NIGERIA

Nigeria is the most populous country in Africa. The country presents one of the most challenging environments for effective distribution due to its population size, lack of infrastructure, and a high proportion of rural and hard-to-reach areas. The Supply Chain Management System team in Nigeria procures rapid test kits and Cotrimoxazole centrally on behalf of the President's Emergency Plan for AIDS Relief's 12 in-country implementing partners (IPs). Prior to July 2012, commodities were delivered to a local distribution center and each IP collected and distributed stock through a separate supply chain. The result was a fragmented system that was difficult to manage, expensive to operate, and plagued by high wastage and poor stock availability. In 2012, a pilot was implemented to consolidate the supply chains into a unified system. In this system, warehousing and distribution services from regional zonal warehouse to health facilities were outsourced to several local logistics contractors. As of September 2013, this distribution model has been rolled out to four zonal distribution centers and more than 1,500 SDPs. The system has been successful in achieving a 95% on-time delivery and order fill rates, and reducing ARV stock-outs from 25% to 7%. The system has also made substantial progress toward coordinated procurement, integrated stock management, and coordinated information management. As a result, the program has been fully endorsed by the Federal Ministry of Health and the Global Fund, with the potential of scaling up the program nationwide.

Though highly successful, the system still faced numerous challenges. Major challenges include: the lack of LMIS tools at the health facility level to track data on stock usage and needs; inaccurate and/or late reports and orders from health facilities; multiple sources of supplies to the same facilities; stock imbalances at health facilities; insufficient supply of certain commodities at higher levels of the supply chain; and inaccurate descriptions of facility locations.

Vendor-Managed Inventory

To address stock limited transport infrastructure, long distances, poor disruption planning, and changing commodity needs

Vendor-managed inventory (VMI) systems are systems in which the supplier, or vendor, manages the stock and replenishment decisions for the customer. In VMI systems, the vendor is responsible for determining when the sites need to be replenished, and is also responsible for maintaining adequate stock levels. This is very rare in public health supply chains in EWEC countries. Most countries instead determine the schedule for ordering commodities, the amount needed, and then take responsibility for storing and distributing the commodities themselves or through their partners. In true VMI systems, all these decisions would instead be made by the vendor and not by the customer or purchaser of the commodities.

VMI has many potential benefits, including cost savings, quicker turnaround of commodities, reduced stock-outs, and relieved ordering and transportation burden on government. However, like distribution outsourcing, VMI does not remove the government's role in distribution but rather shifts the focus from tracking orders and making deliveries to overseeing contracts with vendors. The government needs to work with the vendor to establish payment terms, inventory requirements (minimum/maximum stock levels, replenishment frequency, etc.), and determine and monitor performance targets.

When should vendor-managed inventory be considered?

There are a few cases where true VMI systems are used by governments to manage a limited number of commodities, but these commodities usually meet very specific criteria. Commodities currently managed by VMI are: often locally manufactured; have very specific storage conditions or short shelf lives that are better managed outside of government warehouses; move in and out of the supply chain quickly; or require long lead times to acquire raw materials, making the vendor more able to predict product availability than the public sector. For example, the case studies highlighted below deal solely with laboratory equipment and supplies. There are several factors that make laboratory commodities particularly viable for VMI systems. One, laboratories are a specialized service available at a fairly limited number of SDPs, making it feasible for a vendor to take on direct delivery to each lab. Two, laboratory reagents often have a short shelf life (often a month or less) and therefore do not have time to travel through the public health supply chain. Lastly, some laboratory commodities are specific to certain machines allowing for the opportunity to contract with vendors to both supply the commodities and regularly maintain the equipment. There is a built-in incentive for the vendor to keep the equipment working to create demand for the commodities (i.e., reagents) that are used with the equipment.

Moving to a VMI requires a high level of confidence in the supplier's ability to maintain adequate stock levels, conduct quality assurance, and deliver commodities when needed and in the right quantity. The government and vendor must be willing to be transparent and share logistics data with each other. VMI works best when the supplier has access to automated, real time consumption data. As a result, examples of true VMIs are rare in the public health sector.

VMI is not a solution for many commodities, but it may be a way to increase access to specific high-priority underutilized commodities of interest to EWEC countries and the UN Commission on Life-Saving Commodities. For example, resuscitation equipment—one of the critical commodities for

saving newborn lives—may be best managed by the vendor who understands the lifespan of the product, its usage, and how often it needs to be replaced or maintained. When a select subset of commodities are moving through a VMI system, it is important to still maintain integrated information systems so that decision makers from the public health system know what is moving through the system even when they are not directly in charge of its distribution.

MALAWI

In Malawi, VMI is used by the laboratory at the National Blood Transfusion service to manage laboratory equipment. The vendor is responsible for placing equipment in the laboratory, maintaining the equipment, and supplying reagents. The lab uses the reagents to run tests, and provides the vendor with information about how many tests are run. The vendor uses this information to correctly resupply the laboratory with reagents at the appropriate time.

To learn more:

- Selecting and Implementing Vendor Managed Inventory Systems for Public Health Supply Chains: A Guide for Public Sector Managers

NIGERIA

The National Agency for the Control of AIDS (NACA) selected and sub-contracted with a number of local private sector suppliers of laboratory equipment, reagents, and test kits to deliver these items directly to SDPs. Initially, the suppliers visited SDPs to assess their stock status for HIV and AIDS laboratory items and to set minimum stock levels, maximum stock levels, and review periods. At the end of each review period, suppliers visited each SDP, determined the types and quantities of test kits and reagents that needed to be replenished, and then delivered the supplies. They also determined if any equipment needed servicing. The suppliers then prepared an invoice for the quantities supplied to each SDP; the invoice was sent to NACA for verification and payment.

To learn more:

- Selecting and Implementing Vendor Managed Inventory Systems for Public Health Supply Chains: A Guide for Public Sector Managers
- Vendor Managed Inventory: Is it Right for your Supply Chain?

Conclusions

Improving in-country distribution may have an impact on overall product availability and product quality at SDPs in EWEC countries. The examples in this brief demonstrate how countries are currently working on new models to address distribution challenges. Implementing distribution changes requires leadership, resources, and some flexibility to manage the up-front investments needed to make long-lasting and sustainable changes in distribution practices.

All examples mentioned in this brief required significant changes to the country's distribution models and, in most cases, significant changes to other functions of the supply chain. Change may be welcomed by some stakeholders, particularly those interested in being associated with a successful innovation, or when the change is a part of an initiative with strong political backing (i.e., improvements to distribution of family planning commodities in a country with a strong push to improve reproductive health). However, resistance is likely to come from stakeholders at all levels, including prominent politicians who fear that changes, such as outsourcing, will reflect negatively on the government's capacity, to district level employees who fear losing the opportunity to receive allowances if they are no longer included in the distribution process. With adequate planning, communication, political will, and advocacy, such examples of resistance can be moderated. As mentioned in the moving warehouse example, some resistance was mitigated against by ensuring that the system included only free products that would not negatively affects districts' abilities to receive income through cost recovery from the SDPs.

Changing distribution models may also change the visibility and accountability of a supply chain system. In some cases, this may cause apprehension among stakeholders. For example, changing to a direct delivery model may cause regional or national warehouses to be concerned that the system will highlight an insufficient capacity to fulfill orders. Asking the regional or national level to take on responsibility for commodity distribution when it was previously the responsibility of a lower level of the health system may raise political concerns about taking on problems that otherwise would be the responsibility of a different level of the system. Despite these challenges, there may also be very positive outcomes from this increased visibility. As seen in the Tanzania example, delivering directly to SDPs gave the MSD more insight into what was happening at the health facility level and showed it that they had previously fulfilled orders for non-functional health centers, thereby allowing it to decrease waste and create a more efficient system. It also gave the SDPs an opportunity to better understand the role of the MSD as an entity that provides a direct and valuable service to its customers.

Changes to delivery systems may also lead to changes in the financing needed at various levels of the system. As seen in the examples from Tanzania, Mozambique, and elsewhere, systems that include direct delivery to health centers may uncover hidden costs that have been under-resourced in the past or may require budgets to be moved from one level to another. Consolidating costs at a higher level may make delivery systems appear more expensive, even when data show that, in reality, the full costs of the system across all levels are less.

As mentioned throughout, these examples either rely on a functioning supply chain at all levels or require improvements to other functions of the supply chain. Improving the distribution system in isolation will not lead to the desired outcomes when bottlenecks in other functions inhibit progress. In addition, most of these examples rely on the collection and analysis of data in some form, the importance of which is explored more deeply in the *Promising Practices in Data Management* brief. As these country examples have shown, change is possible and within reach for many EWEC countries.

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