

**USAID GLOBAL HEALTH  
SUPPLY CHAIN PROGRAM**

Procurement and Supply Management

# Driving Last-Mile Solutions to Ensure Access to Public Health Commodities

A report on key activities,  
challenges, and lessons learned



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# Acronyms

3PL	third-party logistics provider	LMD	last-mile delivery
ARV	antiretroviral drugs	LMIS	logistics management information system
CBHW	community-based health worker	LM-DOS	Last Mile Dispatch Optimization System
CDC	U.S. Centers for Disease Control and Prevention	M&E	monitoring and evaluation
CHT	County Health Team	MMD	multi-month dispensing
CMS	central medical store	MNCH	maternal, newborn, and child health
CNM	National Centre for Parasitology, Entomology, and Malaria Control (Cambodia)	MoH	Ministry of Health
COVID-19	coronavirus disease 2019	MOHCC	Ministry of Health and Child Care (Zimbabwe)
CSCOM	community health center (Mali)	mRDT	malaria rapid diagnostic test
CSCS	Community Supply Chain Summary	NBCH	newborn and child health
DDD	decentralized drug distribution	NIP	Namibian Institute of Pathology
DMA	Drug Management Agency	NPI-EXPAND	New Partnerships Initiative-Expanding Health Partnerships, Mali
DOOR	Drugs Out of Range	ORS	oral rehydration salts
DRF	drug revolving fund	PEPFAR	U.S. President's Emergency Plan for AIDS Relief
eLMIS	electronic logistics management information system	PMI	U.S. President's Malaria Initiative
EPI	Expanded Program of Immunization	POD	proof of delivery
EpiC	Meeting Targets and Mainstreaming Epidemic Control project	PtD	People that Deliver
EPSS	Ethiopian Pharmaceutical Supply Service	PWD	Population Welfare Department, Government of Balochistan
EUV	end-use verification	QAT	Quantification Analytics Tool
FP	family planning	QMIA	Quality Management Improvement Approach
GHS	Ghana Health Service	QR	quick response
GHSC-PSM	USAID Global Health Supply Chain Program-Procurement and Supply Management	RFP	request for proposal
IP	implementing partner	RFQ	request for quotation
IPLS	Integrated Pharmaceuticals Logistics System	RMS	regional medical store
JMS	Joint Medical Stores (Uganda)	SCMS	Supply Chain Management System
LLIHN	long-lasting insecticide-treated hammock net	SDP	service delivery point
LLIN	long-lasting insecticide-treated net	SOP	standard operating procedure
LMA	logistics management advisor	SSDM	Ghana's Supplies, Stores and Drug Management Division
		ULT	ultra-low temperature



## Objectives

The objectives of this document are to:

- Create a practical resource document that communicates last-mile supply chain experiences for leaders to use in advocating for, investing in, planning for, and developing robust public health supply chains, while highlighting **United States Agency for International Development** (USAID) investments in supply chains and the impact on the people our projects serve
- Document and disseminate learnings and contributions in strengthening the last mile of supply chains by **sharing information and experience.**

## Target Audiences

**The primary target audience** for this document is country governments, technical organizations, and global health and supply chain implementing partners—both globally and in USAID-supported countries. For them, this report aims to share technical knowledge for programming. In this document, they will find information to help them:

- Think about new ways to solve similar challenges
- Apply lessons to inform approaches, develop strategies, and adapt methodologies to their contexts
- Collaborate globally and locally
- Partner to share strategies and resources
- Use new technologies and approaches developed by GHSC–PSM

Another **key audience** is the United States Government, including USAID, the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), and the U.S. President's Malaria Initiative (PMI) in Washington, D.C., and in supported countries, and other donors and multilateral organizations, including the Global Fund to Fight AIDS, Tuberculosis and Malaria; Gavi, the Vaccine Alliance; the United Nations Population Fund, and UNICEF. They will find this document useful to:

- Share key learnings from recent activities to improve decision making for supply chain management
- Leverage new data and innovations that elevate USAID and push global development forward
- Strengthen overall health and global supply chains
- Support USAID's mission to fight infectious diseases
- Develop strategies and methodologies that can live on after the project is complete



# Purpose

## Ensuring availability of public health commodities at the last mile

- Since 2016, the USAID Global Health Supply Chain Project-Procurement and Supply Management (GHSC-PSM) project has worked in **more than 30 countries** to partner with ministries of health, central medical stores, and others to strengthen public health supply chains.

Making quality health products available to clients and patients at the last mile has been central to this work.

- This document aims to capture critical aspects of that work and share challenges and lessons learned in the hope that others can apply these learnings to their own work. As a result of extensive research and interviews with project staff worldwide, it includes **examples from more than 18 countries in Africa and Asia, plus Haiti.**

## Structure of This Document

The chapters of this document reflect old and new ways of organizing and linking key themes of the project's technical support activities as they reinforce the availability of commodities at the last mile:

- Providing last-mile delivery to meet clients where they are
- Using specialized approaches to improve commodity availability and quality at the last mile
- Promoting local ownership to ensure last-mile sustainability
- Increasing participation of the private sector to promote localization and deliver to the last mile
- Enhancing data visibility and use to ensure commodity availability at the last mile
- Using advanced analytics to inform decisions for last mile commodity availability
- Building human resource capacity to ensure commodity availability at the last mile

Although the project has already documented individual country stories related to these themes, this is the first comprehensive compilation of its kind, reflecting the contributions of dozens of technical staff worldwide.

The activities documented here aim to capture stories not already told; however, in some instances, and where appropriate, readers will find a brief reference with a link for more information to activities already documented elsewhere.



# 01.

Introduction

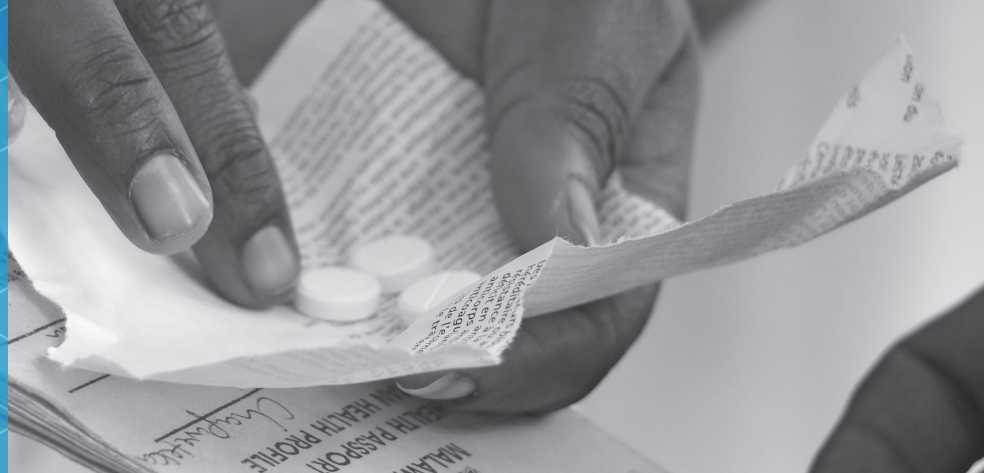


PHOTO CREDIT: GHSC-PSM

## Ensuring Access to Commodities at the Last Mile Is About Much More Than Delivery

Public-sector health commodity supply chains in USAID-supported countries often consist of a series of warehouses and vehicle fleets entirely owned and operated by the public sector, delivering products to public-sector health facilities. Much of the supply chain has traditionally been managed by clinical health providers rather than supply chain professionals. At the same time, ministries of health have long struggled to ensure that patients are within the World Health Organization–recommended five kilometers of a health facility.

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**The delivery of health commodities is evolving,** however. The definition of “the last mile” increasingly includes locations beyond public health facilities, such as private-sector pharmacies, village markets served by community health workers, specialized laboratory hubs, and even homes, bars, and hotels. At the same time, the supply chain and logistics fields are gradually professionalizing, allowing for increased efficiency and for trained clinicians to focus on their clinical work. The private-sector distribution systems for non-health commodities are increasingly robust and private-sector health care provision is growing as well. **As a result, governments are now more open to leveraging the private sector to**

**provide warehousing and distribution services, particularly delivery, to extend the reach of the public sector.**

USAID’s private-sector engagement policy encourages an intentional shift toward market-based solutions where possible. These three trends—the widening definition of the last mile, the professionalization of the supply chain, and the increasing recognition of the private sector—are all reflected in this report, which provides examples from around the world of getting health care commodities to the last mile.

For USAID and GHSC–PSM, reaching the last mile encompasses far more than commodity delivery; it includes an array of services for commodity procurement,

supply, systems strengthening technical assistance and even advocacy: any activity that helps provide a reliable supply of health commodities to the facilities and workers who use them. This report, however, focuses specifically on **interventions and activities that directly support actors and systems at the last mile of the supply chain.**

The examples were selected to illustrate the **evolution of public health supply chain management** over the past few decades. Improving access to essential commodities at the last mile requires a diverse and complex set of inputs: a skilled and motivated workforce; a commitment from national and local governments to owning the supply chain; robust procurement, management, and oversight functions, and more. The richness and variety of activities included in this report reflect all the clinical areas covered by GHSC–PSM: HIV/AIDS; malaria; family planning and reproductive health; and maternal, newborn, and child health (MNCH).

As computational science evolves and information becomes increasingly digitized, the resulting wave of data can

## The shift from single public-sector structures to mixed public- and private-sector systems is facilitated by new technologies and better management of data.

prove challenging to wade through and understand. Data visibility and advanced analytics are highlighted in this report as valuable tools to empower supply chain managers for better decision-making by clarifying and illuminating their data, helping identify risks to last-mile availability, and resolving risks before they impact health workers and their clients.

This report includes many examples of engagement with the private sector for critical last-mile delivery tasks, including outsourcing delivery to third-party logistics companies, or “3PLs”; task shifting to private-sector health providers—pharmacists in particular; and harnessing market forces to ensure high-quality, sustainable supply chains in the health sector. This engagement with the private-sector can also further USAID’s priority on localization, which includes strengthening local capacity and local institutions to solve development challenges. Local ownership of key supply chain functions is essential for long-term sustainability but can be challenging to achieve, partly because of difficulties in ensuring funding sustainability or local commitment to taking ownership of some programs. **Notably, the shift from single public-sector structures to mixed public- and private-sector systems is facilitated by new technologies and better management of data, which permit tracking the flow of commodities from end to end of the supply chain, including while in transit with private-sector logistics providers.** The report includes several examples of how GHSC–PSM is supporting partners for improved

data management in mixed public- and private-sector systems by introducing new dashboards in current logistics management information systems (LMISs), using quick response (QR) codes, and other tools to enhance traceability. Several emerging challenges—from the COVID-19 pandemic to political disruption—require new and specialized approaches to ensuring commodity availability.

These are just some of the topics covered in this document. To provide useful guidance to supply chain professionals and policymakers, this report includes case studies that highlight successes, challenges, and lessons learned from 18 countries where GHSC–PSM has been

providing assistance. In some cases, the solutions implemented by GHSC–PSM and partners have already contributed to measurable improvements in key parameters of supply chain management in the last mile, and relevant data and charts are provided throughout the document whenever possible. In other cases, these improvements, although not yet quantifiable, have already resulted in positive behavioral changes in the supply chain staff and improved communication. In all cases, the solutions have been adapted to the context but are intended to be repeatable and scalable. Importantly, many stories emphasize the movement toward local ownership, including transition plans in place or under development. **The ultimate purpose of the document is to provide practical examples to guide countries and programs experiencing similar challenges in ensuring last-mile availability of health commodities.**



# 02.

## Last-Mile Delivery

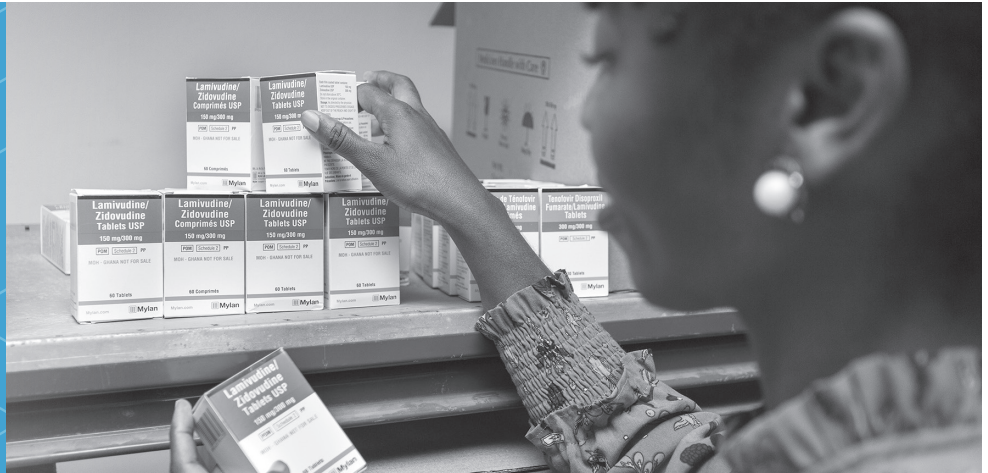


PHOTO CREDIT: GHSC-PSM

## Last-Mile Delivery to Meet Clients Where They Are

In various countries, GHSC–PSM has worked with local partners to adapt health supply chains to meet clients where they are, including private-sector pharmacies or other commercial settings (such as bars and restaurants), communities, and remote locations.

Determining how best to meet clients' needs often requires understanding the obstacles they face in accessing care and finding ways to reduce or eliminate those obstacles: defining "last mile" from the client's perspective.

### New strategies to distribute HIV medications through private pharmacies in Mozambique

Public-sector health facilities have traditionally been the primary point at which clients access services and products for many health programs; however, in many settings the private sector is evolving to be able to provide services and commodities more conveniently. And along with multi-month dispensing

(MMD) is being implemented by GHSC–PSM and partners in several countries to meet clients where they are.

For more about DDD, please see ["Supply Chain Considerations for Implementing Decentralized Drug Distribution: A Look at Common DDD Models and the Supply Chain Implications of Each."](#)

In **Mozambique**, where approximately 13 percent of adults are HIV-positive, clients typically receive their ARVs through hospital pharmacies and other public health facilities. These sites often have long lines and are felt to be barriers to Mozambique achieving its goal of having 95 percent of HIV-positive people on treatment, as reiterated in the PEPFAR Country Operational Plan for October 2022 through September 2023. Private

pharmacies, on the other hand, exist in many communities, especially in urban areas, where the level of congestion at public health facilities can be substantial. Using DDD to provide safe access to ARVs from these local pharmacies could be an important step toward meeting Mozambique's treatment goals by reducing the burden on clients to travel to health facilities and increasing access through sites that are close to home and open longer hours. By reducing crowding in health facilities, it can also reduce the risk of COVID-19 transmission.

Beginning in 2021, GHSC–PSM partnered with Mozambique's Ministry of Health and numerous other partners, including EpiC (the Meeting Targets and Mainstreaming Epidemic Control project, implemented by FHI360), Friends for Global Health, Mozambique's Central Medical Stores, and others to establish a DDD approach for ARVs.

This effort built on a 2019 pilot project carried out in partnership with the Center for Collaboration Health to distribute ARVs through four semi-private pharmacies located in Maputo (owned by the Mozambique government, but operating like private entities). PEPFAR



**Decentralized drug distribution (DDD) is a strategy to provide antiretroviral (ARV) medicines (and other commodities) at more convenient locations.**



recommended expansion of the DDD effort following the pilot project, with the specific goals of easing overcrowding at hospital pharmacies and simultaneously reducing barriers to retention of patients by offering them a more convenient, patient-centered pick-up option.

To start, the partners engaged local decision-makers, including leadership at Mozambique's Central Medical Stores, National HIV/AIDS Health Program, and the National Drug Regulatory Authority, to co-design a system for dispensing and distribution. Local stakeholders voiced concerns about possible risks in distributing through private-sector pharmacies, including patients not being able to access their medicines, disruption in the data management system, and potential theft or loss. To address these concerns, new systems were needed to

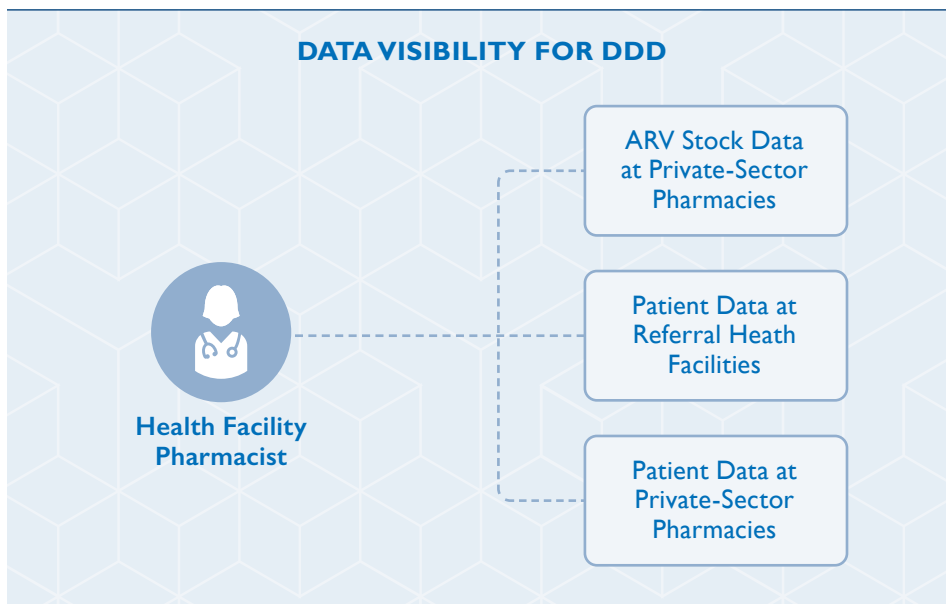
**tracking system, project partners co-designed software customized for use in small, private pharmacies.** Keeping only the functions needed to manage ARVs and loading the software onto tablets, the two systems are easy to use in low-connectivity environments for stock and patient management. Stock data in the pharmacies are fully visible throughout Mozambique's existing LMIS systems, while patient data are visible at both the referring health facility and the pharmacy, allowing health facility pharmacists to track patients from the referring sites to private pharmacies. The visibility into the data helps build confidence in these private pharmacies' ability to secure and properly dispense the medications.

Several partners collaborated closely to launch and support these new systems by developing training presentation decks,

to begin generating demand from patients with stable HIV and transferring patients to pharmacies. EpiC established a tender process, placing advertisements in local newspapers inviting applications for the role of dispensing ARVs. Once provincial teams were trained, they in turn trained private pharmacy staff in how to screen patients, dispense the medications, and use the new tablets and software. Along with the stock management training, the program provided basic training to pharmacy staff on HIV in general, including the need to screen for hypertension and for cough and fever (which could indicate tuberculosis).

MMD of three months' supply of ARVs is already the national policy in Mozambique, so once patients pick up their ART prescription from the health facility, they have three months until they will need to visit the pharmacy for their resupply; during those three months, their records are transferred to the private pharmacy and the provincial warehouse delivers the orders of ARVs to the pharmacy. The participating private pharmacies receive about \$220 per month (regardless of number of patients served) from implementing partners to support the Internet connectivity needed to manage the project data and compensate for time spent dispensing the ARVs. (Mozambique's national policy requires that ARVs be provided for free.)

Distribution of ARVs to the private pharmacies began in seven pharmacies in the Zambezia province in October 2021 with rollout to Cabo Delgado and Maputo Province following in November. The DDD model is expanding fast, with 72 pharmacies participating by May 2022, receiving patients from 39 public health facilities. Approximately 17,000 patients have been enrolled in the private pharmacy program, and almost 12,000 have picked up their ARVs from the pharmacies (the remaining enrolled patients will be picking up their first doses over the next three months).



provide full visibility and traceability of the commodities from the hospital pharmacy to the shelf of the private pharmacy and into the hands of the client, as well as interoperability with national systems.

**By simplifying Mozambique's existing logistics management information system software and developing a modified version of the patient**

standard operating procedures (SOPs), and other guidance documents. GHSC-PSM focused on supply chain and stock management, while EpiC played a key role in demand generation, recruiting patients into the system, and managing the transfer of patients from health facilities to the private pharmacies. Starting in April 2021, project partners began engaging provincial governments, and training provincial teams

Securing buy-in from local partners and designing a program that tracked both patient and stock data across two different sectors and systems were challenging. Of course, launching this work during the COVID-19 pandemic added another layer of complication. Some additional challenges have emerged during the project: staff turnover in private pharmacies is high, necessitating frequent additional training, often at short notice. Also, the tablets (computers) that are designated for the project are sometimes used by pharmacy staff for other purposes.

The program continues to expand and will be evaluated over the next two years. Demand for ARVs from the pharmacies is high, and GHSC-PSM and other partners continue to provide support to the pharmacies, ensuring that resupply is smooth and solving data and system issues. The high levels of engagement among partners led to important innovations and generated commitment to a shared goal.

**As João Teixeira, Director of Forecasting & Supply and Distribution Planning, GHSC-PSM Mozambique said, “We came up with a system that worked, a very innovative process with capacity to resupply the private pharmacies and avoid stockouts and resulting emergency cycles. The program offers a real value-add for patients, who save so much time picking up their medication closer to home and at hours that are convenient for them. The most important success of this model might be for the patients who no longer lose a full day of work to access their ARVs.”**

At the same time, one of the biggest challenges that the project staff and partners foresee is sustainability: implementing partners (IPs) currently

Within six months, the project made important strides with over 26 million condoms delivered to 14,000 hot spots throughout the country, representing a 50 percent increase in condom distribution in Uganda over a six-month period.

support the monthly dispensing fee that goes to each pharmacy as well as funding a call center and other support, and plans for the government to take on this financing role have not yet been finalized.

### Condom Distribution Outside of the Health Sector in Uganda

Another innovative project bringing commodities closer to the end user is being implemented in **Uganda**, where the Ministry of Health (MoH), with support from health development partners, established an alternative distribution system (ADS) to increase access to contraceptives and selected reproductive health commodities operated under the Joint Medical Stores (JMS). In 2020, the national warehouse was overstocked with condoms, while stock status reports, as well as field reports from Uganda’s MoH, revealed that condom “hot spots”—bars, hotels, homes, and other locations—were frequently out of stock. No system was in place to routinely restock these locations. JMS approached GHSC-PSM with a proposal to distribute USAID-procured condoms to these important last-mile hot spots. Starting in March 2021, GHSC-PSM began piloting the hot-spots distribution program with JMS.

As a first step, JMS partnered with a private company to develop an application for verifying and mapping all the hotspots in the country. At the same time, GHSC-PSM and JMS worked to strengthen logistics data collection and management to improve accountability and traceability. District Condom Focal Persons supported JMS’ field teams in verifying the locations

of each hot spot in the application. These local managers also identified additional sites that were suitable for condom distribution. Then, using a spoke and hub distribution model, JMS delivered condoms to hubs across the country and contracted with a private company to collect and deliver them to the hot spots. **Within six months, the project made important strides with over 26 million condoms delivered to 14,000 hot spots throughout the country, representing a 50 percent increase in condom distribution in Uganda over a six-month period.** As an unforeseen benefit, the project also provided important employment opportunities to young people, who were hired as distributors. Also, the new application improved traceability of hot spots across the country, an innovation the MoH of Uganda can adopt to improve its condom logistics management information system.

### Adapting to COVID-19 to Distribute Family Planning Commodities in Ghana

Ghana has made progress toward meeting its family planning goals but, during the COVID-19 pandemic, visits to family planning clinics rapidly fell off, resulting in a decline in family planning acceptors from 14 million in 2019 to only 10.9 million in 2020. To increase use of contraceptive methods, GHSC-PSM collaborated with the Ghana Health Service (GHS) and a local NGO called HealthKeepers Network to deliver short-term contraceptive methods to the last mile using an innovative “direct to the community” approach. GHSC-

PSM ensured an uninterrupted supply of family planning commodities (specifically condoms and oral contraceptive pills) to selected communities. The HealthKeepers, a cadre of local community health workers, distributed these commodities along with accurate information about family planning directly to clients at the very last mile—in markets, villages, and in homes.

### Donkeys and Boats in Haiti: Meeting Delivery Challenges

In **Haiti**, infrastructure is fragile, and four-wheel-drive vehicles are needed on many of the roads. Service delivery points (SDPs) on the islands of La Gonave, Ile-a-Vache, and Boucon Carre can be reached only by boat; after the goods arrive at the island, they need to be transported the remaining distance by the means available, including pickup trucks, motorcycles, and donkey. Two SDPs, Ditty and La Croix, are not accessible by vehicles at all: for these sites, commodities must be carried across a river and delivered by donkey or on the heads of laborers. In the rainy season, when the river cannot be crossed on foot, GHSC-PSM coordinates with the SDP

person in charge to identify alternative sites where the products can be collected. In this challenging environment, local 3PLs provide the last-mile delivery services, including delivering to these remote sites. The price of these unorthodox modes of delivery (donkeys, boats, or other modes of transportation) is included in the price per kilogram offered during the bidding process. **Contracting with these 3PLs is part of a larger localization strategy and allows the local private sector to use its expertise in meeting these remote Haitian clients where they are.**

### Planning a Complex Campaign to Deliver Bed Nets in Ethiopia

Lastly, in **Ethiopia**, GHSC-PSM served as one of many key national, regional, and local partners to deliver millions of long-lasting insecticide-treated nets (LLINs) to the last mile as part of a seasonal distribution campaign in 2017. GHSC-PSM served on the national task force convened to deliver the LLINs, and drafted the distribution plan, which laid out clear roles and responsibilities for all players, from the national level down to

community health workers, police officers, and others charged with last-mile delivery, over 10,000 individuals in all. **GHSC-PSM mapped distribution routes and determined the number of vehicles needed, using rented trucks, camels, donkeys, motor bikes, and human labor to distribute 4.2 million LLINs to 2,054 health posts.** This complex effort included dozens of partners and involved community-level health facilities and health extension workers, other community leaders, and police commanders as a best practice.

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For more about this campaign, see [“Net Gains in Malaria Prevention: In Ethiopia, new approaches to LLIN distribution achieve near universal coverage in high-risk areas.”](#)

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### Conclusion

Last-mile distribution is a critical and often challenging step in the supply chain, but it is essential for ensuring patients have access to lifesaving medicines and supplies when and where they need them. As these country stories show, **meeting clients where they are sometimes requires creative customized approaches related to managing bids from 3PLs, creating new community-based distribution systems to respond to unexpected crises, or working with new partners in the commercial sector.** Importantly, these solutions should be well coordinated and interoperable with currently existing systems. Some of the main barriers these programs face include high staff turnover; difficulties in ensuring funding after the project ends, poor record-keeping and communication, lack of connectivity infrastructure, or the geographical inaccessibility of some last-mile settings.



Last-mile distribution in Haiti. PHOTO CREDIT: GHSC-PSM



# 03.

## Specialized Approaches



PHOTO CREDIT: GHSC-PSM | Bobby Neptune

## Specialized Approaches to Improve Commodity Availability and Quality at the Last Mile

No two supply chains are the same, and public health supply chain management often requires specialized approaches to ensure commodity security at the last mile.

For example, some public health commodities require specific storage and distribution conditions, such as controlled temperature. Or a country's unique geography or other local factors call for adaptation of supply chain best practices. Sometimes creative approaches help ensure overlooked or at-risk communities have access to essential commodities or bring more attention to neglected commodities. And at times, supply chain managers must adapt to natural disasters, political conflict, or—as every country has seen with COVID-19—emerging pandemic threats. **The examples below illustrate the agility and creativity that are sometimes required from supply chain managers to address new challenges.**

### Building a Specialized Cold Chain to Deliver COVID-19 Vaccinations in Namibia

The vaccines developed for the COVID-19 pandemic represent a historic scientific achievement. Getting the vaccines to patients at the last mile, however, presented a substantial challenge in places where the supply chain for health commodities was not equipped to store and transport commodities at cold (or ultra-cold) temperatures required by COVID-19 vaccines.

In **Namibia**, a large country that is dry, often very hot, and has the world's second-lowest population density, GHSC-PSM came up with a highly specialized approach to last-mile distribution at short notice. **Namibia made a commitment to equitable distribution of COVID-19 vaccines, refusing to limit access based**

### on distance or access to the cold chain.

The Namibian Ministry of Health and Social Services also wanted to provide vaccine access to as many young people as possible, and thus had particular interest in the Pfizer-BioNTech vaccine, the only one approved for use in children 12–17 at the time.

The MoH's supply chain relies on five large trucks that travel around the country, delivering supplies to each location approximately every six weeks. When the U.S. Centers for Disease Control and Prevention (CDC) began supporting the government of Namibia to distribute the Pfizer/BioNTech vaccine, the agency asked GHSC-PSM to suggest solutions to the challenge of transporting vaccines long distances in very hot weather, including across the Kalahari Desert. The Pfizer/BioNTech vaccine must be kept at ultra-low temperatures (between  $-90^{\circ}\text{C}$  and  $-60^{\circ}\text{C}$ , or  $-130^{\circ}\text{F}$  and  $-76^{\circ}\text{F}$ ), and it was unclear if Namibia could use the vaccines to protect its population against COVID-19 because of cold chain and transportation challenges.

In evaluating the readiness of Namibia to implement distribution of the vaccine, GHSC-PSM learned that while the MoH did not have any ultra-low temperature (ULT) freezers, the Namibian Institute of Pathology (NIP) had recently received 10 ULT freezers, placed around the country, used for lab supplies and samples, and was happy to allow vaccine doses to be stored in them. Also, the U.S. Embassy in the capital city of Windhoek had a small ULT freezer with the capacity to store some vaccines.



One of Namibia's ULT freezers. PHOTO CREDIT: GHSC-PSM

While these ULT freezers could be used for storage, the next challenge was distributing the vaccines to the ULT freezers in different parts of the country and then to vaccination sites. The MoH's supply chain could not accommodate a product requiring transportation at ultra-low temperatures; the ice packs regularly used for cold-chain transportation were inadequate. GHSC-PSM developed and distributed a request for proposals (a "tender"), and only two bidders emerged out of more than 10 companies that were expected to bid, due to the complexity of the documentation required. The winning bidder was NamPost, a national parastatal organization that provides postal, banking, bill-paying, and other services, including

overnight courier services. NamPost used small vehicles and could transport vaccines from the NIP ultra-low freezers to MoH vaccination locations.

To equip these smaller vehicles with a mobile ultra-low cold-chain, GHSC-PSM purchased four special mobile fridge-freezers that are designed for scientific and medical storage and transportation and can be set at different temperatures, including ultra-cold.

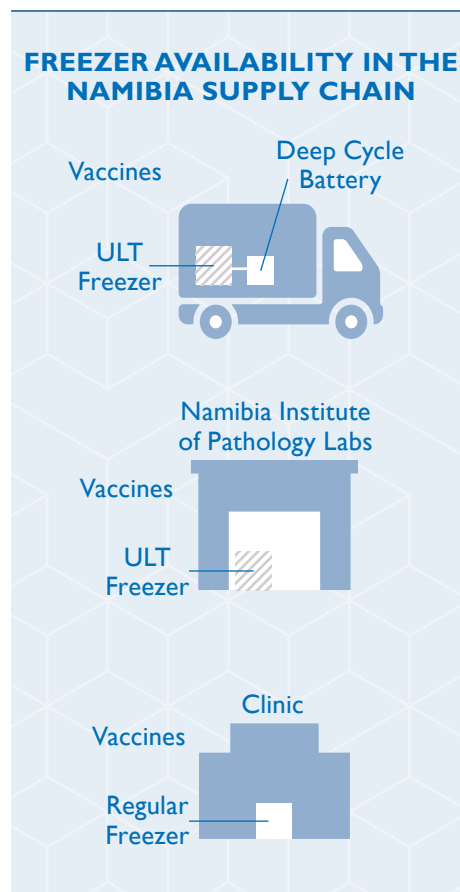
After the freezers were installed and hooked up to the vehicles' power system, a test run in the extreme temperatures in Namibia revealed quickly that the power generated by the car's battery was insufficient to power the freezers for a full day. This new hurdle was addressed by installing deep cycle batteries into the vehicles specifically to support the ULT freezers. Another innovation

was connecting the mobile freezers to a power source the night before transportation to bring the temperature down to  $-80^{\circ}\text{C}$  before being loaded onto the trucks. This practice reduced the initial demand on the batteries, allowing the freezers to retain their low temperatures in Namibia's harsh climate during transportation while minimizing strain on the vehicles' power systems.

Once the testing and set-up were complete, the specially equipped NamPost vehicles delivered the vaccines to the NIP labs with ULT freezers at the regional level. When the MoH was ready to vaccinate, the vaccine was taken from the ULT freezers to the clinical sites, where it could be stored in a regular clinic refrigerator for up to a month until the vaccinators were ready to inject them into the arms of people at the last mile.

While this system was set up specifically to distribute COVID-19 vaccines, it has had several other applications. The NamPost vehicles transported other goods used to support vaccination, including syringes, needles, and diluent. Because the vehicles travel more frequently than the large MoH trucks, sites had the flexibility to request additional supplies outside of the MoH's normal schedule of deliveries, reducing stockouts and adding new nimbleness to the supply chain in Namibia. **The system can easily be adapted for other products requiring a cold chain, including rabies vaccine and oxytocin used to prevent postpartum hemorrhage.**

GHSC-PSM is testing further innovations, including a Bluetooth-enabled padlock that will keep pharmaceutical supplies (often a target for product leakage) secure en route. These padlocks can be opened only through a code that is sent through a smartphone, so they could potentially be closed by a licensed pharmacist at the central level and opened by another



pharmacist at the destination. The smart padlocks also store a record of who opened and closed them, providing another layer of visibility and security to the supply chain.

**Ryno Badenhorst, country director for GHSC–PSM in Namibia, explained, “This project provided proof of concept for using mobile fridge freezers in Namibia. This is a low-cost alternative compared to the cost of a refrigerated truck, when the cold chain requirement is small, and allows these goods to be co-loaded with other freight. We predict that other courier companies may introduce these mobile units for cold chain transportation.”**

The NamPost contract is up for renewal and GHSC–PSM is adjusting it to account for complex issues of ownership of the ultra-low fridge-freezers as well as insurance to be provided by NamPost. The contract stipulates that when NamPost is no longer using the freezers to distribute COVID-19 vaccines, they will be donated to the NIP, where they can be used to transport specialized drugs requiring an ultra-cold cold chain, such as chemotherapy agents.

While the work to make COVID-19 vaccines available in the Namibian context required a rapid response and innovation, it may have a long-term impact on the availability of products requiring cold chain transportation at the last mile.

He further explained that, because of the high cost of ULT freezers and the compact size of vaccines, a partnership such as that between the NIP and the Namibian MoH is ideal. “The COVID-19 crisis brought

Supply chain managers should know what their supply chain performance is and routinely monitor it, enabling them to identify challenges, assess root causes, and determine solutions.

everyone together, and all the Namibian partners pulled in the same direction to solve the vaccine distribution problem.”

### **Responding to the Need for Rapid Changes to Supply Chains at the Last Mile**

In addition to public health threats like COVID-19, political unrest can raise the need to retool public health supply chains. Changes in government can alter partnerships and affect the distribution of commodities, while civil war or violence can disrupt supply chains.

Over the past decade, **Mali** has been experiencing broad-ranging security challenges, which had serious repercussions on the political, security, socio-economic, and humanitarian situations of the country. Continuous attacks by local insurgent groups, including some affiliated with Al Qaeda and the Islamic State, have spread from the North to the central regions of the country. In August, 2020, a group of military officers staged an overthrow of the elected government. In October of that year, that group ceded power to a transitional government. Following an August 2020 coup d’état, restrictions under section 7008 of the Department of State, Foreign Operations, and Related Programs Appropriations Act, 2020 were applied to assistance that benefits the Government of Mali.<sup>1</sup> Given the application of Section 7008, GHSC–PSM was no longer able to partner directly with Mali’s transition government at the national, regional, and district levels for the storage

of USAID donated contraceptives and for distribution to community health centers.

Before the application of Section 7008, all donated commodities had been delivered to and stored at a warehouse run by the government of Mali and then distributed by the government. Once the rule was applied, USAID, through GHSC–PSM, convened with its partners and developed a plan to adhere to the USG restriction and still ensure availability of family planning commodities at the last mile in targeted regions. Under the coordination of USAID, weekly meetings were held with GHSC–PSM and other USAID IPs, including USAID Keneya Sinsi Wale, USAID-funded Momentum Private Healthcare Delivery, and JIGI, a private non-profit organization operating a central warehouse in Bamako. The plan defined roles and responsibilities for each partner, established communication strategies, and included working with the private sector and community health centers (CSCOMs), which are considered non-profit private organizations in Mali. GHSC–PSM established a new chain of custody for the commodities: new deliveries of commodities were sent to the JIGI warehouse in Bamako, while the existing stocks in the government warehouse were collected and delivered to the CSCOMs. **The project developed an innovative, web-based tool to manage and track delivery of commodities, built using KoBo toolbox, a free, open-source software designed for use in humanitarian settings.**

<sup>1</sup> See Coup-Related Restrictions in U.S. Foreign Aid Appropriations, Congressional Research Service, Updated February 2022 <https://sgp.fas.org/crs/row/IFI1267.pdf>  
U.S. Embassy in Mali, *Bilateral Relations Fact Sheet*, Accessed June 1, 2023. Congressional Research Service, *Crisis in Mali*, updated May 23, 2022.

The tool is used to collect and track information about drivers, trucks, and points of contact at delivery locations, monitor fuel consumption, and manage the proofs of delivery from storage at the central warehouse to the delivery of contraceptives to each CSCOM.

Given the disruption and rapidly changing environment, strong collaboration between GHSC-PSM and other USAID IPs was essential. Weekly discussions with USAID, GHSC-PSM, and other USAID IPs (described above) allowed each partner to provide updates, discuss issues, and find solutions together. Also, because the partners could not work directly with Government of Mali staff and facilities, community participation was critical for understanding the needs of the CSCOMs and planning for the delivery of contraceptive packages at designated locations in each health district. To facilitate communication, GHSC-PSM created WhatsApp groups for distribution routing and for sharing information about the loading of trucks, departure times, tracking of truck movement, and estimated arrival time at the designated delivery locations.

Even with strong collaboration and attention to communication and participation, planning and implementing a new distribution system took some time in such an unstable and challenging environment. As a first step, GHSC-PSM developed and submitted distribution plans that were validated by all USAID partners. This process took nearly four months. The next phase involved procurement processes beginning with preparing and publishing a call for tenders to select a 3PL provider. Assessment of the selected provider revealed issues that resulted in the need to run the selection for providers anew—extending this process another four months. Also, boxes were procured for repackaging products, the initial distribution plans became obsolete and had to be revised, and so on.

The first distribution from the central warehouse to the district stores was made from September 25 to 30, 2021, and the distribution from district stores to the CSCOMs was completed by the end of October 2021. For the three USAID focus regions (Mopti, Segou, and Sikasso), GHSC-PSM subcontracted with a local 3PL to distribute the contraceptives to 28 health districts. Within the health districts, the contraceptives were handed over to the USAID-funded Mali Health Systems Strengthening, Governance and Financing Activity led by Palladium, which ensured

Implementing partners not only coordinated the distribution of family planning commodities but also played a significant role in raising awareness among CSCOMs. Using information from Mali's LMIS system, GHSC-PSM analyzed data to compare consumption before and after the distribution of the additional contraceptive commodities and awareness-raising activities. Consumption of all family planning commodities increased when comparing the six months after distribution with the six months before distribution (to ensure comparability, data during



Following Mali's political crisis, GHSC-PSM and partners worked to reduce supply chain risks to family planning commodities. PHOTO CREDIT: GHSC-PSM

the distribution of contraceptives to 793 CSCOMs. In the other two regions, Kayes and Koulikoro, GHSC-PSM worked with USAID partners, including NPI EXPAND and Momentum, both of which subcontracted to the local organization JIGI, to distribute contraceptives in the districts and CSCOMs. At that point, all the CSCOMs in the five regions received deliveries topping up their stocks with a six-month supply. Through this distribution, GHSC-PSM ensured that each targeted region was stocked with family planning commodities for the following six months. The quantities of contraceptives distributed represented a total of more than 148,392 couple-years of protection.

the three months of a family planning outreach campaign, held in July, August, and September 2021, when distribution rose to 44,224 items per month, were not considered). The increase in the availability of commodities appears to have had an impact on consumption. The highest increase in consumption rate occurred with the male condom (173 percent), female condom (172 percent), and cycle beads (118 percent). Consumption also increased by 13.2 percent for injectable contraceptives, 13.7 percent for intrauterine devices, and 4.6 percent for Jadelle implants. The two most widely used methods were Depo-Provera, with 87,785 units consumed over six months, and Microgynon, with 60,994 units consumed



over six months. A high number of Jadelle implants at 36,235 was also consumed in the second six-month period measured. These three methods made up most of the contraceptives consumed.

A comparison of end-use verification (EUV) data collected in March 2021 and October 2021 is intriguing. The rate of contraceptive stockouts at health facilities on the day of the visit decreased between the two editions. It varies from 4 percent to 42 percent (October 2021) compared to 15 percent to 83 percent (March 2021).

**These data suggest a positive impact of the September implementation of last-mile distribution at the sites.**

At the regional and district levels, the picture is less clear with 80 percent of regional facilities reporting stockouts of contraceptive pills, while district-level facilities showed a small increase in stockouts from March to October 2021.

Despite the challenges in implementing the program under Section 7008, these data show that the redesigned distribution program was effective at providing a reliable supply of contraceptives at the last mile. **For the purpose of localization and long-term sustainability, country ownership of health supply chain management is always the long-term goal. However, in any unstable environment, a specialized approach can successfully build a parallel distribution system that meets clients' needs for commodities.**

**Improving Access to Neglected Maternal and Child Health Commodities**

The UN Commission on Life-Saving Commodities for Women and Children, which responded to the UN Secretary-General's Global Strategy for Women's and Children's Health (2010),<sup>2</sup> identified several key commodities as “neglected” by the international community. Beginning in 2019, GHSC–PSM initiated work to expand the

last-mile availability of these key maternal, newborn, and child health commodities.

In the newborn and child health (NBCH) field, work focused on amoxicillin, oral rehydration salts, and zinc, the three child health commodities identified as neglected by the commission. The recommended formulation of amoxicillin used to treat pneumonia in newborns and children is dispersible tablets (amoxicillin DT): as well as being an easy-to-administer, “child-friendly” formulation, this form of amoxicillin has many advantages for the supply chain, as it is stable, much cheaper (about half the price) smaller, and lighter than the older syrup version—and thus less expensive to transport and store. The recommended treatment of diarrhea consists of two products: oral rehydration salts (ORS) and zinc. Ideally, these two commodities should be co-packaged so that they are available together. Co-packaging also increases adherence rates to the full treatment course.

GHSC–PSM conducted rapid assessments in **Liberia** in 2020; results showed significant barriers to last-mile availability of these key NBCH commodities. None of the commodities were integrated into national supply chains, although some

distribution occurred through parallel supply chains. EUV survey data collected from 99 sites (5 hospitals, 73 clinics, 7 health centers, and 14 storage depots) across 15 counties showed high levels of stockouts of amoxicillin, ORS, and zinc. For treatment of diarrhea, 80 percent of sites did not have zinc and 42 percent did not have ORS. For treatment of pneumonia, none of the sites had amoxicillin dispersible tablets, 93 percent did not have amoxicillin at a concentration of 250 mg/5 mL, and 81 percent did not have amoxicillin at a concentration of 125 mg/5 mL. **The assessment did, however, find that these important commodities may be available through other channels; for instance, community health assistants provide a large part of NBCH services in Liberia and usually receive their supplies from partner-managed parallel supply chains. This diversity in the last-mile channels for newborn and child health provides some protection from stockouts in the national public-sector supply chain.** In general, limited funding, insufficient and poor-quality data, and inadequate prioritization are common factors that affect NBCH commodity availability. GHSC–PSM used the assessment findings to successfully



*In 2019, GHSC–PSM began work to increase last-mile availability of key maternal, newborn, and child health commodities. PHOTO CREDIT: GHSC–PSM | Bobby Neptune*

<sup>2</sup> [Commissioners' Report, UN Commission on Life-Saving Commodities for Women and Children, 2012](#)

For more information you can read GHSC-PSM’s technical report, [“Assessment of the Availability of Quality Newborn and Child Health Commodities in Mali”](#)

advocate for selection and quantification of amoxicillin DT and ORS+zinc in Liberia’s supply chain.

In **Mali**, a similar assessment initiated in 2019 found that none of these three products were available in the national supply chain. Independent donors instead provided the commodities directly to community health workers and providers at facilities. However, neither co-packaged ORS and zinc, nor amoxicillin DT, were registered in the country or included in national treatment guidelines; also, they were not included in Mali’s national medical stores nor stored and managed by existing logistics systems. The parallel delivery systems led to limited visibility into consumption and availability of these commodities. **In response to the survey results, Mali’s MoH immediately adapted pneumonia treatment**

**protocols that prioritize amoxicillin DT.** The MoH also plans to catalyze the use and management of co-packaged ORS+zinc by integrating it into the national health supply chain.

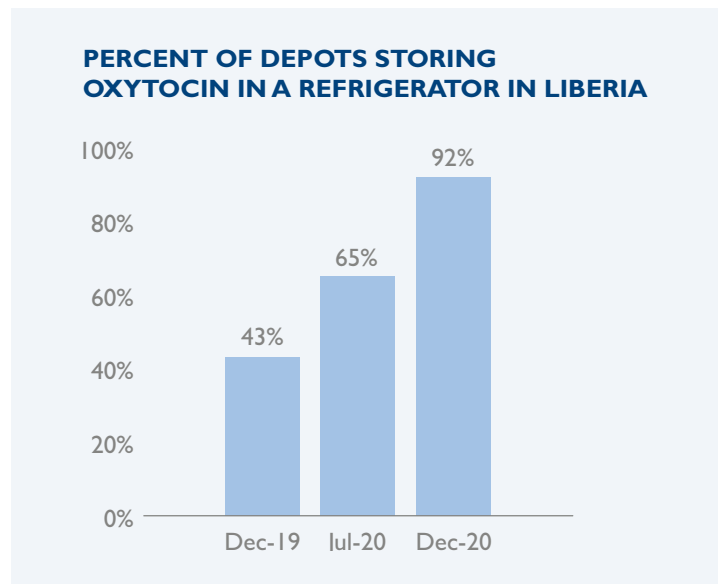
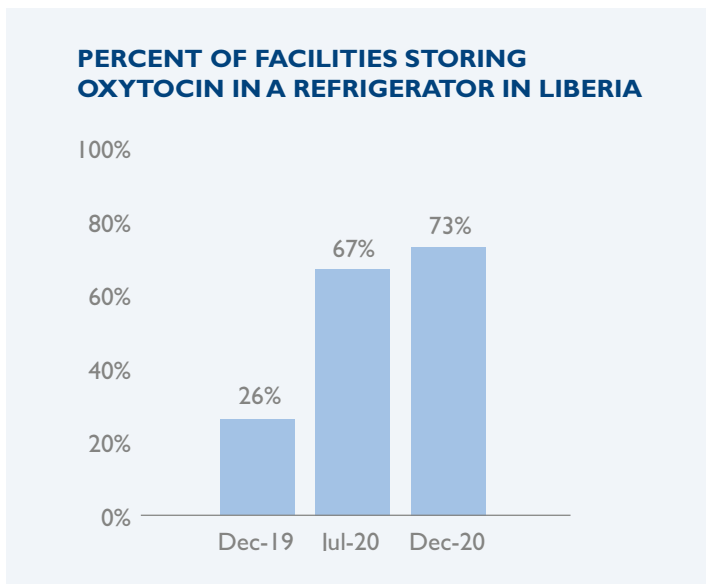
GHSC-PSM also addresses the last-mile availability of maternal health commodities. Postpartum hemorrhage is a leading cause of maternal mortality, and uterotonic drugs, provided immediately after childbirth, are proven to save lives. Getting oxytocin, the most effective uterotonic, to patients at the last mile proves to be challenging. The drug requires a cold chain, and post-marketing surveillance has found that many of the oxytocin products available in low- and middle-income countries are of poor quality, either because of manufacturing problems or because of inappropriate storage, specifically not being kept cold. The international community recommends

three key approaches to ensuring access to high-quality oxytocin at the last mile: 1) procure quality-assured oxytocin; 2) label it correctly, and 3) keep it cold in the supply chain to the last mile. GHSC-PSM’s work to make high-quality oxytocin available at the last mile requires special attention to this drug’s unique requirements.

In **Liberia**, oxytocin is included in the Essential Medicines List and treatment guidelines; however, surveys showed that many health care facilities did not have working refrigerators, putting women at risk of receiving degraded oxytocin at the last mile. Liberia’s MoH issued a statement calling on facilities to store oxytocin at the recommended colder temperatures, or use an alternative product, misoprostol, which is less effective, but stable at room temperature. Shortly after this statement was issued, GHSC-PSM brought together partners in Liberia to jointly develop recommendations aimed at ensuring access to effective uterotonics at the last mile. **An important result of this convening process was the decision to use Expanded Program of Immunization (EPI) refrigerators for oxytocin storage, a major development, as EPI refrigerators are**

For more information you can read GHSC-PSM’s technical report, [“Assessment of the Availability of Quality Newborn and Child Health Commodities in Liberia”](#)

**PERCENTAGE OF DEPOTS AND HEALTH FACILITIES STORING OXYTOCIN IN A REFRIGERATOR IN LIBERIA**



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For more information, read GHSC–PSM’s, [Ensuring Uterotonic Quality in Liberia](#)

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**available all over the country.** Typically, EPI programs do not allow any commodities other than vaccinations to be stored in EPI fridges. As the figure on the previous page shows, the policy change led to an important increase in the percentage of facilities storing oxytocin in refrigerators.

Liberia also added misoprostol to its quantification and ordered additional misoprostol for use in the sites without refrigeration. **Liberian stakeholders are also updating national guidelines for treatment of postpartum hemorrhage.** These decisions at the country level will lead to greater availability of quality uterotonics at the last mile.

**Ghana’s** MoH and GHS were aware of studies conducted by the Ghana Food and Drug Administration showing that more than half of oxytocin samples collected in the country failed tests designed to determine the efficacy of the product: 56 percent of samples in a 2013 study and 62 percent in a 2014 study were substandard. GHSC–PSM conducted a review in 2018 and made specific and detailed recommendations to improve access to uterotonics at the last mile. One suggestion was to address pricing inconsistencies in Ghana’s highly decentralized procurement system and to ensure that Ghana’s National Health Insurance Scheme is reimbursing SDPs for oxytocin at its full cost, rather than the previous outdated and insufficient price (based on a donor was supplying all oxytocin). The low reimbursement for oxytocin was a clear disincentive for SDPs to procure and use this lifesaving drug. Also, the project recommended to add oxytocin to the country’s framework contract arrangement for procuring essential drugs, to ensure a regular supply of quality oxytocin at a

Strong collaboration between GHSC–PSM and other IPs has been key for successful implementation of these approaches.

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reasonable price. While all these changes are anticipated to improve access to high-quality uterotonics at the last mile, assessments have not yet been conducted.

Similarly, in **Mozambique** and **Ethiopia**, GHSC–PSM conducted assessments to provide a basis for making recommendations to the government to improve last-mile access to oxytocin and other uterotonics. In **Mozambique**, the assessment demonstrated temperature excursions and points of risk, with the inclusion of oxytocin in pre-bundled essential medicines kits for lower-level facilities presenting particular risks.

**Based on the assessment and WHO recommendations, the Mozambique MoH issued a memo in August 2021 calling for all oxytocin with clear cold chain specifications to be removed from the kits and instead transported and stored through cold chain.** In **Ethiopia**, GHSC–PSM worked with the MoH and the Ethiopian Pharmaceutical Supply Service (EPSS) **to integrate oxytocin supply into the existing national pharmaceutical reporting and distribution system**, the Integrated Pharmaceuticals Logistics System (IPLS), so that facilities could report their consumption and request their needs on a single form and in a regular, recurring timeframe; this in turn helped EPSS re-supply oxytocin based on facilities’ actual need instead of ration-based distribution.



**Since the integration with IPLS, stockouts have declined from 11 percent to 4.2 percent, a clear last-mile impact.**

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## Conclusions

Given the complexity of the world and the impact of political unrest, pandemics, extreme weather, supply chain disruptions, and other unpredictable factors, GHSC–PSM and others working on health care supply chains **need to be prepared to develop specialized approaches to reach clients at the last mile.** In the case of Namibia, the specialized approach discussed here may have a long-term impact on the availability of products requiring cold-chain transportation at the last mile, although initially designed as a rapid response for COVID-19 vaccine availability. Strong collaboration between GHSC–PSM and other IPs has been key for successful implementation of these approaches. For example, after political disruption in Mali, working with a range of non-government partners was essential for the successful distribution of contraceptive commodities when the government-run distribution system could no longer be used. In Mali and Liberia, GHSC–PSM has contributed to integrating indispensable MINCH products into the national supply chains and supported the MoHs in updating the current guidelines for their use. Particularly for oxytocin in Liberia, the project brought together partners to develop recommendations; the inclusion of oxytocin in the EPI refrigerators is a rare breakthrough. Other enabling factors for the programs described here are having a well-designed distribution plan describing the responsibilities of each organization and monitoring and evaluation activities, performing weekly discussions with all partners, and creating WhatsApp groups to facilitate information sharing.

# 04.

## Promoting Local Ownership



PHOTO CREDIT: GHSC-PSM

## Promoting Local Ownership to Ensure Last-Mile Sustainability

Although GHSC–PSM often engages with national supply chain entities like MoHs and central medical stores, local entities—such as regional/state authorities or regional medical stores (RMSs)—can also play a key role in ensuring the availability of commodities at the last mile, including contributing to the sustainability of key supply chain functions.

These entities typically have more direct relationships with health facilities and thus can have more influence on availability of commodities at SDPs. This chapter presents two examples of the work GHSC–PSM and partners are doing to improve health financing strategies that were not leading to a sustainable supply of commodities at the local level.

### Strengthening Last-Mile Delivery in Ghana by Increasing Regional Ownership and Sustainability

**Ghana's** extensive health care system, with over 5,000 health facilities, including 450 hospitals, started moving toward regional ownership and commodity sustainability over a decade ago when commodity procurement was decentralized to subnational entities and, more recently, since 2017, when the current mode of

last-mile distribution began. Ghana has 10 RMSs that supply those sites with a mix of donor-provided and government-procured commodities. Starting in 2002, the Ghana Health Service (GHS)—the major implementer of health policies in the country—adopted a policy of scheduled delivery of commodities directly to SDPs from RMSs. The GHS oversees the regional level, including RMSs, which in turn supervise districts that oversee the local level. In 2003, Ghana established the National Health Insurance Scheme to provide access to care for all citizens. This national insurance structure was designed to facilitate local ownership: facilities are expected to use revenue generated from billing the health insurance service to purchase supplies from the regions. This financing approach was intended to help ensure the long-

term sustainability of the health sector's commodity supply.

By 2017, it became apparent that Ghana's health financing strategy was not leading to a sustainable supply of commodities. In eight out of 10 regions, distribution from RMSs to SDPs had become fragmented, inefficient, and costly. Sustainability—defined as the region's ability to use its own resources to implement last-mile distribution—was not within reach. The public sector was often unable to reliably deliver supplies from the central and regional levels due to vehicle maintenance issues, lack of a centralized communications hub, and overall limited capacity and tools. Thus, SDP staff often had to travel to RMSs themselves to collect supplies. This took health care providers away from clinical care, often led to long waiting times at the warehouses, was inefficient and expensive, and was not well coordinated: health care providers sometimes purchased supplies that their department needed, while leaving other departments stocked out. As Daniel Owusu Afranie, Systems Strengthening Team Lead with GHSC–PSM, said: "a pharmacist might come and procure essential medicines, and



then a nurse would come separately to collect family planning supplies. The system was unstructured and not optimized. It was also not secure, as materials were transported in private vehicles or public transportation and were not insured." Assessments revealed that stockouts at the last mile were common and medicines sometimes expired in RMSs.

Also, the financing system did not function optimally in some regions, for many reasons, including delays in reimbursement from the National Health Insurance Scheme resulting in facilities becoming indebted to the RMSs; lack of adherence to the policy guiding health commodity reimbursements that were supposed to be ring-fenced, leading to funding being used for other purposes; the high cost of fueling and maintenance for regions using their own vehicles; and the lack of back-up systems in case of a problem.

In 2017, the Government of Ghana included a plan to strengthen last-mile delivery in its strategy to ensure the availability of health products at SDPs. USAID began supporting GHSC–PSM to strengthen Ghana's last-mile delivery (LMD) strategy, focusing initially on two regions and later expanding to four. **The LMD strategy established a framework to guide implementation and delivery to facilities, while providing technical support to regions and involving private partners.** This exercise was carried out through a collaborative effort of GHSC–PSM; the Supplies, Stores and Drug Management (SSDM) Division of GHS, and the respective Regional Health Directorates from GHS. District directors, medical superintendents from hospitals, and in-charges of health centers were also involved. The SSDM partnered with GHSC–PSM in all activities leading to implementation of the LMD in the regions: advocacy, design of tools for LMD, training of facility commodity managers, stakeholder meetings at the regions, selection of 3PLs, organization of periodic review meetings, LMD supportive supervision, costing studies, and other

## Sustainability—defined as the region's ability to use its own resources to implement last-mile distribution

activities. The overall goal of GHSC–PSM's technical assistance is to increase regional ownership and sustainability, and the regional authorities have been an integral part since the program's inception, participating in the design, planning, implementation, and review of the whole LMD strategy. In 2018, The Global Fund committed to supporting similar work in four other regions that were not successfully implementing last-mile distribution. By May 2018, all eight regions identified as having issues with last-mile distribution were receiving support.

**The LMD strategy strengthens regional ownership of the supply chain by streamlining and systematizing the distribution system in several ways: reducing the cost of transporting commodities from regional warehouses to SDPs, leveraging the capabilities of the private transportation sector to reduce the reliance on government-owned vehicles, providing technical assistance to the RMSs, and facilitating better communication throughout the supply chain. 3PLs support picking, packing, and loading of commodities; issue documentation such as invoices or proofs of delivery; support route optimization; build the capacity of RMSs to establish systematic procedures for picking and packing, distribution, and documentation; and, importantly, provide insurance that was unavailable when facilities used their own vehicles.**

In this way, the system enables the RMSs to aggregate orders for facilities on the same route and deliver medicines on

schedule based on route optimization at a significantly lower cost than using the pick-up system. **The goal of the LMD strategy is for each region to manage its own financial resources to implement the last-mile distribution—either using their own vehicles or paying for 3PL services.** Currently, regions are at different levels of implementation due to their diverse financial and human resource capacities.

The LMD strategy introduces an integrated suite of services that work together to ensure a reliable supply of health commodities at the last mile:

- A WhatsApp platform shares timetables, order deadlines, delivery updates, etc. within the region
- For facilities that are yet to be onboarded on the eLMIS, orders (requisitions) are submitted to the RMS through a dedicated email address based on an established timetable
- Facilities are notified of confirmation of receipt by the RMS
- Requisitions staff at the regional level download and review orders
- Warehouse staff pick, pack, and load orders
- Delivery plans are shared on the WhatsApp platform to alert facilities of expected delivery times. The drivers update the estimated times of arrival throughout their journey, significantly improving the efficiency of the offloading process
- 3PLs complement the region's delivery vehicles to transport commodities on identified routes

**One of the most effective strategies introduced by GHSC–PSM is the**

simple WhatsApp “group chat” for each region to alert facilities of deadlines to order supplies, remind them to submit their proofs of delivery by email for reconciliation, and be prepared for delivery (see examples below). Importantly, WhatsApp service provides end-to-end encryption, which ensures security of communications. These chat groups are now entirely managed by the districts.



Maintaining last-mile availability through WhatsApp group communication. PHOTO CREDIT: GHSC-PSM | Farmhouse

Another effective strategy to ensure sustainability is a push for the districts to use the unique strengths of 3PLs better. GHSC-PSM conducted a study to learn more about the costs of three approaches to last-mile distribution: pick-up by SDP staff, delivery by RMSs using government vehicles, and delivery by private 3PLs. GHSC-PSM

evaluated costs, stockouts, efficiency, and time-use affecting the availability of services at the last mile and found that RMS delivery was the cheapest, while collection by individual SDPs was the most expensive.

Delivery using 3PLs costs, on average, two percent of the value of the distributed commodities, and is not as cheap as delivery provided by the RMS. However, delivery by 3PLs led to lower stockout rates (18 percent compared to 47 percent for facilities picking up supplies themselves and 48 percent if the RMSs delivered the commodities) and higher rates of “stocking according to plan” at 73 percent for delivery by 3PLs compared to 41 and 43 percent, respectively, for the other two modes. Delivery by 3PLs also offers the benefit of insurance. The results of this assessment were presented to the regions and encouraged them to move away from the individual pick-up mode of commodity delivery.

Because sustainability is an explicit goal of the LMD program, GHSC-PSM hosted a workshop in September 2019 in which all regions developed sustainability plans. The regions established timeframes to ramp up their delivery to SDPs, all aiming to deliver 100 percent of supplies using their own funds by the end of 2021. The regions calculated

their “net worth”—the value of their stocks plus the amount owed to them by the facilities minus what they owe to their suppliers. Also, they committed to “ring-fence” the funds earned from the SDPs for commodity supplies so they will not use them to fill other budget gaps. Some of the regions decided to use their funds to procure their own vehicles, and all expressed a commitment to moving their health care commodities toward full sustainability of funding. Unfortunately, shortly after these sustainability plans were developed, the COVID-19 pandemic disrupted supply chains globally, and Ghana and the LMD program were no exception.

Since implementation plans were not met due to the pandemic disruption, LMD transition plans were updated in most of the regions between May and June 2022. Three regions have met or will meet the transition plans and use their own resources by the end of 2022 (both using their own vehicles to deliver to health facilities and paying for the necessary 3PL services): the Eastern region, Ashanti, and Greater Accra. The other regions have not been doing as well: as of May 2022, some regions still needed to repair old or damaged trucks. By the end of 2022, these regions will have their own plans to support 3PL involvement.

**COMPARISON OF COSTS AND PERFORMANCE INDICATORS OF 3PL DELIVERY VERSUS DELIVERY FROM RMSs IN GHANA**

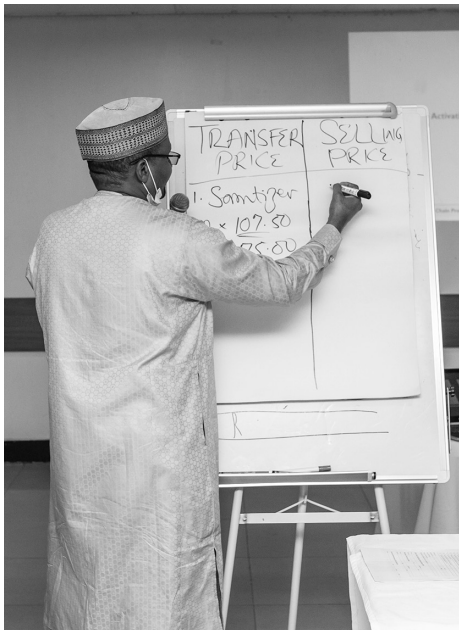
Cost Indicators	Delivery via 3PL	RMS Delivery Other Regions	RMS Delivery Western Region
Average Total Cost/m3	474.23	455.06	388.23
Performance Indicators			
Stock-out Rate	18%	48%	59%
Average Stock-outs Per Region*	1	4	45
Average Duration of Stock-outs Per Region**	38	145	1,971
Stocking According to Plan (10 Tracer Commodities)	73%	51%	15%
Insurance for Commodities in Transit Included in Price	Yes	No	Yes

Better
  Average
  Worse

\*Average Stock-outs per Region is the annual, cumulative count of Stock-outs divided by the number of regions

\*\*Average Duration of Stock-outs per Region is the cumulative number of days across ten tracer commodities

Despite these setbacks, the improvements brought about by the LMD program have been sustained. All regions continue using the WhatsApp platform, Ghana's LMIS, and the correct ordering systems (including following schedules for order submission and delivery to the facilities by the RMSs and using data to revise optimized routes when needed). The regions are starting to staff their supply chain teams more appropriately,



A strategic price structure allows drug revolving funds to be sustainable. PHOTO CREDIT: GHSC-PSM

for instance, hiring facility managers for the RMSs. Staff from SDPs are no longer traveling to regional stores to collect supplies; instead, regions have established reliable, scheduled delivery of supplies to SDPs.

Notably, the work of numerous partners at the central and regional levels supported by GHSC-PSM to develop the LMD project has created a sense of ownership among those responsible. Also, improvements in the supply chain have led to enthusiasm for the work and greater buy-in from the staff, who positively valued the system as “cost-saving” in monitoring visits conducted by GHSC-PSM and the Supplies, Stores and Drug Management Division (SSDM). Scheduled delivery of commodities from the RMS to the health facilities applying

the LMD directions results in cost-savings that can be further invested in supply chain improvements. In this way, LMD has significantly contributed toward the national health objectives and improved availability and sustainability at the last mile.

An important lesson learned from implementing the LMD strategy is that consistent engagement of all stakeholders, including in the design and review process, is a crucial enabling factor, particularly the engagement of regional teams in all processes. Other lessons are the critical role of the private sector in ensuring efficacy and the best performance in the distribution functions, as well as the relevance of transparency in selecting 3PLs. Also, effective communication between all partners involved, facilitated by WhatsApp groups, has been essential. Finally, celebrating small successes while waiting for larger impact has helped to keep all partners aligned and has motivated the teams.

### Drug Revolving Funds to Reach the Last Mile in Nigeria

Nigeria has more than 34,000 health facilities; most are managed by 37 different state health ministries. This makes coordination and management of the health system, particularly health commodity supply systems, challenging.

An approach to ensure sustainable access and availability of commodities at the last mile is the use of drug revolving funds (DRFs), a central strategy to the Bamako Initiative signed by African Health Ministers in 1987. The Bamako Initiative explicitly called for community participation in managing and funding supplies of essential medicines. While donor funds may procure seed stocks, the DRF strategy calls for countries to charge patients for the medicines, either directly or through health insurance schemes, and to use the resulting income to resupply the drugs—hence, the funds “revolve” and ideally should never be depleted. The system is expected to be sustained by charging small markups on the supplies to fund

supply chain operations (including program costs such as fueling, last-mile distribution, monitoring and evaluation, supervision, and other elements of program functioning, while also providing a small reserve fund for each facility to meet emergencies, compensate for inflation, and other factors). On a practical level, this should ensure a continual supply of affordable medicines in public health facilities.

In 2018, USAID Nigeria commissioned a study to understand the interventions that could improve MNCH commodity availability and uptake in its integrated health program states (Bauchi, Kebbi, and Sokoto). Findings revealed that MNCH supply chain systems in these states were fragmented and underperforming, which resulted in commodity stockouts at SDPs and low uptake of MNCH services by mothers and children. The study also uncovered significant challenges with governance, efficient inventory management, and timely distribution of commodities in these states. At a stakeholder engagement meeting, a key recommendation to overcome the poor MNCH commodity availability was implementing state-wide sustainable health products supply systems. The DRF model was overwhelmingly selected by the stakeholders.

Previous efforts to set up DRFs across 36 states and the Federal Capital Territory in Nigeria had collapsed (except for four states), resulting in uncertainty in the supply chain, lack of quality assurance of available medicines, and frequent stockouts.

**The revised DRF scheme drew from lessons learned from previous attempts and developed a different approach. This new approach included establishing a Drug Management Agency (DMA) as the only source of quality-assured medicines and other health supplies for SDPs.**

Several governing structures for the DRF were established at different levels: a DRF steering committee in charge of policy and compliance, a state DRF committee



providing technical direction for the DRF and oversight to DMA and health facilities, and a local government area DRF committee. Communities were involved in state and local government area DRF committees. Robust financial and health product management systems with transparency and accountability measures were implemented, including creating dedicated accounts for DRF funds at each health facility. The funds are structured to support the poor and vulnerable not covered by Nigeria's health insurance schemes through a markup element for "deferral and exemption." GHSC-PSM's role is to provide key technical assistance to strengthen the DMAs, using MNCH as the entry point for establishing DRFs and providing maternal and child health commodities as seed stock.

The three states were at different levels of implementation; for instance, in Bauchi, a DMA was in place and functioning well since 2013. Kebbi and Sokoto were at an earlier stage of established systems; no existing agency or scheme was in place, and considerable advocacy efforts were made to establish the DMAs through the state-level legislative process. As a result, the governors of each state approved the laws establishing DMAs in Kebbi and Sokoto, allowing state governments to fund the DMAs and hire staff. This local ownership by the states is essential to the sustainability of the agencies.

Once the DMAs were established, DRFs were set at the state, local government, and facility levels in a phased approach. The DMA of Sokoto started operations in January 2022 in 20 health facilities capitalized for DRF in phase I and, as of June 2022, 123 health facilities have been trained and capitalized for DRF, set-up, and rollout. To date, DRFs have been established in 54 percent of facilities across the three states: Bauchi at 99 percent (345 out of 349 health facilities) and Sokoto at 46 percent (123 out of 268 health facilities). Kebbi State is working on improving its health sector budget performance per USAID requirements for DRF support before the establishment of the funds.



DRF facility activation day in Sokoto State, Nigeria.  
PHOTO CREDIT: GHSC-PSM

### DRF Facility Activation Day in Sokoto State, Nigeria.

To function well, DMAs and health facilities must be autonomous in DRF operations. GHSC-PSM provided extensive guidance on governance to ensure independence and sustainability, including establishing steering committees to oversee the DRFs at all levels. A key strategy to ensure the sustainability of the funds is to involve trusted community members to supervise them, with community leadership engagement in accordance with the local context. Each health facility must include at least four community representatives that serve as signatories for the DRF accounts among the nine-person facility DRF committee. The technical assistance provided by GHSC-PSM to the financial management system is also vital to ensure robust and transparent accounting and reporting of the funds. Specific SOPs and data collection tools have been developed to guide different functions at diverse operation levels.

**Another strategy to ensure the sustainability of the DRFs is that health facilities are required to buy all their supplies from the state CMS managed by the DMA. This strategy has two primary purposes: first, to guarantee the quality of commodities in an environment where not all the supplies available in the local market are**

### quality assured and, second, to ensure that the DRFs are used and sustained.

The main barriers to implementing the DRF scheme include inadequate human resources (number and cadre) and limited additional financing commitment from states for essential medicines. Task-shifting policies are being put in place to mitigate the human resource challenges. Another challenge was the lack of a DMA in Sokoto and Kebbi, delaying the establishment of the funds particularly in Kebbi, which only recently established the DMA and started implementing the DRF scheme. On the other hand, the main learnings have been that effective advocacy to the state government yielded the release of funds to upgrade infrastructure as well as human resource redistribution to meet minimum requirements for establishing the DRF (as observed in Bauchi, Sokoto, and Kebbi States). Capacity-building activities have led to improved proficiency of staff in performing their jobs.

### Conclusions

The stories in this chapter show that local and regional entities play an essential role in ensuring the availability of commodities at the last mile, contributing to the sustainability of key supply chain functions. The engagement of all stakeholders, the crucial roles of the private sector, advocacy with local authorities, and effective communication among all partners emerge as the main enabling factors to reinforce local ownership of the supply chain. Interestingly, a GHSC-PSM assessment in Ghana showed that the involvement of 3PLs in commodity delivery offered substantial advantages: more consistent service, decreased stockouts, traceability, and insurance provision, compensating for the slightly higher cost than when commodities were delivered by regional warehouse fleets. On the other hand, getting governments to take over financing when USAID-funding and/or projects end remains the biggest barrier to local ownership, a problem exacerbated by disruptions due to the COVID-19 pandemic.



# 05.

## Private Sector Participation



PHOTO CREDIT: GHSC-PSM

## Increasing Participation of the Private Sector to Deliver to the Last Mile

Traditionally, public-sector health systems in USAID-supported countries have chosen to operate their own supply chains. However, as the capacity of the private sector improves with overall economic development, MoHs, GHSC-PSM, and others have the option to engage with the private sector and to outsource key supply chain functions, including warehousing, distribution, management information systems, and more.

In various countries, GHSC-PSM has outsourced distribution of medicines, laboratory supplies and samples, and other commodities and has advocated for MoHs to do so as well.

Outsourcing distribution to 3PLs can be an important strategy and is possible because of the increased capacity of the private sector in recent years, coupled with the emergence of new private-sector partners. However, outsourcing requires careful oversight, and in some cases, work to increase the capacity of 3PLs to meet the stringent requirements of transporting lifesaving commodities at global standards.

### Working with the Local Private Sector to Outsource Transportation of HIV Commodities in Haiti

In **Haiti**, where GHSC-PSM procures and distributes HIV and other health

commodities to about 270 SDPs, the project has been working with and strengthening local private-sector companies for outsourcing transportation for some time.

The first USAID-supported contracts to 3PLs in Haiti were implemented in 2014, by USAID's Supply Chain Management System (SCMS) project, the precursor to GHSC-PSM. GHSC-PSM rebid the 3PL contracts in 2016 and the two local 3PL companies previously contracted by SCMS passed GHSC-PSM's selection requirements, ensuring continuity. In 2020, GHSC-PSM awarded a contract to a third local 3PL.

Ensuring that these local companies meet the standards needed to deliver high-value health commodities requires considerable support, including screening, training, and implementing systems to ensure security and visibility throughout the supply chain.

To satisfy the contract requirements, these local 3PLs must meet stringent standards to transport health commodities. Pharmaceutical products cannot be mixed with other products during transit, and the vehicles must be impeccably clean, meaning the trucks cannot be used to transport agricultural or other types of products. Of 50 trucks inspected by GHSC-PSM, only 22 passed the stringent selection criteria. Once selected, the trucks must pass a checklist-based inspection every time they are used. Also, the drivers must have current licenses, and these are also checked before every journey.

Training for managers includes contract-reading sessions (highlighting to managers and drivers what requirements the contract includes), training sessions on quality standards for transportation of pharmaceuticals and the distribution process, and coordination with GHSC-PSM and health facilities during deliveries. Training for drivers focuses on safety and how to correctly log the deliveries, and frequent driver turnover means that training must be ongoing. As Distribution Manager Magalie Cineus said, "We needed to train them in reporting as well as quality, cleanliness, and timeliness, calling the SDP

in advance of delivery, and all the customer service requirements.”

Also, GHSC–PSM has developed a dashboard-based system that provides a high level of visibility throughout the journey, backed up by verification through a call center. Each truck and each driver are identified with a QR code, allowing for the delivery to be securely tracked from end to end, from the public sector to transit with the 3PL, and back to the public sector. The paper-based proof of delivery (POD) travels with the truck and is marked with codes for scanning upon pick-up. A dashboard tracks information for each delivery (POD number and content, Dispatcher QR code, Truck QR code, Driver QR code, and GPS QR code), as well as the GPS trail on a map. After each delivery, call center staff contact the facility to confirm the POD information and to request that they verify the quantities delivered. The call center system is designed to address the problem of busy staff at SDPs not promptly checking the supplies delivered, potentially leading to gaps in the tracking system at the last mile. Call center staff also identify delays or problems through weekly meetings, allowing the system to provide corrections.

This integrated system provides the ongoing monitoring needed to allow for outsourcing to local 3PLs by, while requiring little additional effort from drivers and clinic staff. Apart from the visibility the system provides into the work of the local 3PLs, it is designed to continually monitor stockouts and overstocks and can organize redelivery of commodities from overstocked facilities to where they are needed. The system also allows for recalls; this capacity was needed recently with the discovery of a contaminated product (ethanol 70 percent used for lab services). The call center system developed by GHSC–PSM could identify the location of every recalled item. The call center reached out to the SDPs to verify that the product was still in stock and verified the quantities available. GHSC–PSM then provided these data to the wholesaler

who had supplied the faulty product, and that wholesaler dispatched 3PLs to collect the contaminated bottles and replace them. Because of GHSC–PSM’s work to verify and strengthen these local 3PLs, the wholesaler could employ one of them to operate this exchange quickly and effectively.

The work of supporting and developing these three local logistics companies is paying off. As of June 2022, 3PLs are delivering supplies to all GHSC–PSM–supported SDPs, apart from six in Port-au-Prince that collect their products directly from the warehouse. In most of the counties (the departments of Nord, Nord-Est, Nord-Ouest, Centre, Artibonite, Sud, Sud-Est, Nippes, and Grande-Anse) the on-time delivery rate is generally 100 percent. One department (Ouest) is experiencing profound security issues, including gang fights and kidnapping, which have led to postponement of distribution beyond set dates, monitoring of the situation, and waiting for a window to open to safely dispatch the vehicles. Even with this situation in Ouest, on-time delivery has been between 80 and 97 percent overall.

**The companies receiving the 3PL contracts have been able to invest in better fleets. Because of the success**

**of this work and the improvements seen in the local 3PLs, the MoH, which generally prefers to own its own vehicles, is now considering using local 3PLs instead of managing last-mile delivery through its own fleet.** By increasing efficiency in distribution to the last mile, the transition to 3PLs can potentially improve patient access to a range of health commodities in Haiti.

Well-managed contracts with 3PL service providers have long been recognized as an effective strategy for improving logistics performance. In Haiti, GHSC–PSM is using contracts with 3PLs to this end and to promote localization, increasingly emphasized by USAID since the recent appointment of Samantha Power as Administrator. By specifically contracting with local 3PLs and providing them with abundant capacity building—including training and ongoing supervision as described above—the project is working to improve the overall capacity of the Haitian logistics sector, promoting localization.

**Public-Private Partnerships to Reinforce Last-Mile Distribution of Insecticide-Treated Nets in Cambodia**

At times, ensuring last-mile availability of commodities requires a blended approach



*In Cambodia, GHSC-PSM contracted with the private sector to deliver nets to communities.*  
PHOTO CREDIT: Chemonics | Chris Norman

that incorporates the private and public sectors. In **Cambodia**, GHSC–PSM partners with the National Centre for Parasitology, Entomology and Malaria Control (CNM) within the MoH to distribute LLINs and long-lasting insecticide-treated hammock nets (LLIHNs) to the provincial/operational district level and selected health centers. In late 2020, CNM asked for PMI support for GHSC–PSM to distribute LLINs and LLIHNs.



Household net distribution in Cambodia included getting the signature of recipients. PHOTO CREDIT: GHSC–PSM | Hsandy Thovy

In January 2021, GHSC–PSM Cambodia issued a request for proposal (RFP) to six 3PLs identified as possibly having the capacity to do the needed work. None of the six responded, citing as reasons for non-response the length of the RFP, the volume of documents required for a complete proposal, and the RFP's overall complexity.

GHSC–PSM then released a second-round request for quotation (RFQ), which simplified the application and evaluation process. The project also identified international 3PLs and asked their local subsidiaries to request their responses to the RFQ. Two of the three vendors that responded to the RFQ met basic requirements and criteria (both were

subsidiaries of international 3PLs), and GHSC–PSM awarded one of them a simplified contract that reflected the one-off nature of the work. **The company that won is an international conglomerate founded in Cambodia—a “local” international company. As such, this work contributes to USAID’s commitment to localization,** as described above.

Under the contract, the 3PL distributed the nets to the operational district warehouse and to health facilities over a five-week period. To verify delivery of the nets to health facilities, the project required PODs from the 3PL within four business days of delivery. The 3PL also provided daily updates to GHSC–PSM on the number of packs/bales transported. The company was also required to report any discrepancies, variances, or issues within 24 to 48 hours after their occurrence, and submit a final delivery report within four business days of completion of any delivery.

In collaboration with CNM, GHSC–PSM also provided support for last-mile delivery from the health center to communities. For instance, the project assisted in training health center staff on how to conduct a census, before distribution, to determine the number of nets needed. GHSC–PSM provided guidance to health center staff on how to manage the process of delivering the nets to households, including obtaining the signatures of household members, signing delivery notes, and completing a daily sheet as a prerequisite for receiving payment for meals and transportation.

This hybrid private- and public-sector distribution proved successful. Despite several delays to activities due to COVID-19, more than 79,000 nets, enough to protect 158,000 beneficiaries, found a home. People were happy to receive the nets through door-to-door distribution, and the active involvement of village chiefs, village health workers, health center staff, provincial health

departments, and central-level supply chain actors helped ensure the program's success.

**A key lesson learned was the use of a simplified RFQ instead of an RFP to encourage more 3PLs to apply for the net distribution work. For others working with 3PLs in similar contexts, after awarding work to selected 3PLs, the project recommends providing them with clear guidance on routes and the names and contact information for recipients to speed deliveries.**

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For a more extensive discussion on outsourcing transport to the private sector, see [“Contracting for Transportation of Public Health Commodities to the Private Sector,”](#) published by GHSC–PSM in June 2021.

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### Strengthening Oversight to Manage Multiple Third-Party Logistics Providers in Nigeria

In **Nigeria**, GHSC–PSM delivers health commodities bi-monthly to approximately 11,000 USAID-supported health facilities and millions of patients across all 36 states and the Federal Capital Territory. The project has delivered more than \$500 million in health commodities on behalf of the U.S. Government since its inception. Also, GHSC–PSM has further leveraged its significant supply chain operations and economies of scale by integrating warehousing and distribution operations for The Global Fund (through a separate contract with Chemonics International). This has resulted in combined delivery to approximately 15,000 health facilities bi-monthly.

Given the size and scope of the operations, several management challenges—recently described in a Global Fund audit<sup>3</sup>—and opportunities to continue to enhance the complex supply chain have surfaced. GHSC–

<sup>3</sup> [Nigeria Supply Chain: Sub-contractor invoice fraud resulted in substantial overcharging](#),” Office of the Inspector General, the Global Fund, March 2021





In Nigeria, GHSC-PSM holds bi-monthly performance meetings with 3PL providers. PHOTO CREDIT: GHSC-PSM | Akay King

PSM looked for opportunities for continual improvement and made adjustments to the supply chain over time to better support the delivery of health commodities throughout Nigeria. This included:

- Expanded the pool of 3PLs. Initially, the project worked with six 3PLs but has since expanded participation to 11 3PLs to support the bi-monthly distribution. This has further enhanced local participation and increased competitiveness, with the ultimate goal of handing over management of the supply chain to the Government of Nigeria. The expansion also helped the project to complete last-mile delivery on schedule.
- Conducted bimonthly performance meetings. After each delivery cycle, the GHSC-PSM team meets with each 3PL to review performance and identify areas of improvement.
- Established simplified pricing. By moving to volume and per site-based pricing, the task of reviewing distribution invoices is now more straightforward—every site has a different contractual rate based on origin, destination, and volume.

- Engaged a chief internal auditor and team. Their role in part is to proactively review a sampling of 3PL transactions for accuracy and flag instances where supporting documentation is insufficient to support 3PL charges.
- Established and continually updated invoicing checklists. The project developed and refined invoice review checklists that allow reviewers to confirm whether charges are appropriately supported before payment.

Furthermore, as part of the project's technical assistance to the government, GHSC-PSM established the first public-private partnership framework contract for the health supply chain between the government and a private-sector warehousing provider. This 3PL provider now operates the two national central warehouses that store public health commodities. This partnership with the private sector has also been employed to manage four axial distribution centers that support last-mile deliveries through well-structured subcontracts with the 3PL warehouse operators.

These measures are proving effective in providing quality services to clients. The achievements boosted the confidence of The Global Fund to renew its contract with Chemonics in late 2021 through 2023, and USAID tasked GHSC-PSM with distributing COVID-19 vaccines throughout Nigeria, with more than 18 million doses distributed by April 2022.

### Conclusions

Local private-sector organizations can be important players in delivering health care commodities to the last mile, but as the three examples in this chapter illustrate, establishing and managing such partnerships require care and effort. The high standards of quality as well as rigorous contracting and reporting requirements

can be a challenge for potential local private-sector partners, as occurred in Cambodia. Ensuring visibility of goods as they move from the public sector to private-sector logistics providers and back to the public sector may require the development of detailed tracking systems, as the story Haiti illustrates. Now in Haiti, the MoH, which generally prefers to own its own vehicles, is considering using local 3PLs. **In Nigeria, where 3PLs deliver a huge volume of health commodities each month, GHSC-PSM used audit results to overcome the challenges of managing such a large-scale effort.**

Several examples elsewhere in this report also illustrate the benefits of working with the local private sector, with appropriate levels of oversight. For instance, in Namibia a local parastatal has been delivering COVID-19 vaccines at ultra-cold temperatures, a task for which the MoH trucks were unequipped. Partnering with the private sector for last-mile distribution has proven to be an effective strategy to promote localization, as an increasing number of local companies are successfully bidding on and fulfilling these delivery contracts, with substantial support and oversight. An overarching goal of localization is to build sustainable local systems; successful partnerships between public-sector partners and local private companies can support countries in meeting the health needs of their populations with less need for donors and IPs.

### References for Localization:

[Administrator Samantha Power On A New Vision for Global Development | November 4, 2021](#)



[USAID LOCAL CAPACITY DEVELOPMENT POLICY](#)



# 06.

## Data Visibility and Use

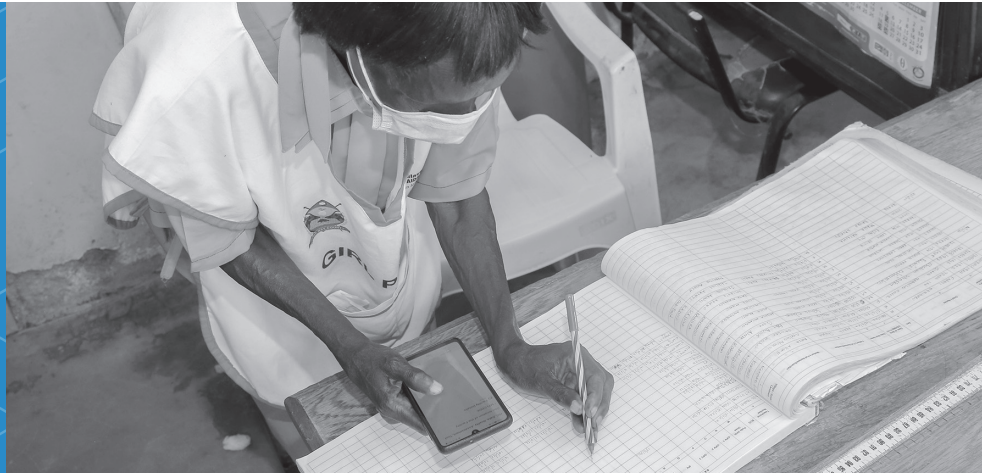


PHOTO CREDIT: GHSC-PSM

## Data Visibility and Use to Ensure Commodity Availability at the Last Mile

Commodity availability at the last mile requires ongoing access to crucial data points in pharmacies, warehouses, and other places where commodities are stored at the last mile.

Access to these crucial supply chain data—like stock levels, consumption, and expiration dates—can be challenging, especially in places with limited internet connectivity, electrical power, and other necessary infrastructure. GHSC–PSM has worked in numerous countries to help overcome these obstacles and ensure decision-makers have the information they need to deliver, redistribute, and manage stock of life-saving commodities at the last mile.

### Overcoming Connectivity Issues in Remote Sites in Pakistan

Pakistan's LMIS is a sophisticated, government-owned, web-based system that allows for data visibility into a range of essential health commodities: vaccines, contraceptives, and MNCH supplies. Initiated in 2011, this LMIS has been scaled up over time and now provides communication between SDPs at the last mile (more than 16,000 SDPs, from large

hospitals to remote clinics) and the rest of the supply chain. These data permit government entities at the national and local levels to make informed decisions, allocate funds, procure supplies, and manage the system with efficiency and minimal waste and delay. Most recently, it has also been used to manage COVID-19-related inventory other than COVID-19 vaccines.

For most of the country, this Internet-based LMIS system works very well. However, some SDPs in Balochistan province could not access the national LMIS system. Balochistan has the largest landmass of all Pakistan provinces and the smallest population. It borders Afghanistan and Iran; the road and technology infrastructure in this region are dilapidated and, in some cases, almost non-existent. The lack of Internet connectivity meant, for example, that health care managers in family planning clinics could not easily

update their stock levels, order new stocks, and report problems at their SDPs. The resulting paper-based systems created delays and errors and ultimately impacted the ability of service providers to reach their communities with the necessary commodities.

In 2018, the Population Welfare Department (PWD) of the Government of Balochistan asked to collaborate with GHSC–PSM to address this problem. As a result, GHSC–PSM and the Government of Balochistan signed a Letter of Understanding that allowed for a consultative process with local stakeholders, including the Department of Health and the Lady Health Workers program. Through this inclusive process, local service providers voiced the need for data visibility to manage their family planning stocks.

The proposed solution relies on mobile phone technology, which exists even in most remote SDPs. However, engaging a local mobile private operator as a partner was challenging. As GHSC–PSM staff said, "These telcos are very commercially oriented and not so interested in

corporate social responsibility work. After much effort, we engaged a local mobile private operator, and they agreed to partner on the project.” Once this company was on board, they built an Unstructured Supplementary Service Data (USSD) system that uses mobile phone networks to send weekly information about commodity levels and consumption to the USSD servers, which then feed the data directly into the national LMIS. **With only a few clicks on a mobile phone (not a “smart” phone), personnel at SDPs could select a week to report on, a type of report (stocks received and consumed, positive and negative adjustments, etc.), a commodity (such as oral contraceptive pills, intrauterine devices, injectable), and the number of items.** In this way, the USSD served as a more efficient and accurate connection between the remote clinics and the central LMIS system than the old paper-based reports.

Once the USSD had been built, GHSC–PSM and its local partners trained service providers from five pilot districts to use the system and gave them mobile phones for data reporting using the USSD. Other government employees were trained as Master Trainers to support the rollout of the USSD. Simple written guidelines were distributed. Also, PWD developed policies to support a shift from monthly paper-based reporting to weekly phone-based reporting in the districts. Service delivery providers in those five districts started sending their weekly data to the national LMIS. As a result, PWD regional staff could quickly see the commodity needs of the districts on the LMIS rather than waiting for paper reports. They then allocated funds to procure replenishment and place an order to the central warehouse in Karachi that ships directly to the region. In other words, the five districts participating in the USSD program were directly contributing consumption data from the last mile into the system, which

These telcos are very commercially oriented and not so interested in corporate social responsibility work. After much effort, we engaged a local mobile private operator, and they agreed to partner on the project.

was being used for requisition. While the project supported implementation (from April 2019 to September 2020), reporting compliance was above 90 percent.

After significant training and support, the new system proved to be easy and user-friendly for health workers in these remote posts. Staff at SDPs still kept paper records, and, once a week, they texted their stock levels, consumption, and other details into the USSD system. The phone’s menu allowed them to read a sequence of simple questions and select answers.

**Based on lessons learned from the original rollout, GHSC–PSM further refined the system and implemented auto-generated requisitions for resupply from the data submitted. This solution saves time and reduces the administrative burden of the PWD, improving efficiency.** The solution enabled data visibility from 70 family welfare centers of five districts and helped the PWD to ensure commodity security to over 400,000 married women of reproductive age.

However, the project has faced several challenges, including staff capacity and funding. Different languages are spoken in the most remote parts of the district, so many of the staff could not be trained using the national language of Urdu. Local PWD trainers carefully customized training to reach these populations. Many of the staff in the SDPs were unfamiliar with technology in general, so the system had to be extremely easy to use. The language barrier and lack of understanding of technology also hampered information technology support from the mobile

private operator in Islamabad. An additional challenge was sustaining these services. Fees to support the mobile phones were paid by GHSC–PSM during the first year, with the plan that they would become the responsibility of Balochistan after the initial set-up. However, investment inequities and resource allocation constitute a significant challenge in the province. The Government of Balochistan has low resources and the system is not a priority; thus, it has yet to allocate resources for sustaining the program. Of note, monthly reporting is still done through the government-owned Pakistan Contraceptive LMIS system (initially funded by USAID) supported by the national government, which is funding the data hosting and security fees. At the local level, however, funds are scarce, and the Balochistan government is not currently supporting the additional expenses of the local mobile private operator for USSD services.

This system is not envisioned to be a permanent solution. Ultimately, all sites should be able to connect to the national LMIS. However, given the remote nature of these districts, the Internet may not reach these areas for several years. In the meantime, USSD is an effective way to rapidly submit data into a central system without Internet connectivity. It has applications in many countries with connectivity challenges and is used in non-GHSC–PSM–supported programs in Bangladesh, Iran, and South Africa. Once the provincial government pays the fees to support the system, USSD will be a fully localized appropriate technology for Balochistan.

## Integrating Data from Village Health Workers to Improve Visibility of Malaria Commodities in Zimbabwe

In **Zimbabwe**, GHSC–PSM piloted a program to improve data visibility at the last mile specific to village health workers (VHWs). VHWs are volunteers who play a key role in supporting malaria programs and ensuring last-mile availability of malaria commodities, as over 50 percent of malaria cases are identified and treated at the community level. Each VHW covers a catchment area and orders commodities monthly from its respective facility. Data from all VHWs are aggregated along with the clinics' data at the end of each quarter to inform decisions about resupply from the central medical stores (CMSs). However, **the data reported by the existing VHW LMIS provided limited visibility into the status of malaria commodities, partly because once they were issued to a VHW for distribution, they were reported as consumed, regardless of whether they had reached a patient. This was hypothesized to be a contributing factor to the over-reporting of quantities of malaria medicines consumed by as much as 5:1 versus numbers of patients treated for malaria.**

In 2017, with support from the U.S. President's Malaria Initiative (PMI), the National Malaria Control Program and malaria partners investigated the causes of such wide discrepancies and found that only one of 47 sites investigated accounted for stock at the VHW level. The investigation also found poor documentation of stock returns and expired or damaged stock from VHWs. VHWs often provided monthly return forms incomplete, late, or not at all.

In consultation with partners and VHWs, PMI—through GHSC–PSM—funded the redesign of the VHW LMIS system to improve data visibility for VHW commodities. The process included a design workshop with participants from the National Malaria Control Program,

the Directorate of Pharmacy Services (including the Logistics Unit), NatPharm (the CMS), Zimbabwe Assistance Program in Malaria, provincial focal points, and selected district health executive team members. VHWs were interviewed during the workshop to understand their views and the shortcomings of the current system, their expectations for the new system, and the support they needed to conduct their community management activities effectively.

The system aimed to improve data visibility for consumption, stock on hand, and adjustments (expiries, damaged, etc.) and, importantly, support VHWs to obtain product refills based on their actual needs, improving the quality of data coming from the VHWs and the ability to calculate actual consumption. The redesigned system aimed to improve data availability and quality through enhanced LMIS forms, an electronic data capturing system, and more streamlined business processes. Specific changes included:

- A better-defined and standardized issue and return voucher.
- Modifications to the existing community-based health worker malaria rapid diagnostic test (mRDT)/Malaria Medicines Register to include losses, adjustments, and other data for malaria medicines and mRDTs.
- Implementation of a new Community Based Health Worker (CBHW) Stock Form (see image, upper right) to summarize each VHW's monthly consumption, losses/expiries, stock on hand, and ordering.
- Implementation of a new Community Supply Chain Summary (CSCS) form to consolidate losses/expiries, consumption, and closing stock from all

VHWs reporting quarterly at a facility. The CSCS aggregates the information on CBHW stock forms associated with a facility (these two forms are maintained separately).

CBHW STOCK FORM							
Name of VHW: _____		Name of Facility: _____		Date of Physical Count: _____			
District: _____		Province: _____		Month & Year: _____			
Commodity	Physical Usable Stock on Hand* (A)	Consumption (B)	Order Quantity (C) = Consumption multiplied by 2 giving Stock on Hand (B) X 2 = (A)	Final Quantity to Order** (D)	Quantity Received (E)	Stock Expiring in 3 Months (F)	Losses & Expiries (G)
Rapid Diagnostic Tests (Tests)							
Coartemether 1 x 6 Blister							
Coartemether 2 x 6 Blister							
Coartemether 3 x 6 Blister							
Coartemether 4 x 6 Blister							
Artesunate 50mg suppositories							
Artesunate 200mg suppositories							
Sulfadoxin/Pyrimethamine							
Paracetamol 500mg tablets							
Surgical Face Mask each							
Hand Sanitizer							
Cotton rolls							
Methylated Spirit bottles							
Gloves							

\*excluding stock expiring in 2 months, expired and damaged (D)  
 \*\* May be increased or reduced over (D) based on seasonality, IRS spraying, epidemic etc

Version: Nov 2021

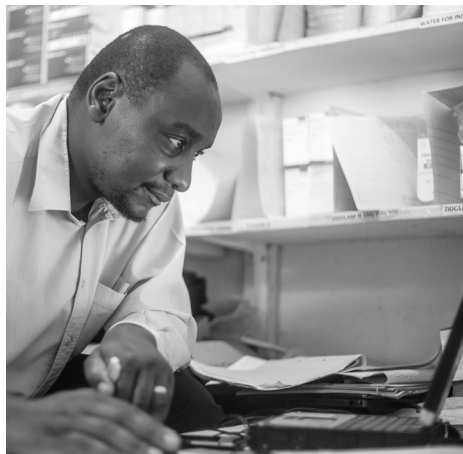
CBHW Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
 Health Facility Staff name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

CBHW Stock Form Summarizing Each VHW's Monthly Consumption, Losses/Expiries, Stock on Hand, and Ordering.

To evaluate the effectiveness of these changes, GHSC–PSM piloted the redesigned system in two districts (Kariba and Rushinga) for one year, between late 2019 and late 2020, including an endline assessment. GHSC–PSM and the Ministry of Health and Child Care (MoHCC) defined a set of indicators to measure intended outcomes: stockout rate, order fill rate, reporting rate, optimum stock availability, losses and expiries, and data completeness.

**Results showed that the redesigned system improved the visibility of VHW logistics data for decision-makers, including data on consumption, stock on hand, losses, and adjustments for VHWs and health facilities. However, VHW reporting rates remained almost unchanged during the pilot. One possible reason is the impact of COVID-19 restrictions on accessing health facilities.** To improve VHW reporting rates, GHSC–PSM will provide routine support and supervision visits, and district pharmacy managers will highlight the importance of reporting rates during ordering rounds to clinical staff.

Most VHWs confirmed that they found the redesigned mRDT and Medicines Registers and the new order forms easy to use. However, questions remained about data quality. While no specific indicator was defined to assess data quality for the pilot, qualitative comments suggest mixed outcomes. Some sites noted “LMIS forms



*Data provided by village health workers in Zimbabwe are used by decision-makers at all levels of the supply chain.*  
PHOTO CREDIT: GHSC–PSM

well filled” and “Completeness of CSCS form greatly improved.” Others noted incomplete or incorrectly filled forms, no forms available, lack of reporting of zeroes, order quantities unrelated to consumption, and challenges translating VHW data to the Facility Order Form. The lack of good-quality data makes forecasting and commodity distribution and redistribution difficult.

The indicator with the most positive change was data completeness (proportion of sites with data available for VHW stock on hand, consumption, and losses/adjustments). At the start of the pilot, only 11 percent of sites in the two districts had complete data on VHW consumption, stock on hand, and losses and adjustments. Following implementation of the pilot, this measure rose to 87 percent— suggesting that creating a standard format for capturing these data through the CSCS form has increased the likelihood of data being recorded.

Stockout rates were high for some malaria commodities—up to 100 percent for some drug formulations and mRDTs—in 2019 before the pilot in both districts, while ranging from about 20 to 50 percent for most malaria commodities at the end of the pilot. This followed an increase in stockouts throughout the supply chain during the same period. Due to other supply chain disruptions, it was not possible to attribute any change in stockout rates to the pilot. Instead, stockout rates at the VHW level will be routinely monitored to evaluate any potential impact the system has on stockout rates in the future. Data on stock returns and expiry reported during the endline survey showed that VHWs were implementing the system as required, returning short-dated stock before expiry. The pilot program showed that, with adequate support of reporting tools, VHWs could report logistics data and effectively order products from their affiliated health facility. Also, increased data visibility has enabled managers to troubleshoot the VHW system and make more informed decisions.

During the pilot, the main challenges faced by the program were the low order fill rates for malaria commodities resulting from low stocks in the national pipeline, the low reporting rates of VHWs, and data quality issues resulting from poor data being collected.

One of the main lessons learned from the program is the need to work with health facilities and VHWs to improve the number of reporting VHWs. A second lesson is the need to provide regular support to VHWs for both malaria case management and procurement and supply chain management. Measures include better supporting the VHWs through environmental health practitioners working in collaboration with nursing staff at the clinics. Checklists and SOPs will be developed to monitor critical aspects of the system. A third lesson is the

importance of sensitizing and supporting district pharmacy managers in collecting and recording VHW summary logistics data during ordering rounds to provide feedback on VHW reporting. Another lesson is that all facilities with active VHWs testing and treating malaria should be provided with adequate malaria commodities. VHW data should be included in data quality assessments and report findings. To track the quality of data being sent by VHWs, yearly Data Quality Audits are being extended to include assessment of VHW data, and data will also be reviewed during routine support visits to clinics.

Following the results of the pilot and the Case Drug Consumption Survey conducted in 2017 (which showed a big disparity between case and consumption mainly caused by the non-accountability of commodities kept by VHWs), the MoHCC, PMI, The Global Fund, and other stakeholders recommended scale-up of the program to collect VHWs data, increase data visibility, and address the case consumption disparities. Besides increasing data visibility, they also envisioned that the system can perform better with increased support and mentorship to clinic staff and VHWs, availability of LMIS forms, on-time distribution of malaria commodities, and availability of commodities at the community level. Thus, after the two pilot districts, the new system was expanded to 17 malaria high-burden districts, 12 of them funded by The Global Fund and five by PMI. Training in these additional districts started in April 2022 after training manuals, LMIS forms, and SOPs were revised to address shortcomings noted during the pilot. Plans are not yet in place to cover the last of the 20 high-burden districts, although funds are being mobilized. Currently, the program focuses only on malaria commodities, but discussions are being held in-country to add other commodities to the last-mile distribution system.



## Adapting the Existing DHIS-2 to Support Supply Chain Decision-Making in Botswana

In **Botswana**, the MoH and other supply chain actors had a wealth of data from many sources, including the Warehouse Management System, Excel-based monthly LMIS reports, data from the Quantification Analytics Tool (QAT)<sup>4</sup>, monthly patient reports, and others. Health facilities did a good job reporting stock levels and other key data. Yet, the lack of integration of all the systems required manual workarounds and made it difficult to analyze and leverage all data for decision-making to ensure a reliable supply of health commodities at the last mile. Also, since most tools were standalone and not interoperable, data were accessible only to a few users. The existing tools generated reports that needed further analyses and interpretation.

After careful analysis and consultation with the MoH and other stakeholders, GHSC–PSM launched an initiative in March 2021 to integrate the various data platforms in Botswana’s DHIS-2<sup>5</sup> and create new dashboards to help supply chain managers to make decisions about procurement, redistribution of commodities between health facilities, and other actions.

Instead of introducing new software, the MoH preferred to integrate and enhance DHIS-2 because MoH staff were already familiar with it. For the last several years, DHIS-2 has been used in the country for monthly reporting on ARVs, prevention of mother-to-child HIV transmission, malaria programs, and MoH surveys and surveillance activities, but had not been used as a platform for supply chain management. DHIS-2 is also being used for several COVID-19-related activities, including surveillance and vaccination reporting. Importantly, the system is open-

source and the Botswana government already owned and managed a server dedicated to operating it. **Leveraging the existing resources rather than developing new software saved resources and reduced the need to retrain supply chain workers.**

To create the new dashboards focused on supply chain management, GHSC–PSM contracted with a software company recognized for its extensive experience working with DHIS-2. The company deployed a small team of five who made all the necessary changes by 2021. Since then, at monthly technical working group discussions with CMS, GHSC–PSM, USAID, several non-governmental organizations, and other key partners, supply chain managers have used the powerful new dashboards and data visualizations to identify risks to commodity availability at all levels of the supply chain, including the last mile. The system includes all commodities in Botswana’s public health system. A common discussion point concerns the current stock situation at CMS and, if stocks of a commodity are low, planning for stock redistribution from health facilities with excess stock to those at risk of stockout until deliveries arrive to replenish the CMS. CMS also uses the analysis in the dashboards to decide on the quantity of stocks to replenish health facilities.

The enhanced decision-making process has already contributed to helping manage stocks of legacy ARVs during the transition to new adult and pediatric HIV/AIDS treatment regimens. Triangulation of patient data with supply chain data has been especially useful in managing this transition: supply chain managers could analyze maps, tables, and charts showing stock levels at all levels of the supply chain, consumption rates of new and legacy ARVs, and numbers of patients transitioned

into new regimens. In this way, supply chain managers redistributed stock between treatment sites to ensure a reliable supply of legacy ARVs and avoid costly unnecessary procurement as the new regimens replaced the old. ARV stock levels were already adequate before the intervention and have been maintained. Between April 2021 and February 2022, the monthly percentage of health facilities where tenofovir, lamivudine, and dolutegravir stock was available ranged from 97 to 100 percent (monthly average of 98 percent since 2018). Pediatric dolutegravir 10 mg was introduced around June 2021, and the monthly percentage of health facilities where it was available also ranged from 97 to 100 percent until February 2022.

**The key impact of the tool so far has been providing online visibility of stocks at the facility level, helping CMS with stock redistribution, particularly for products that are often stocked out at the CMS level, and therefore avoiding treatment interruptions.** In contrast to the situation for ARVs described above, the stock levels of most health commodities are currently low mainly because of delays at CMS to renew long-term procurement contracts. With the low stock levels, the



In Botswana, data visibility solutions leverage the existing DHIS-2 system to manage all public health commodities. PHOTO CREDIT: Chemonics | Andi Gultom

<sup>4</sup> Funded by USAID, QAT is a modernized solution for country-led supply planning: <https://www.ghsupplychain.org/quantificationanalyticstool>

<sup>5</sup> DHIS-2 is a global open-source project used by more than 73 countries worldwide for collecting and analyzing health data: <https://dhis2.org/>. The Botswana DHIS-2 supply chain dashboard can be accessed through this link (since it contains government-protected data, a user and password are needed): <https://dreams.gov.bw/cms/dhis-web-commons/security/login.action>

dashboard is greatly helping CMS to redistribute the limited stocks to avoid treatment interruptions. For example, the CMS is using the supply chain dashboard to locate and consolidate the drugs and supplies from other health facilities for redistribution during an ongoing cataract surgery campaign in Serowe-Palapye District Health Management Team. Overall, the initiative has proved to be a cost-effective and rapid solution, less expensive than previous large technology initiatives. The development of the tool amounted to almost \$55,000, with development and rollout taking eight months, and it is an open-source software with zero subscription fee. A comparable tool with similar functions, such as Microsoft Power BI, would cost about \$5,000 of monthly subscription fee, and a more robust eLMIS solution would cost more than \$2 million. Since funding to invest in an eLMIS was lacking, DHIS-2 allows at least the ability to consolidate the manual reports through automatic uploads, run analytics, and share data using a web-based platform.

However, despite the initiative's overall success, some challenges have emerged, including technical glitches typically related to software development and connectivity challenges when accessing a new online platform. The most pressing issue has been the impact of moving large amounts of data to the MoH server, resulting in slower than usual processing. GHSC-PSM is working with CMS to expand server capacity.

For those considering similar adaptations to DHIS-2, especially in the absence of other eLMIS solutions, Ashenafi Desta Hordofa, Logistics Management Unit Manager, GHSC-PSM, encourages exploring the full potential of the platform. "We might have done this earlier if we had completely understood DHIS-2's capabilities and applications to supply chain management. Once you get to know it better, you realize that it can be customized and has tremendous potential

We might have done this earlier if we had completely understood DHIS-2's capabilities and applications to supply chain management. Once you get to know it better, you realize that it can be customized and has tremendous potential for data storage and reporting, and display of data analytics and visualizations.

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### **A Call Center Helps Commodity Reporting in South Sudan**

**South Sudan** has similar infrastructure challenges to those in Balochistan (Pakistan) described above. However, GHSC-PSM took a different approach than that used in Pakistan and, instead of relying on health facility staff to report information about stock levels, the project established a call center model in which staff proactively call all health facilities in two regions. This information is key to organizing the push of commodities currently at the district warehouses down to the last mile. This innovative program incorporates call center technology from Spain and the United States and has been adapted for other countries, including Haiti and Niger.

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**For more information on the South Sudan call center, see [Data Collection by Phone: The South Sudan Call Center | USAID Global Health Supply Chain Program \(ghsupplychain.org\)](#)**

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### **"Internet of Things"-Powered Device to Report Stock Status Changes in Angola**

In **Angola**, contraceptive prevalence is currently about 18 percent. From October 2019 to June 2021, GHSC-PSM piloted the Drugs Out of Range (DOOR) system to report low stock events in public-sector

health SDPs, as part of its effort to expand contraceptive access in the country. The DOOR system reports critical stock changes using an electronic push button device installed in the same room where commodities are stored in SDPs. The DOOR system relies on Wi-Fi-enabled "Internet of Things" technology—i.e., a non-standard computing device (other than desktops, laptops, smartphones, and tablets) that connects wirelessly to a network and has the ability to transmit data. It incorporates multiple external data analytics systems to provide real-time stock availability status with immediate alerts to supply chain actors. As part of their routine inventory checks, pharmacy staff press the appropriate button on the device when the stock status changes for a particular product, triggering a cascade of actions and responses. In this way, the system aims to reduce the time lag to alert supply chain managers of critical stock events and, eventually, the prevalence of stockouts. GHSC-PSM conducted a mixed-methods evaluation of the system's effectiveness, viability, and acceptability from July 2020 to January 2021. The evaluation found that compliance from facilities was encouraging but highly variable, being lower in facilities that experienced Internet challenges. Key

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**For more information on DOOR, see ["Opening the DOOR to a New Commodity Stock Alert System," published by GHSC-PSM in March 2022.](#)**

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operators of the system demonstrated evidence consistent with the expected theory of change outcomes, validating the behavior change component of the system. Visibility of stock status at SDPs increased but technology challenges and broader contextual issues curtailed the size of the effect. The evaluation concluded that the DOOR system presents potential for expanded impact in the short term, once technology challenges are resolved.

### Improving Visibility Into Supply Chains Globally: Examples of GSI Standards Implementation, Data Ecosystem Integration, and Open LMIS Development



*GHSC–PSM has promoted data visibility as a key factor in ensuring access to health commodities at the last mile.*  
PHOTO CREDIT: GHSC–PSM

A key tool in ensuring the availability of commodities at the last mile is traceability. Perhaps the best-known tool for product tracing is the barcode. An international non-profit organization company called GSI<sup>6</sup> defines barcode standards around the world. GHSC–PSM's Global Standards team supports numerous countries in adopting GSI standards to better locate and trace the commodities within their systems. Most recently, GHSC–PSM provided technical support to Ghana to develop a traceability strategy; in Malawi and Rwanda, GHSC–PSM hosted workshops supporting

traceability implementation and standards and guidelines; and, in Zambia, worked with the MoH to develop a National Product Catalog, supported by training, and to develop SOPs.

Improved data visibility results in more accurate and prompt quantification of supplies available at the last mile (SDPs, laboratories), and indeed throughout the supply chain, allowing for more accurate forecasting and planning. GHSC–PSM's new QAT is being introduced around the world; GHSC–PSM has also developed a program to integrate the data in QAT with that of the Global Family Planning Visibility and Analytics Network (VAN)<sup>7</sup> developed by the Reproductive Health Supplies Coalition. Although not specifically operating at the last mile nor designed to include last-mile data, both QAT and VAN are part of the larger data ecosystem that helps ensure last-mile availability.

Management information systems improve the efficiency and effectiveness of operations, and GHSC–PSM supports countries in implementing them. For instance, the LMIS called SIGLUS is used for data collection at health facilities in Mozambique. Because the system was built on a Microsoft Access platform, it had limited capabilities. In response to emerging needs, GHSC–PSM helped develop SIGLUS v.3 on an open LMIS platform that allows for more flexibility. GHSC–PSM also adapted SIGLUS for use in private pharmacies (see chapter on “Meeting Clients Where They Are”) as part of a broader effort to deliver health care commodities at the last mile.

### Conclusions

By working in countries with a range of infrastructure issues and requirements, GHSC–PSM has promoted data visibility as a key factor in ensuring access to health commodities at the last mile.

From sophisticated legacy systems like Pakistan's national LMIS to creative solutions like South Sudan's call center and Balochistan's USSD system, GHSC–PSM's work to support data visibility is a crucial component in last-mile access. Critical elements for the success of these programs include the use of adequate technologies adapted to the local context, involvement of all the different stakeholders, and, notably, capacity building and reinforcement of human resources (including the provision of customized training and regular support). The case of DHIS-2 in Botswana suggests that adapting and/or integrating data visibility tools with locally owned existing platforms rather than developing new software, whenever possible, can emerge as a less expensive solution that eliminates the need for staff retraining. However, this is not always the case, and many legacy systems will need to be replaced to ensure data visibility.

**Although the systems mentioned here have contributed to fostering data visibility and reinforcing decision-making capacity, in some cases also contributing to positive behavioral changes in the supply chain staff, these changes have not always been reflected in numerical evidence of improved commodity availability or data quality.** Some of the challenges for improved data visibility and data use mentioned in this chapter include technical and infrastructure challenges (such as connectivity problems and limited server capacity), human resource issues (also discussed in the corresponding chapter, including limited staff capacity and technical training, and variable compliance), the challenging sustainability of funding some programs, data quality issues, and fragility of local systems, adding difficulties in facing unexpected disruptions (such as the ones due to the COVID-19 pandemic or an exceptional malaria outbreak).

<sup>6</sup> <https://www.gsi.org>

<sup>7</sup> <https://www.rhsupplies.org/microsites/gfpvan/>



# 07.

## Advanced Analytics



PHOTO CREDIT: Chemonics | Chris Norman

## Advanced Analytics to Ensure Access at the Last Mile

Countless decisions are involved in delivering health commodities to the last mile.

*How many supplies should we send to each clinic? What size truck is best for this delivery? How should we pack the truck?* Country-level supply chain managers must grapple regularly with each of these problems (and many others). But too often these decision-makers rely on data that are insufficient or hard to interpret, or do not use data for decision-making at all, potentially leading to guesswork and inaccuracy.

Over the past two decades, health sector data have been steadily moving from paper-based to digital formats. The digitization of logistics data, along with increased computing power, opens the door for a more powerful and nuanced approach to analytics, allowing logisticians to address factors that would have been too complex and time-consuming to address in previous eras. Also, advances in cognitive science provide more information about how people make decisions, and how they can be affected by unconscious bias, risk aversion, and assumptions.

Taking full advantage of these new opportunities, GHSC-PSM conducts advanced data analytics, based on collaborative, human-centered design processes, to facilitate the best possible decisions about the many supply chain questions involved in last-mile delivery. Good analytics and well-designed tools—including dashboards, apps, and others—can support country decision-makers to find patterns in complex data, uncover issues around variability and seasonality, evaluate the reliability and completeness of data, and proactively address potential problems before they occur.

### Last-mile Dispatch Optimization System in Zambia

A new approach to advanced analytics is being piloted in **Zambia**, where the Zambia Medicines and Medical Supplies Agency (ZAMMSA) is responsible for distributing health care supplies to SDPs. ZAMMSA operates one large central warehouse and seven provincial hubs. GHSC-PSM identified two phases of work needed to optimize delivery of

health commodities to the last mile. The first addresses the delivery of commodities from the central warehouse to the regional hubs, while the second aims to optimize deliveries from the hubs to SDPs.

The work began by developing dashboards to address inefficiencies identified by ZAMMSA central warehouse workers, who noted that they did not have sufficient information to prepare orders and were sometimes ordering trucks at the wrong time or in the wrong sizes, and did not always have orders ready for pick-up. GHSC-PSM, using the principles of human-centered design, began by observing the warehouse process, analyzing existing databases and systems, and talking to stakeholders to gain insights on what would work for the Zambian context. Andrew Inglis, advanced analytics manager for GHSC-PSM, described the process: "We started by having a natural conversation with the team on the ground. We talked about what decisions they make and what their current data look like. Through these conversations, we were able to co-design analytic tools that can help them do their job better. The decisions that the local program is making drive the design."



GHSC–PSM designed the Last Mile Dispatch Optimization System (LM-DOS), a web-app dashboard built using multiple open-source tools for coding, optimizing, and mapping routes. **The data used by the app comes from multiple sources; GHSC–PSM automated these data feeds, eliminating the need for warehouse workers to enter data and instead allowing the user to review data and, as needed, modify this information—a much quicker process.**

The new dashboard allows warehouse staff to see the workflow much more clearly. Using up-to-date volumetrics data, information about accessibility (what is the largest truck that can navigate smaller rural roads?), GPS coordinates for each warehouse and SDP, and numerous other factors, the app provides a preliminary table summarizing the orders. Warehouse staff review and approve the orders, and the app then guides users through suggestions for “pick waves,” loading order, selection of vehicles, and routing of supplies. While the new app, launched in late 2021, has yet to be formally evaluated, users on the ground in Zambia already report good experiences with it.

**Elisha Msipu Phiri, GHSC–PSM’s distribution center logistics advisor in Zambia, says, “Route planning that used to take two or three hours now happens in about 10 minutes with the click of a button. It is difficult to quantify but we are definitely going to see cost savings. The tool is really helping us plan effectively.”**

The analyses provided by the app can identify new ways to improve that were not visible before; they can challenge teams to rethink existing practices and habits and determine the best way forward. For instance, while warehouse staff may think it is always more cost-efficient to put a lot

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of goods onto a large truck, LM-DOS may illustrate that there is opportunity for cost saving by sending out three 10-ton trucks instead of one 30-ton truck, given the geography of the deliveries.

The program is designed to be sustainable and transferable to other countries. GHSC–PSM used open-source software as the basis for the system, and the road data used to calculate distance and travel time come from the Open Route Service Group<sup>8</sup> (hosted by University of Heidelberg, Heidelberg Institute for Geoinformation Technology), which provides the data free of charge. “The whole idea is that we are designing it so the analytical tool is ready to go,” says Inglis. “It just needs some specific configuration and customization for each country.” Training videos are being developed to allow new staff to be onboarded quickly; this is another strategy to build sustainability of the program as it expands.

### Using Advanced Analytics to Improve Data Quality in Malawi

In **Malawi**, GHSC–PSM is working with the MoH to better understand their supply data and make improvements to their supply chain. The Malawi MoH had successfully increased reporting of data from the last mile: 90 percent of SDPs were providing stock-level data to the central level every month. Yet the MoH felt there was still room to improve the visibility and performance of the supply chain.

GHSC–PSM conducted a review of the LMIS data from 2021 showing that 25 percent of all dispensed products were transferred from facility to facility before being dispensed, instead of from warehouse to facility to patient. In a well-functioning supply chain, such stock transfers should be the exception, and certainly not as high as a quarter of all products. Stock transfers create blind spots in visibility, limit the system’s ability to track and trace products (increasing the risk of stockouts and expirations), and add substantial cost and delay to the supply chain.

To address this high rate of transfers and resulting low visibility into the supply chain, GHSC–PSM updated the LMIS manual to emphasize prompt reporting of adjustments by the sending and receiving facilities and thus to increase the visibility of the actual flow of commodities from warehouse to patient. A coefficient of variance indicator was also introduced to allow decision-makers to identify sites with unstable consumption levels, providing insights on where additional action is needed to reduce the risk of stockouts. Understanding the reliability of consumption data is critical to being able to confidently order the right quantities.

At the same time, GHSC–PSM began developing an analysis dashboard that incorporates several different analytical processes and tools. **The dashboard, developed using human-centered design principles, will allow users to**

<sup>8</sup> <https://openrouteservice.org/>

### view data through the lens of Program, District, Facility, and Product and to walk through multiple scenarios,

including Actual versus Stated Inventory rules (showing the difference between what should be happening and what is actually happening); frequency of delivery scenarios, and order quantity change scenarios. Revising the LMIS manual, focusing more on variance, and developing the dashboard are the first steps in a change-management process that is currently underway in Malawi. The goal is to illuminate problems in the supply chain process so that country teams can identify necessary changes and adjustments that will help their systems function more efficiently.

### Using Analytics to Manage Multi-Month Dispensing in Ethiopia

The Ethiopian Pharmaceuticals Supply Service (EPSS) asked GHSC–PSM to address challenges in distributing HIV/AIDS medication. Since 2010 when EPSS (formerly known as EPSA and before that as PFSA) introduced an integrated pharmaceutical logistics system, hubs and SDPs have been maintaining stock levels to cover between two and four months of consumption. Ethiopia introduced the Appointment Spacing Model (ASM) in 2017 for stable patients with HIV; these patients were encouraged to transition to six-month MMD. The COVID-19 pandemic further underscored the need for MMD to reduce crowding at health facilities and led to a policy of mandatory six-month MMD for these patients. While this longer MMD model yields many benefits, supply chain managers feared overstocks or stockouts would result from the shift, and required better understanding of issuance patterns and a smoother and more predictable supply chain. GHSC–PSM used advanced analytics to identify unstable issuance patterns for MMD and non-MMD commodities, analyze inventory turnover, and make recommendations for improving supply chain stability. After some simple improvements to make the data easier to



*In Zambia, design of a new system started with understanding the needs of users. PHOTO CREDIT: GHSC–PSM*

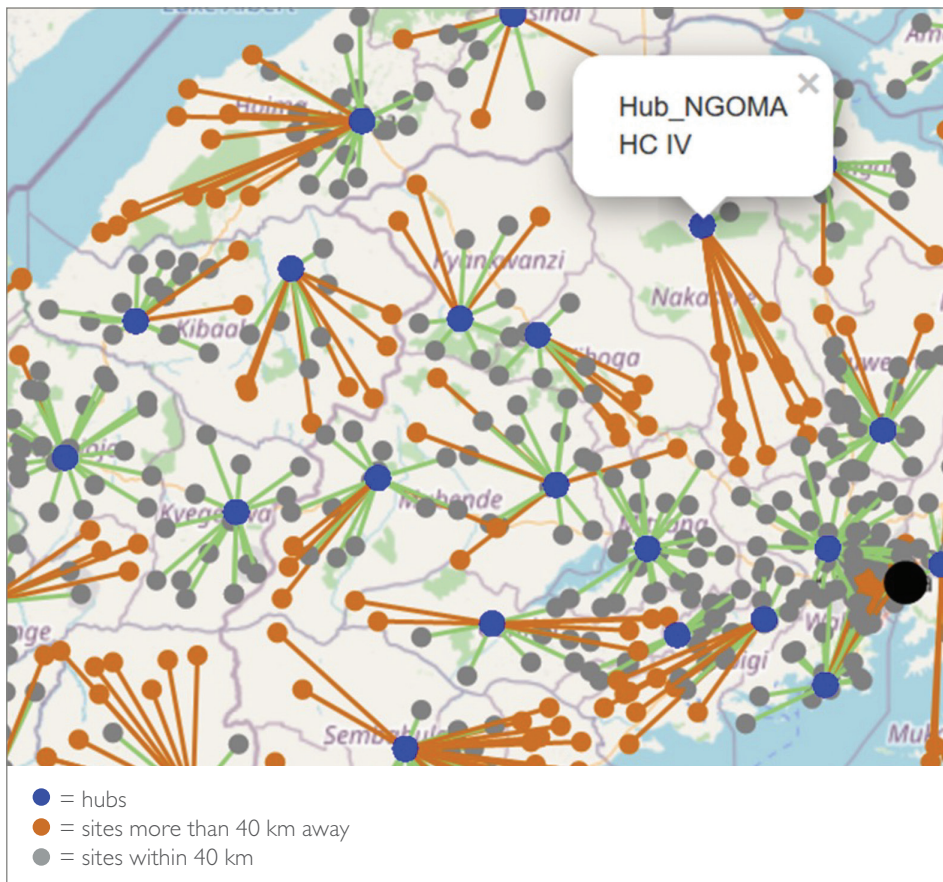
manage and analyze, such as standardizing the names of the Ethiopian facilities in the dataset and consolidating past and current data, GHSC–PSM designed an anomaly detection dashboard. This new dashboard was designed to test for four measures of stability in the supply chain: outliers, moving averages, ranges, and coefficient of variation in the issuance of supplies to SDPs. **By combining these four measures, the dashboard calculated an “anomaly score” presented in visual and tabular formats. Ethiopian supply chain professionals can select a facility or product to review and those with higher anomaly scores can be targeted for attention.**

Another approach is the inventory turnover analysis, which used the same dataset to focus on supply hubs rather than on facilities. The inventory turnover dashboard identifies products at high risk for either overstocking (leading to unnecessary costs and storage space, and possible expirations and wastage), or stockout, affecting availability at the last mile. Since the Ethiopian supply chain system stocks each hub bi-monthly, an annual turn rate

of around six per year means that stocks are moving steadily through the system. By clearly identifying hubs with higher or lower than expected turn rates, the inventory turnover dashboard supports the anomaly detection dashboard and provides specific information that allows Ethiopian supply chain professionals to proactively address these challenges.

A review of the data generated by both these dashboards identified a number of hubs, facilities, and products with uneven issuances, with large quantities being distributed one month and small quantities the next month. This unstable issuance pattern presents opportunities for improvement, as small orders still require significant effort to pick, pack, load, and transport. The systematic review supported by the dashboards also revealed that some sites are not providing consistent data, limiting the ability of EPSS to provide accurate and targeted deliveries of supplies.

EPSS can use the information provided through advanced data analytics to identify and target specific sites for additional



In Uganda, interactive maps allow sites to be highlighted by distance and other factors. Map of the existing lab diagnostic network in Uganda, highlighting where distances are greater than 40kms from facility to hub used to identify where hubs are not well located and to suggest more optimal locations. GHSC-PSM built a custom script in the Microsoft Python™ and Mapping Library called Folium to generate the maps and used Microsoft Python Libraries to determine the distance between facilities and hubs.

inputs, and support facilities to improve data quality, and consolidate ordering, for some locations and products.

### Better Maps for Testing Supplies in Uganda

In **Uganda**, the MoH distributes supplies to over 2,500 testing laboratories nationwide, through hubs. Testing supplies go from hubs (shown in the map below in blue) to SDPs (shown in orange or gray). At the SDPs, tests are conducted, and then sent back to hubs, where they are collated and sent to the national lab (the black dot in the map) for analysis. Motorcycles are the main form of transportation used in this component of the Ugandan supply chain, as the volume of testing supplies and completed tests is fairly small. The MoH requested better information to identify

sites more than 40 kilometers from hubs, as they determined that 80 kilometers (40 kilometers each way) is the outer limit for motorcycle delivery.

The MoH had access only to paper maps and struggled to easily compile the information they needed. GHSC-PSM's analytics team developed interactive maps that allows sites to be highlighted by distance and other factors. This new tool allows the MoH, CDC, USAID, and other stakeholders to interact with the data—clicking and zooming in—to better understand and redesign the network of testing sites. This map is in the form of an HTML file that can be viewed on and offline. With the interactive nature of the data, decision-makers can query and pose a series of questions and scenarios.

The map above illustrates how some of the hubs were mis-positioned, that is, located far from the SDPs. The call-out box for the Ngoma hub in the northeast corner of the map links exclusively to SDPs that are tagged as orange—that is, more than 40 kilometers from the hub. All the SDPs are clustered in the same direction, south of the hub. In this situation, the MoH may choose to relocate the hub to one of the SDPs in the middle of the cluster. While this seems like a relatively simple decision, it could not be made until the data were visible and could be queried by the local stakeholders.

### Conclusions

Advanced data analytics, often paired with improvements to data visibility, do not replace the decision-making of logistics managers and other supply chain staff. Rather, they offer decision-makers the ability to view and query data to generate solutions and guide decision-making and possible action. Ideally, the data analytics described here will allow supply chain managers to be more informed and more efficient. However, human beings are always at the center of these processes, and new tools, systems, and ways of working often need to be introduced thoughtfully and over time. As the supply chain world becomes more complex and stressed, the increasing volume of information now available can be overwhelming, and the capacity of people to absorb new systems can sometimes be limited. GHSC-PSM works closely with stakeholders at the country level to develop tools that meet their needs and support them through a change management process. While supply chain staff are sometimes hesitant about advanced analytics at the outset, a well-designed system supports and empowers their decision-making; it enhances but does not replace the nuanced, local information that the country team possesses. Thus, a proper human-centered design and careful change-management system are essential elements of the design process.



# 08.

## Human Resource Capacity



PHOTO CREDIT: GHSC-PSM | Andi Gultom

## Building Human Resource Capacity to Ensure Commodity Availability at the Last Mile

**GHSC-PSM strengthens human resource capacity to ensure delivery of supplies, from procurement at the very beginning of the supply chain to the point where the commodity reaches the client or patient:**

A mother who chooses a family planning method to space her next pregnancy, a person living with HIV refilling the ARVs that allow them to live a healthy and productive life, a family receiving bed nets to protect their children from malaria. Last-mile delivery is a story of medicines, trucks, roads, health facilities, and clients. But, most of all, it is a story of people: the human resources who make it all work. These people must be trained and supported to work to their full capacity. Thus, GHSC-PSM aims to reinforce institutional supply chain systems to enable them to adequately recruit, train, support, and retain the needed human resources. To create sustainable programs, GHSC-PSM aims to identify local institutions to take ownership of the programs for the long term.

### **Logistics Management Advisors to Strengthen the Human Resource Capacity in Liberia**

In **Liberia**, as in most supply chains, the system's ability to maintain availability of commodities at the last mile depends on the quality of the data coming in from the SDPs. SDPs provide paper-based reports to the county level monthly, including stock numbers, consumption numbers, and stockouts. At the county level, these reports are entered into Liberia's electronic logistics management information system (eLMIS) system and reviewed by Supply Chain Technical Working Groups, which include MoH staff, donors, and county pharmacists. These groups meet monthly and use the aggregated data from SDPs to decide health commodity requirements and redistribution within and across the counties, to minimize the risk of stockout and expiries. The data are used to calculate commodity orders from CMSs. However, high staff turnover and limited training in logistics management created human resource gaps impacting commodity availability. Other challenges

identified at the county level were suboptimal accountability for dispatched commodities caused by frequent stockouts and expiries, inaccuracy and late submission of reports, weak governance and oversight, and infrequent supportive supervision of supply chain activities.

To address the human resource challenges and build the capacity of supply chain professionals throughout the Liberian health care system, from SDPs to the central level, GHSC-PSM established a cadre of logistics management advisors (LMAs) that started in early March 2019 in the Western, Central, and Southeastern regions of Liberia and that will end in November 2023. **Three initial LMAs, later increased to eight, are embedded at the county health supply chain management level. They support the county, district (sub-county level), and SDP-based professionals who manage the health care supply chain in 15 counties. The advisors strengthen the human resource capacity through hands-on mentorship, training, supportive supervision, and technical assistance.**



GHSC–PSM also directly supports the delivery of long-lasting insecticide-treated nets to county warehouses from the central level and onward to the SDPs in collaboration with the County Health Teams (CHTs). LMAs participate in this work, developing and implementing distribution plans for last-mile delivery of quarterly supplies from the county warehouse along with county supply chain staff, and assist the CHTs in validating and entering data into the eLMIS. They also work with the MoH/ Department of Pharmaceutical Services to evaluate and approve requisitions to resupply commodities to hospitals and county warehouses, and to train county-level staff to transfer the training to the district and health facility levels. Mr. Ibrahim Dukuly, GHSC–PSM’s field program coordinator, reports, “The LMAs are health professionals with logistics training. They are extroverts, diplomatic, and very versatile. They love supporting pharmacists and logistics managers at the county and district levels. They sit with teams in the field and check data quality, providing advice and support. They are communicating all the time.” With a focus on sustainability and local ownership, LMAs work to continuously build the capacity of around 1,000 supply chain workers who support the last mile in Liberia. Dukuly concludes: “The LMAs are very sensitive to the local sites, and their training is customized. They add a lot of value to the county and are generally appreciated.”

To ensure the long-term sustainability of the program at the county level, LMAs work together with the CHTs to mitigate supply chain issues in the counties and ensure the quality of the data entered in the system to inform decision-making. A CHT representative designated by the county pharmacist accompanies each LMA during field visits to acquire knowledge and skills on stock management capacity building for depot and health facility staff (how to conduct

The LMAs are health professionals with logistics training. They are extroverts, diplomatic, and very versatile. They love supporting pharmacists and logistics managers at the county and district levels.

stock management capacity assessment, analyze inventory reports, assess the correct use of the LMIS tools, assess data quality, etc.). The CHT representative also documents routine activities and mitigation actions conducted by the LMA as a guideline to be followed by the CHT when the project ends. The goal is for all the staff working with the LMA to be capable of adequately addressing key supply chain issues once the LMA program ends. An additional challenge is whether the government can secure their commitment to perform their assigned tasks by improving the salary payment mechanism. During the last year of the GHSC–PSM project, implementation of LMA’s routine activities will gradually be handed over



*In Liberia, logistics management advisors help build the capacity of pharmacists and others at the last mile to manage health commodities. PHOTO CREDIT: GHSC–PSM*

to the CHT for execution under LMA guidance, and the CHT representative who accompanies the LMA will take over implementation of the activities.

The LMAs also play a facilitation role within the county-level working groups, identifying action points and following up on questions. They conduct supportive supervision with counties, districts, and SDPs on an ongoing basis. The LMAs also stay in touch with the various players in between visits, using messaging apps, chat rooms, and other communication channels—strategies that “short-circuit the formality of making requests,” according to Dukuly, and allow for quick communication to prevent stockouts. While working to increase collaboration and communication, the LMAs also support managing and reporting stock, collecting and checking proofs of delivery, and verifying the data. Data quality is another challenge in the health supply chain system in Liberia due to constant staff attrition, inadequate monitoring and training of supply chain staff, unavailability of supply chain tools, lack of adequate computer skills, and other factors. With the support of LMAs, Liberian SDPs have now achieved an eLMIS reporting rate for malaria products of over 90 percent, although the quality of the data still requires improvement in some cases.

A main impact of the LMA program so far has been improved timeliness of reports while addressing accuracy concerns. Also, the joint supportive supervision of LMAs and CHTs has contributed to improving stock management in some health facilities, and a systematic approach to collect relevant data in the site assessment tool will be used to better describe the impact. Notably, the LMA program has contributed to institutionalizing the county-level

Supply Chain Technical Working Group meetings, and some counties are even initiating them at the district level. Finally, the LMA program has contributed to improving key supply chain parameters, including improved product redistribution from overstocked facilities to others at risk of stockout; enhanced inventory management at county warehouses and hospitals, with most of their inventories submitted monthly; and increased visibility of stock status for decision-making, thanks to periodic tracking of last-mile commodity delivery.

**One challenge faced by LMAs is related to the high levels of staff turnover in the Liberian health care system. In this case, LMAs play a critical but unanticipated on-the-job training role as they supervise and mentor staff—who generally have little or no logistics training before starting the job.** Also, a major challenge for GHSC-PSM is that only eight LMAs are positioned across the country, so the project needs to optimize resources to ensure that LMA presence is felt in all counties, GHSC-PSM is working with the MoH to develop onboarding requirements for new staff, with the goal that district counterparts will train logistics staff before deployment. These and other approaches are designed to strengthen human resource capacity over the long term. Another challenge faced by the Liberian health care system is the general scarcity of resources, including inadequate access to computers and Internet connectivity. The LMA program functions in this highly constrained environment, and thus fully overcoming the challenges that lead to poor-quality data and stockouts remains complex.

GHSC-PSM through the LMA project has provided recommendations to mitigate some of these challenges. First, health facilities need to be able to generate revenue to pay volunteer workers, for example, by reinstating fee-for-service.



*Improving the capacity of health facility staff can be complicated, hard to measure, and difficult to sustain. PHOTO CREDIT: GHSC-PSM*

**The MoH has elected to implement a DRF program that will require patients to pay some minimum fee-for-service. Currently, the framework, policies, and implementation strategy are still being developed, and a pilot will be implemented before the rollout begins.**

MoH leadership should be encouraged through the Supply Chain Technical Working Groups to ensure staff conduct regular monthly inventories to guide decisions and should mobilize partners' support to address information technology equipment gaps that impact reporting.

Some important lessons learned from this program include the utility of Supply Chain Technical Working Groups meetings at the subnational level, which bring together in-county partners to document issues affecting the supply chain system and exert efforts to mitigate them, and the need for mentoring/supportive staff with strong supply chain skills to enhance access to technical support both in-county and at the national level.

### **Rwanda's Quality Management Improvement Approach**

Rwanda's supply chain is decentralized, with regional warehouse pharmacies and

SDPs ensuring reliable health commodity supply. The supply chain has faced several challenges related to human resources, such as high staff turnover, limited time dedicated to supply chain activities, and a lack of supply chain professionals at the SDP level.

In this context, GHSC-PSM is offering technical assistance in Rwanda to help ensure uninterrupted availability of high-quality health commodities, with a focus on products for the prevention and treatment of HIV/AIDS and malaria, family planning, and maternal, neonatal, child, and community health. With funding from USAID, the MoH and GHSC-PSM are implementing a workforce development intervention called the Quality Management Improvement Approach (QMIA) to strengthen the last-mile capacity-building system, improving and sustaining Rwanda's service delivery and medicines availability. The QMIA, based on the Lean and Six Sigma methodologies, monitors the performance of supply chain professionals while continuously building their capacity to run a smooth supply chain operation.

## The Framework of the Quality Management Improvement Approach (QMIA) in Rwanda is Based on Five Guiding Principles

The QMIA includes two components: biannual supervisory visits, where key performance indicators are measured, and discussion sessions dedicated to experience sharing and skill building. The central level conducts both components, supporting regional warehouses—Rwanda Medical Supply branches—which in turn assist SDPs through supervisory visits and discussion sessions. Through the visits and discussions, the QMIA process includes continuous capacity building through mentorship, supportive supervision, and performance improvement and measurement. The intervention also provides on-the-job mentorship to health facility staff in planning and implementing improvements in supply chain components, such as warehousing and inventory control, re-supply, storage, waste management, data management, and record keeping using such channels as the eLMIS, pest control, and transportation. The MoH continues

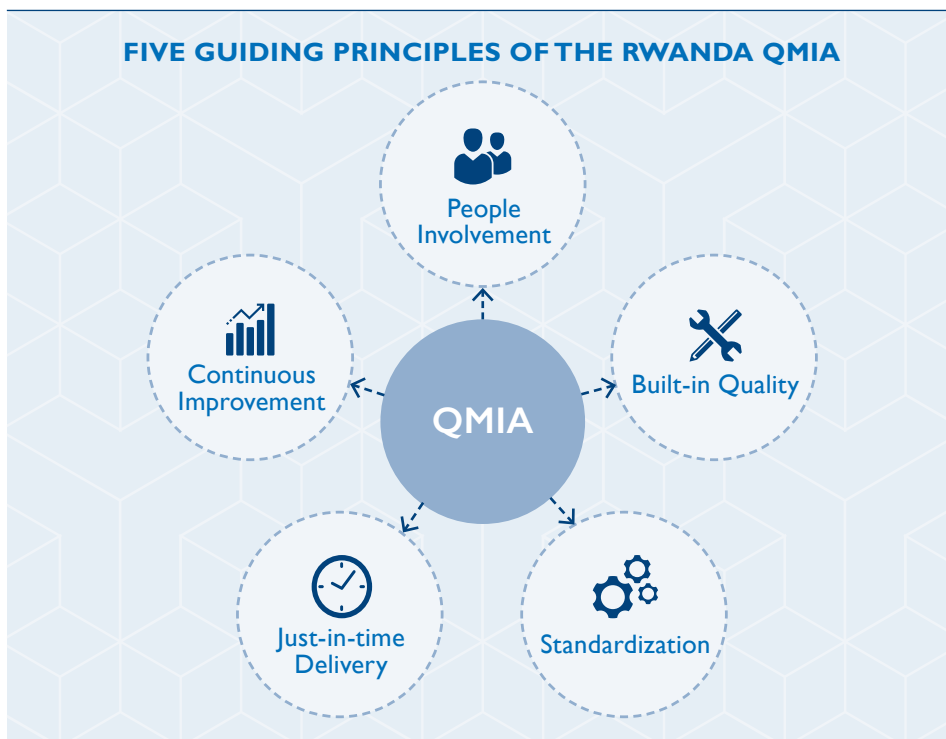
to provide technical and administrative assistance in collaboration with GHSC–PSM to build the necessary capacity and to support Rwanda Medical Supply branches in effectively supervising lower-level health facilities but also mentoring them to measure and improve their performance.

The team for this activity is composed of 40 trainers, who conduct training to Rwanda Medical Supply branches, and 30 facilitators, who conduct training to SDPs and collect data during site visits. Facilitators have created a WhatsApp group including all district personnel and another between each central team with the district representative to improve communication between different levels of the supply chain. From 2017 to 2021, more than 1,200 health supply chain staff were trained using the QMIA. The intervention contributed to major improvements in several key supply chain outcomes (2017 versus 2019), most importantly, an increase from 90.2 to 99 percent availability of commodities supported by GHSC–PSM measured at the health facility level (data from the QMIA tool). Other signs of improvement

included increased use of the eLMIS (55 to 96 percent), higher accuracy of data (25 to 85 percent), increased recording of HIV commodity consumption (35 to 95 percent), and reduced stockouts (10 to 1 percent). In 2020, however, QMIA was not implemented due to disruptions caused by the COVID-19 pandemic, which contributed to decreased eLMIS use (88 percent in 2021) and inventory accuracy (70 percent in 2021). The QMIA has proved to be a successful training and capacity-building platform for supply chain management in Rwanda, enhancing system use and availability of accurate data to guide decision-making. Notably, the approach fosters a positive behavioral change to build local solutions and improves communication.

The main lesson learned from applying the QMIA is that continuous capacity building is critical to building and sustaining a well-performing supply chain. Also, the recommendations from training and site visits have provided a better understanding of the reasons behind poor performance. **When the in-person aspects of the QMIA process were disrupted by the COVID-19 pandemic, GHSC–PSM and the MoH jointly developed an e-learning platform and electronic learning materials. The materials continue to be used to train supply chain staff at all levels and strengthen workforce capacity at SDPs and RMSs and CMSs.** In this way, the staff learns about supply chain best practices onsite, saving time and resources from supervision and attendance to workshops. However, QMIA sessions will also be performed in the future to continue capacity building and improve data quality along the supply chain.

The main limitations of the approach have been observed at the SDP level, where most supply chain staff do not have formal training in supply chain management. Also, supply chain staff often face a heavy





workload due to staffing shortages. Thus, a second lesson learned is the critical need for staff with supply chain backgrounds and experience at SDPs. Also, supply chain professionals require a development plan that promotes motivation and professional growth and offers adequate and high-quality training.

The main strengths of the QMIA approach include establishing a process of continuous improvement and knowledge transfer, where the central level trains Rwanda Medical Supply branches, which then train SDPs. Another important strength is the government ownership of the QMIA, including the e-learning platform and electronic learning materials, reinforced through collaboration with development partners.

### Global Initiatives for Sustainable Supply Chain Improvement Through Workplace and People Enablement

At a global level, GHSC–PSM collaborates with People that Deliver (PtD)<sup>9</sup> in supporting governments and organizations to improve supply chain performance by advocating for country-based interventions that strengthen human resources in health supply chains. PtD's goal is to achieve professionalization of the supply chain workforce within the health sector. Since many supply chain professionals work in facilities at the last mile, increasing their skills also helps ensure a reliable supply of commodities at the last mile. GHSC–PSM has worked with PtD to develop and implement the Theory of Change for supply change management, which provides strategies to manage the quantity, type, and capacity of human resources required to operate health supply chains at every level, including the last mile. GHSC–PSM has also worked with PtD in the Whole of Labor Market Analysis (WLMA), in which supply chain employees are considered the supply and employers the demand in a specific country context. Following

the imbalance between the demand and supply of the supply chain workforce as a major output of the WLMA, GHSC–PSM and PtD launched the PtD Supply Chain Management Professionalization Framework in June 2021. This groundbreaking framework includes tools, materials, and presentations that establish global standards aligning career path, education, and professional growth in health supply chain management.

### Conclusions

If human resource capacity is inadequate, investments in health commodities and the systems to distribute them can and often do fail to operate at full capacity. In the settings mentioned in this chapter, high staff turnover, uneven staff capacity and training, and limited resources—such as computers, adequate Internet connection, or funding—are still some of the main barriers to a well-performing workforce in supply chain operations.

Although human resource capacity is at the center of much of GHSC–PSM's work to ensure the availability of public health commodities at the last mile, improving such capacity can be complicated, hard to measure, and difficult to sustain. For instance, when GHSC–PSM issued a call for ideas from countries, most decided to focus more on other topics than on human resources. **One potential reason for the limited work performed on human resource capacity at the last mile is the difficulty in reaching sites directly, which means that training and capacity building are often conducted at higher levels.** This highlights the need for further work to implement programs to strengthen human resources at the last mile. In this report on multiple interventions to improve delivery of health care commodities at the last mile, only the two described in this chapter explicitly aim to improve the capacity of supply chain professionals. Yet virtually every story throughout this document includes

interventions designed directly or indirectly to improve human resource capacity.

Despite their limited number, the two examples in this chapter demonstrate that capacity building and the integration of monitoring and continuous improvement processes are essential to strengthening the capacity of the supply chain workforce. Offering adequate opportunities for professional growth and recognition and fostering staff motivation contribute to improved performance.

Also, working groups that include staff at different levels of the supply chain have been shown to contribute to improving work performance and communication in general. In this sense, digital technologies are simple tools that can be leveraged to enhance communication among supply chain personnel. Finally, the programs for strengthening human resource capacity in supply chain operations mentioned in this chapter are either government-owned or are planned to transition to local ownership with the support of GHSC–PSM, following the project's objectives.



*More emphasis should be placed on human resource capacity at the last mile. PHOTO CREDIT: Chemonics | Andi Gultom*

<sup>9</sup> [Home | People That Deliver](#)



# 09.

Key Messages



PHOTO CREDIT: GHSC-PSM

## Key Messages and Overall Lessons

The last mile of the health commodity supply chain remains an area in need of further work, particularly for technical assistance provided by partners. This collection of stories, learnings, and innovations has been gathered to provide inspiration and guidance for improving last-mile access to health commodities.

To ensure commodity supply at the last mile, it is important to guarantee that all levels of the supply chain are working adequately and that higher-level supply and demand planning functions are performing well. However, **this report focuses explicitly on interventions and activities that directly support actors and systems at the last mile of the supply chain**, providing a variety of examples of how GHSC-PSM works with governments, local authorities, USAID, and a range of other private- and public-sector partners in different countries to improve **commodity availability and quality at the last mile**. While some of the proposed solutions may not succeed in the end, there is a great value in capturing and sharing the lessons they provide and in applying these lessons to future supply chain activities and interventions.

GHSC-PSM and partners assessed the needs, characteristics, and main obstacles encountered in each setting, aiming to provide appropriate, human-centered, and timely support while considering sustainability and the scalability of the solutions to other settings with similar issues. As a result, customized solutions have been developed and implemented, all with the final goal of improving commodity access for patients at the last mile, even in hard-to-reach areas. Transition plans to local ownership are already in place or under development for many of the programs.

Although much has been accomplished at the last mile, much work remains. Resources to support data visibility, direct delivery, and the presence of well-trained professionals, among others, are frequently inadequate to support the last mile, resulting in insufficient product

availability. USAID—through GHSC-PSM and other global health and supply chain implementing partners—governments, other donors, and multilateral organizations continue to work to overcome these challenges. To ensure commodity supply at the last mile, it is important to guarantee that all levels of the supply chain are adequately working and that higher-level supply and demand planning functions are performing well. While some of the proposed solutions may not succeed in the end, there is a great value in capturing and sharing the lessons they provide and in applying these lessons to future supply chain activities and interventions.

**A high degree of innovation and experimentation is crucial for developing sustainable solutions at the last mile.** Many of the approaches described in this report explicitly apply a human-centered perspective: for instance, analytics tools have been developed in Zambia, Ethiopia, and elsewhere, with participation of warehouse staff and others involved in delivering to the last mile, and focused on their expressed needs. Others are specialized approaches for commodities requiring particular

conditions for storage (for example, to ensure that the cold chain is maintained during the last-mile distribution of COVID-19 vaccines in Namibia or uterotonics in Mali and Liberia, which guarantees patients' access to quality commodities) or distribution adapted to a country's unique environment (in Mali, GHSC-PSM worked with the private sector and community health centers to develop a contraceptive distribution plan after the project was no longer able to directly partner with Mali's transition government for the storage and distribution of FP/RH commodities).



All support provided at the last mile should strive to reduce the burden on health care workers, instead of increasing it. PHOTO CREDIT: GHSC-PSM | Psays Photography

Despite the differences in context, setting, and implementation progress, several common **challenges and considerations** have been raised throughout the document. Some of these challenges impact different levels of the supply chain, such as the lack of adequate infrastructure (including Internet connection), human resource issues (such as limited staff capacity or uneven compliance with SOPs), limited system resiliency translating into difficulties in facing disruptive events (such as the COVID-19 pandemic), and difficulties in ensuring the sustainability of funding and local ownership when donor support ends. The chapter on promoting local ownership to ensure sustainability addresses the challenges of

funding and local commitment, explaining how the increase of regional ownership has improved last-mile delivery in Ghana and how DRFs have been implemented in several Nigerian states to ensure sustainable access and availability of commodities at the last mile.

However, some challenges specific to the last mile have also emerged. A significant barrier is the lack of personnel trained in supply chain management at the last mile.

**Usually, last-mile health facilities rely on a small number of clinicians (doctors, nurses, and community health workers) who are trained—and expect—to focus on their clinical work. Often, these staff not trained in supply chain operations and management and lack the time required to perform supply chain-related tasks, such as ordering and reporting.** All support provided at the last mile should strive to reduce the burden on health care workers, instead of increasing it. Examples of this include a call center for commodity reporting in South Sudan and an “Internet of Things”-powered device implemented in Angola that reports stock status changes with the push of a button. These systems are simple and quick to use, do not require extensive training, and can help mitigate the lack of infrastructure to report data in some settings.

Other barriers related to human resources include high staff turnover, uneven performance from some staff, and limited economic and technical resources. A whole chapter is dedicated to interventions aiming to strengthen human resources in supply chain operations, such as the LMA program in Liberia or the QMIA in Rwanda. These cases demonstrate that sustained capacity building and the integration of monitoring and continuous improvement processes are essential to strengthen the capacity of the supply chain workforce. Those who work at the last mile, such as health care and community health

workers, should be brought into the discussion to understand their needs

**Lack of infrastructure, such as deficient or absent Internet connection in many hard-to-reach settings, remains a persistent challenge for supply chain personnel and health care workers at the last mile.**

clearly. Working groups that include staff at different levels of the supply chain and the use of digital technologies have been shown to contribute to improving work performance and communications.

In Balochistan province in Pakistan, mobile phone networks are being applied as a temporary solution to overcome this challenge, and the call center model applied in South Sudan can be easily scalable to other settings with similar issues.

A pivotal resource at the last mile is community health workers, who are frequently volunteers and outside of the formal health systems. Issues impacting the vital functions of community health workers include low reporting rates, lack of data integration, and data quality problems (the last primarily due to insufficient training). Additional efforts are needed to ensure that data from community health workers are integrated with the supply chain data at the health facility level, as illustrated by the approach to integrate malaria commodity data from VHWs in Zimbabwe. Further efforts should guarantee that community health workers receive adequate training, supportive supervision, and appropriate compensation, making them feel an integral part of health care at the last mile.

Several **enabling factors and lessons learned** are common to the programs discussed here. This report demonstrates that the involvement of all stakeholders at different levels and at all steps

of implementation, including the participation of national, subnational, and local authorities, local partners, the private sector, and communities, is essential to develop the best solutions adapted to each context. This is particularly relevant at the last mile in remote settings, where local authorities and communities are key players in local governance, and thus have significant influence in decision-making related to health care. Data visibility should be enhanced by advanced data analytics to convey relevant information to specific audiences of stakeholders, supporting and empowering local decision-making by logistic managers and other supply chain staff. The chapter on advanced data analytics demonstrates that successful implementation of new analytic tools requires a proper human-centered design and careful change management as essential elements of the design process. Notable examples include an open-source app that sequences deliveries into routes, suggesting “pick waves” to facilitate order assembly and loading in Zambia’s central warehouse, and a map in Uganda that illustrates the best placement of hubs for HIV testing supplies.

Also, effective communication, either among staff members and/or all involved partners, particularly between SDPs, CMSs, and distributing partners, is crucial to streamline supply chain operations and ensure timely arrival of commodities at the last mile. In particular, this report contains several examples of the utility of widely accessible digital tools with this scope: for example, the WhatsApp groups integrated in the LMD strategy in Ghana to notify when commodities arrive at an SDP or used to share experiences among supply chain staff in Rwanda. Another lesson learned is that, **whenever possible, leveraging the existing technological resources for stock management, ordering, and reporting at health facilities—for example, by integrating new dashboards into an existing**

A priority is to leverage available technology to decrease the burden on health care workers by facilitating ordering and reporting to the next level.

**platform such as DHIS-2 rather than developing new software, an approach implemented in Botswana—can help conserve resources and reduce the need to retrain supply chain or health care workers.** Finally, having high-performing and well-trained staff is crucial to ensuring adequate supply chain operations at the last mile. In addition to hiring qualified staff, capacity building through customized training and adequate support, developing career growth plans, promoting behavioral change, and fostering motivation can reinforce supply chain personnels’ capacity, as discussed in the chapter about human resources.

Although one chapter specifically discusses how to increase the participation of the private sector to promote localization and deliver to the last mile, private-sector involvement appears transversely across several chapters. Examples include working with and strengthening local private logistics companies for outsourcing transportation of commodities in Haiti, which requires a high level of tracing and visibility. In Cambodia, a hybrid public-private model for distributing antimalarial nets has proved successful, thanks to the active involvement of different stakeholders, while in Mozambique, private pharmacies are contributing to a more convenient delivery of ARVs at the last mile. In Ghana, GHSC–PSM supported establishment of the LMD strategy, a framework guiding implementation, and delivery to facilities that also involves private partners. Involving 3PLs in last-mile distribution in Ghana has had several advantages, such as decreasing stockout rates, increasing “stock according to plan,” and providing

insurance for commodities—and shows that local authorities can also leverage private-sector practices and apply them to the public sector.

**The future is expected to bring the power of new technologies, such as big data, artificial intelligence, blockchain, and unmanned aerial vehicles, to the last mile, but changes in infrastructure are needed to accelerate the adoption of these technologies in most of the settings where USAID and GHSC–PSM provide support.** A priority is to leverage available technology to decrease the burden on health care workers by facilitating ordering and reporting to the next level, as exemplified by the new stock forms used by VHWs in Zimbabwe. Last-mile distribution can be optimized, for example, by using open map data and dynamic routing—a replicable solution that is now expanding from Zambia to Kenya and Mali. Since replicability and scalability are relevant factors to be considered in any last-mile solution, several chapters emphasize how these solutions are being adapted to be scalable in different settings.

This document demonstrates that improvements in supply chain operations and in the flow of commodities, data, work, and funds throughout supply chains—particularly at the last mile—can be achieved only through innovative approaches and active collaboration of all stakeholders. With all this in mind, USAID, through GHSC–PSM, continues to provide its support to ensure that all clients receive a continuous, reliable supply of the quality health products they need no matter where they are.