



Supply Chain Evolution

Introduction to a Framework for Supply Chain Strengthening of Developing Country Public Health Programs



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USAID | DELIVER PROJECT, Task Order 4

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Abstract

A “Supply Chain Evolution Model” demonstrates to countries how to implement and sustain an integrated supply chain. It illustrates how public health systems can move through a process management trajectory that leads to improved supply chain management capacity, from ad hoc to organized to integrated to extended stages. In the earlier stages, health system managers have little understanding of what their supply chain system looks like, how it is operating, and how to manage various supply chains as one cohesive system that interacts with its broader environment. As MOHs and donor partners coordinate and carry out efforts to define, measure, and manage public health supply chain processes, those supply chains can evolve. In the later stages, the flow of information and visibility into supply and demand improves at all levels of the supply chain. Roles and responsibilities of personnel are clarified and validated. In the integrated and extended stages, health system managers increasingly understand how their system operates, ways to use resources more efficiently, how to manage and align supply chain actors to achieve common goals, and, ultimately, ways to interact more effectively with the broader environment in which the supply chain is situated. This paper has been reviewed and is supported by USAID’s Office of Population and Reproductive Health of the Global Health Division and supports the broad objectives of the U.S. Global Health Initiative.

Cover photo: Clockwise from upper left—family planning commodities; healthcare provider in Ethiopia at refrigerator; child in Liberia receiving routine health services; delivery truck outside a clinic in Liberia. JSI.

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John Snow, Inc.
1616 Fort Myer Drive, 11th Floor
Arlington, VA 22209 USA
Phone: 703-528-7474
Fax: 703-528-7480
Email: askdeliver@jsi.com
Internet: deliver.jsi.com

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Acronyms

ARV	antiretroviral
CAMEG	<i>Centrale D'Achat des Medicaments Essentiels Generiques et des concommables Medicaux</i>
CMS	Central Medical Stores
CS	commodity security
DGFP	Directorate General of Family Planning
DPS	Directorate of Pharmacy Services
EDI	electronic data interchanges
EDL	Essential Drug List
LCF	Logistics Coordination Forum
LIAT	Logistics Indicators Assessment Tool
LMIS	logistics management information system
LMU	logistics management unit
LSAT	Logistics System Assessment Tool
LSU	logistics sub-unit or logistics and supply unit
MCAZ	Medicines Control Authority of Zimbabwe
MIS	management information system
MOH	Ministry of Health
MOCHW	Ministry of Health and Child Welfare
MOHFW	Ministry of Health and Family Welfare
NatPharm	National Pharmaceutical Corporation
RH	reproductive health
SDP	service delivery point
SOP	standard operating procedure
SCM	supply chain management
SCMS	Supply Chain Management System
TOT	training-of-trainers
USAID	U.S. Agency for International Development
UNFPA	United Nations Population Fund

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Executive Summary

The United States Government's Global Health Initiative (GHI) seeks to achieve significant health improvements and foster sustainable, effective, efficient, and country-led public health programs that deliver essential health care. Through GHI, the government is committed to improving and saving lives by strengthening health systems (U.S. Government's Global Health Initiative 2011).

Supply chain management is an important component of strong health systems and critical for the effective implementation of health programs. This paper helps inform strategic decisionmaking for supply chain strengthening activities that support the broad objectives of the GHI. It also informs development of a set of complementary quantitative and work planning tools as part of a broad supply chain strengthening framework. The paper has been reviewed and is supported by USAID's Office of Population and Reproductive Health of the Global Health Division.

This paper articulates a “road map” for supply chain strengthening of developing country public health systems, taking them from a state of low logistics capacity and minimal organizational structure for logistics management to a fully integrated supply chain, characterized by high performance and effective coordination among internal partners and external stakeholders. This map, while tailored for public health systems, parallels Lockamy and McCormack's (2004) depiction of private sector supply chain evolution from systems in which individual personnel complete logistics tasks without standardized guidelines to systems in which multiple supply chain partners make coordinated decisions and support optimized performance of the overall supply system. This model illustrates how Ministries of Health (MOHs) can use supply chain strengthening investments to reach a state in which multiple supply chains support and advance health program objectives by delivering value at a level greater than the sum of their parts.

The model presents four phases that describe evolutionary progression of supply chain management capacity in the developing country public health context:

- **Ad Hoc**—At this stage, supply chain practices and processes are unstructured and ill-defined with few, if any, metrics in place for performance measurement. Beyond the individual actor or logistics function is little to no visibility of demand and supply, and these actors define and perform their responsibilities based on their perception of what is needed and appropriate. Dependency of performance on individuals' abilities means that personnel turnover is disruptive. Stockouts, shortages, and expiries are routine, and targets, if defined, are often missed. Although conclusive public health sector data are unavailable, the private sector experience indicates that total landed supply chain costs are high and customer satisfaction is low. Little collaboration exists among the various actors either within the MOH administration or between the MOH and external counterparts.
- **Organized**—At this stage, processes have been defined for individual logistics functions (forecasting, procurement, storage, inventory control, and distribution) and relevant personnel. Based on established standard operating procedures (SOPs), personnel use supply and demand information for operational decisions such as how much of each product a facility should receive in a given ordering cycle. Basic performance metrics may exist, but their use and quality depends highly on the strength of the logistics management information system (LMIS).

- **Integrated**—At this stage, the MOH has raised the profile of supply chain management as a strategic approach to improving customer service and achieving its health improvement objectives. Individuals and separate institutions in the MOH not only understand their respective roles but also see them as part of the larger supply chain process. The MOH deliberately and strategically manages health commodities and supplies across partners, logistics functions, and health system levels, meaning that it sets goals and monitors overall system performance and its individual functions. Typically, a logistics management unit (LMU) serves as the focal point for strategic supply chain decisionmaking and coordinated management of multiple programs’ logistics functions on its own or in cooperation with contracted organizations.
- **Extended**—At this stage, public health supply chain management has expanded to cover institutionalized coordination between public and private sector distribution systems, and suppliers that serve these markets. This stage represents a challenge even for private sector supply chains in developed countries because it requires significant amounts of operating trust among separate organizations. At this stage, alignment of incentives and demand visibility across supply chain entities – including multiple distributors, suppliers, and manufacturers – leads to optimal performance throughout the network. Efforts to improve data visibility through systems such as electronic data interchanges (EDI) give supplier partners a better picture of downstream demand and support the public and private sectors of the broader health system in achieving supply chain objectives.

As a roadmap for supply chain strengthening, this model can help a program qualitatively determine where it falls in relation to goals of integrated and extended level supply chain management, and what types of investments must occur to support progress.

In this model, two main phases of supply chain strengthening accomplish this evolution. To move out of the ad hoc state, MOH departments and donor partners must focus on establishing roles and procedures for partners, programs, logistics functions, and health system levels. This “definition” phase also includes design and effective implementation of an LMIS to capture essential logistics information. The next phase, supply chain integration, focuses on changes in logistics management structure in the health program and includes empowerment of dedicated logistics management capacity, typically an LMU, to increase supply chain process management and control.

In sum, in the earlier stages, health system managers have little understanding of what their supply chain system looks like, how it is operating, and how to manage various supply chains as one cohesive system that interacts with its broader environment. As MOHs and donor partners coordinate and carry out efforts to define, measure, and manage public health supply chain processes, those supply chains can evolve. In the later stages, flow of information and visibility into supply and demand improves at all levels of the supply chain. Roles and responsibilities of personnel are clarified and validated. In the integrated and extended stages, health system managers increasingly understand how their system operates, ways to use resources more efficiently, how to manage and align supply chain actors to achieve common goals, and, ultimately, ways to interact more effectively with the broader environment in which the supply chain is situated.

Introduction

Different in-country public health supply chains perform at different levels. Due to numerous factors, such as economic development, history and scale of donor support, human resource availability and commitment of politicians and civil servants, some public health supply systems exhibit low performance, a lack of information and high costs of delivery while other systems enjoy sustained, predictable, and high levels of service. Even in a single country, one health program such as family planning or immunization might demonstrate high supply chain capacity while another such as essential medicines might not.

Donor support for in-country supply chain strengthening activities, combined with local MOH commitment, seeks to move programs out of this category of poor supply chain performance to help them provide complete, reliable, and effective health commodities.

The USAID | DELIVER PROJECT, its predecessors, and other partner projects have worked with MOHs in many countries to implement these supply chain strengthening activities over time. As a result, many countries have made incremental improvements to various supply chains and, in some cases, achieved significant long-term, system-level improvements. In most cases, as investments are increasingly coordinated, built on one another, and extended across all the actors responsible for managing any part of the supply chain process, performance improves in terms of product availability at the service delivery level.

Several key factors appear to contribute to a strategic supply chain strengthening approach, including—

- purposeful, consensus-led design of reporting systems and inventory control rules
- definition and clarity of logistics roles at each operating level
- collection and use of high-quality consumption data
- central-level stewardship, system-wide commitment, and motivation to perform supply chain roles.

Currently, no model or framework captures these improvements and places them on a long-term road map toward achieving fully capable, cohesive public health supply chain systems.

To help develop this roadmap, this paper adapts commercial sector concepts about supply chain evolution and combines them with the USAID | DELIVER PROJECT's analysis of country experiences. This evolution model can help to inform donor partners and MOHs about long-term progression of public health supply chains. It can help to answer questions such as—

- What long-term trajectory are developing country public health supply chains taking?
- What are distinct stages or phases in that trajectory?
- What specific investments are required at each stage to foster progress toward a higher level of performance?

Guide to the Paper

The following points help to describe the paper's purpose and content in more detail:

- *The audience* includes donors, technical assistance providers, and MOH staff involved in defining strategies and implementation plans for public health supply chain strengthening activities.
- *The approach* adapts a private sector supply chain evolution model using country case studies and supply chain strengthening investments known to improve supply chain performance in multiple health systems.
- *The purpose* is to help inform stakeholders about various stages public health supply chains pass through as they evolve and clarify the strategic approach and types of investments needed to move from one stage to the next.
- The content includes—
 - A description of Lockamy and McCormack's supply chain evolution model that has been proven and tested in the commercial sector.
 - An adapted supply chain evolution model for public health supply chains in developing countries. This model is based on qualitative analysis of extensive experience strengthening supply chains in a broad range of countries and regions over many years, and on insights into factors that contributed to improved supply chain performance over time in the commercial sector.
 - A summary of collected case studies that outline the trajectory of supply chain strengthening efforts in the public health sector in six developing countries.
 - A discussion of how individual supply chain strengthening activities might be managed in coordination to reach a state in which the supply chain delivers value at a level greater than the sum of its individual parts.
- *This model* can be used whenever country stakeholders are planning supply chain strengthening activities in the public health sector. The evolution road map can help to frame decisionmakers' long-term vision for supply chain interventions and plans for assessing, defining, monitoring, and ensuring that their investments pay off over time.
- *The paper* does not include—
 - Quantitative analysis of the supply chain evolution model. Sufficient comparable data among countries are not available to prove that certain investments or approaches result conclusively in improved supply chain performance across certain standard stages in developing countries.
 - Quantitative tools to support operationalization of this model. While a potential, more comprehensive framework is outlined in this paper, the model itself does not include mechanisms for benchmarking, measuring return on investment, or assessing country factors that support or impede long-term supply chain success.
- This paper makes frequent use of critical terms such as “logistics” and “supply chain management” with distinction between them. In general, “supply chain” refers to a network of organizations engaged in a transactional or long-term relationship that as a total output ensures

product availability for the end consumer. “Logistics” refers to the cycle of operational activities and functions in and among organizations, such as procurement, storage and distribution. In *Supply Chain Logistics Management* (2007), Donald J. Bowersox makes the distinction that “logistics is the work required to move and position inventory throughout a supply chain. As such, logistics is a subset of and occurs in the broader framework of a supply chain.”

Developing a Supply Chain Evolution Model in the Commercial Sector

Although no current model captures developing country public health supply chain evolution, a proven private sector model articulates a progressive maturity framework for commercial supply chains.

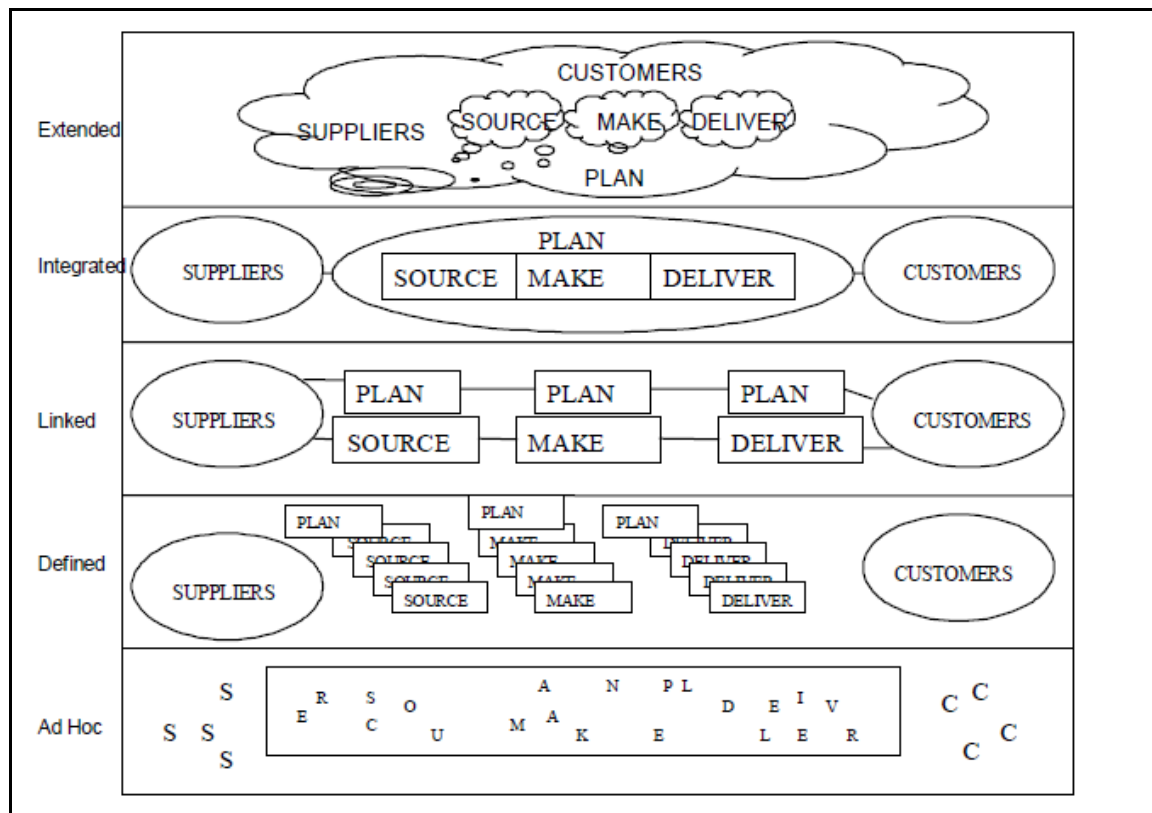
Building on decades of academic research and commercial practice, Archie Lockamy III and Kevin McCormack (2004) applied the theoretical concept of “process maturity” to supply chain management. As a strategy for private sector performance improvement, the idea of “process maturity” suggests that a company’s value-adding processes – such as product design, software development or supply chain management – can be explicitly defined, managed, measured, and controlled by the company. Under this concept, clear definition and direct management of the process has been proven to have a positive impact on performance through limited surveys that compared self-perceived performance in basic logistics functions to supply chain maturity. Further statistical, survey-based research by McCormack in Brazil (2008) identified a strong, positive correlation between supply chain process maturity and supply chain performance.

In many cases, the path to process maturity involves gathering separate business activities that constitute a whole process and managing them together. For a company that designs cars, the design process involves conceptual design, marketing, and operational engineering for manufacturing. The company could choose to manage these activities separately, each with its own performance targets and incentives. The effect would be chaotic. Designers might be incentivized to make designs as innovative as possible, while marketers seek designs that can achieve high sales, and operational engineers favor models cheap and simple to build. These competing interests and approaches would not support the goal of designing cars that achieve each objective together.

“Process maturity” suggests that these activities should be managed together within the single process of designing cars. McCormack (2000) found that defining, managing, measuring, and controlling these activities as part of a larger process reduced conflict, strengthened coordination, and improved performance. The more a firm embraces this “process view” in its management and organizational approach, the greater the benefits. Following this trajectory, a firm undergoes several maturity levels or evolutionary stages that begin with the process components being undefined and progress toward a state in which all firm activities are part of a process organization and view.

This concept can also be applied to supply chain management and its functional components—plan, source, make, deliver—which for the public health context are better known as the logistics cycle. Adapting the process maturity concept to supply chain management, Lockamy and McCormack (2004) developed a model with the following stages (see figure 1).

Figure 1. The Supply Chain Management Maturity Model



Ad Hoc. Supply chain practices are unstructured and ill-defined with no process measures. Jobs and organizational structures are not based on horizontal supply chain processes. Process performance is unpredictable. Targets, if defined, are often missed. True supply chain management (SCM) costs are high. Customer satisfaction and functional cooperation are also low. Successful completion of functional activities is typically dependent on abilities of individuals and not repeatable in their absence.

Defined. Basic SCM processes are defined and documented. Jobs and organizational structures basically remain traditional. Process performance is more predictable. Targets are defined but missed more often than not. Overcoming functional silos takes considerable effort due to boundary concerns and competing goals. SCM costs remain high. Customer satisfaction has improved but remains low.

Linked. This represents the breakthrough level. Managers employ SCM with strategic intent and results. Broad SCM jobs and structures are established outside and atop traditional functions. Cooperation among intra-company functions, vendors and customers takes the form of teams that share common SCM measures and goals reaching horizontally across the supply chain. Process performance becomes more predictable, and targets are often achieved. Continuous improvement efforts take shape focused on root-cause elimination and performance improvements. SCM costs begin decreasing, and esprit de corps replaces frustration. Customers are included in process improvement efforts, and their satisfaction begins to show marked improvement.

Integrated. The company, its vendors and suppliers formalize cooperation as part of the SCM process. Organizational structures and jobs are based on SCM procedures, and traditional functions, as they relate to the supply chain, begin to disappear. SCM measures and management systems are deeply imbedded in the organization. Advanced SCM practices, such as collaborative forecasting and planning with customers and suppliers, take shape.

Process performance becomes very predictable, and targets are reliably achieved. Teams set process improvement goals and achieve them confidently. SCM costs are dramatically reduced, and customer satisfaction and esprit de corps become a competitive advantage.

Extended. Competition is based on multifirm supply chains. Collaboration between legal entities is so routine that advanced SCM practices allowing transfer of responsibility without legal ownership are in place. Multifirm SCM teams with common processes, goals, and broad authority take shape. Trust, mutual dependency, and esprit de corps bond the extended supply chain. A horizontal, customer-focused, collaborative culture is firmly in place. Process performance and reliability of the extended system are measured, and joint investments in returns and improving the system are shared.

While these stages represent plateaus of expected performance, an organization will typically be in transition and making improvements to ascend to the next level.

In summary, Lockamy and McCormack's maturity model and accompanying empirical study give us these trends:

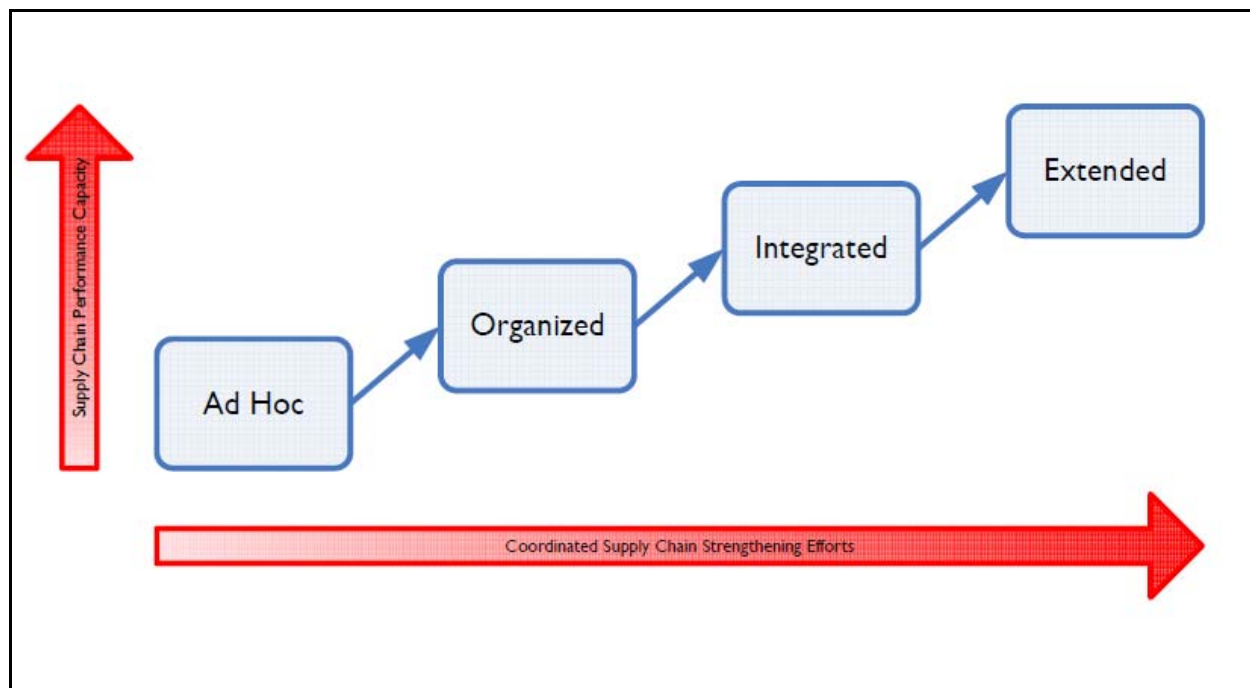
- Increased supply chain performance in terms of better and more predictable fill rates, inventory turns, and delivery costs can be achieved by increased definition and clarity of logistics roles and tasks, increased centralized coordination of logistics activities in the firm, and increased coordination between firms and their suppliers and customers.
- These steps build on one another and produce progressively greater benefits in moving from one stage to a higher one.

A Supply Chain Evolution Model for Developing Country Public Health Systems

The developing country public health context presents several obvious departures from Lockamy and McCormack's private sector model. However, the experience of implementing supply chain strengthening activities across a broad range of countries in multiple regions helps to illustrate how public health systems can also move through a similar process management trajectory to improved supply chain management capacity (see figure 2).

For a detailed discussion and summary of experiences in one Nigerian state, Burkina Faso, Zimbabwe, Bangladesh, Nicaragua, and Guatemala, and how they inform adaptation of this supply chain evolution model for developing countries, see Appendix A. Results of this qualitative analysis are summarized in below.

Figure 2. Supply Chain Evolution Model for Developing Country Public Health Systems



As MOHs and donor partners coordinate and carry out efforts to define, measure, and manage the public health supply chain process, those supply chains can be expected to evolve through the depicted stages, and to improve in terms of their capacity to deliver commodities effectively and efficiently. However, numerous other non-supply chain factors not directly captured in this relationship may affect patient-facing availability and accessibility of health commodities, a

performance outcome of the health care supply chain. These include commitment of donors and the MOH to keep products in full supply and environmental factors such as quality of governance, corruption, and general economic development. These stages mark a progressive development in this relationship that builds on achievements of previous stages. Stages of this evolution include ad hoc, organized, integrated, and extended.

Ad Hoc

At this stage, supply chain practices and processes are unstructured and ill-defined with few, if any, metrics in place for performance measurement. Beyond the individual actor or logistics function is little to no visibility of demand and supply, and these actors define and perform responsibilities based on their perception of what is needed and appropriate. Dependency of performance on individuals' abilities means that personnel turnover is disruptive. Stockouts, shortages, and expiries are routine, and targets, if defined, are often missed. Although conclusive public health sector data are unavailable, the private sector experience indicates that total landed supply chain costs are high and customer satisfaction low. Collaboration among various actors in the MOH administration or between the MOH and external counterparts is minimal.

Day-to-day operational decisions and higher-level strategic decisions occur without use of logistics data because this information is unavailable and logistics and supply chain management are not seen as important capacities for the MOH. Many health systems personnel do not fully recognize the need or usefulness, nor do they have adequate tools to collect specific logistics information.

This is the status quo in most organizations before supply chain strengthening efforts in which functions, processes, and roles are not well defined. Many developing-country public health supply chains that have not focused on addressing logistics and supply chain performance face this situation.

In “X State”, Nigeria, essential medicines are managed without SOPs. Personnel complete necessary tasks to make products available at facilities, but these tasks are conducted with little transparency or efficiency. At the central level, visibility into demand is nonexistent, and operational decisions are based on guesses about consumption.

At this stage, the supply chain does technically exist—health commodities reach SDPs by passing through various partners – but performance is likely low. Most significantly, individuals are unaware of their role in a greater supply chain system, and no defined entity is responsible for monitoring supply chain performance or coordinating interactions between actors. No central or common vision describes the role of various individuals and institutions in supporting the public health supply chain.

In general, these ad hoc systems are characterized by—

- Inflexibility—lacking operational agility to respond quickly to changing supply and demand
- Inefficient processes—including non-value-adding procedures based on bureaucratic requirements
- Inefficient organization—supply chain management structure and responsibilities that follow existing bureaucratic institutions or donor interests
- Lack of data for supply chain decisionmaking—useful supply chain data may come only from expensive surveys or monitoring and supervision efforts
- Lack of supply chain management capacity.

Organized

At this stage, processes have been defined for individual logistics functions (forecasting, procurement, storage, inventory control, and distribution) and relevant personnel. Based on established SOPs, personnel use supply and demand information for operational decisions such as how much of each product a facility should receive in a given ordering cycle. Basic performance metrics may exist, but their use and quality depends highly on the strength of the LMIS, which is still being strengthened. Performance metrics may also monitor performance of distinct logistics functions instead of capturing successful contribution and alignment of those functions to overarching health system objectives.

Overall logistics performance has improved significantly over the ad hoc stage, but room for improvements in efficiency and performance remains. Trust and collaboration continues to build among actors in the supply chain although they may not be formally aligned on common goals such as lowering stockouts to a specific level. This is due mainly to the fact that, structurally, logistics activities are decentralized and dispersed throughout various departments, institutions, and health system levels. Compared with making products available at the service delivery point (SDP), lowering costs and improving efficiency may not be high priorities for program and logistics managers due to lack of data and interest. Supplies and supply chain and logistics management are recognized as important elements of a public health program but still considered separate support functions, not strategic functions of a broader public health system. At this stage, personnel have basic capacity in terms of tools, operational guidelines and training to conduct logistics activities.

Compared with USAID | DELIVER PROJECT's vision of a seamless or integrated supply chain (USAID | DELIVER PROJECT 2009 and 2011), a program at the organized stage has built a foundation for further development by establishing clarity of roles and responsibilities, and basic visibility of information. It has done so for entities over which it has direct control—supply chain actors that support downstream distribution. However, overall structure of the public health supply chain still follows the general health service and administrative government structures, with distinct parallel systems based on disease categories and distribution tiers aligned with geopolitical boundaries, leading to supply chain inefficiencies. Also, a lack of centralized management or oversight, together with a lack of aligned objectives between partners, leads to uncoordinated and occasionally conflicting activities.

Required SC Strengthening Efforts to Reach This Stage

In Burkina Faso, family planning commodities are provided, ordered, and distributed according to existing SOPs. While responsibility for information management and physical distribution fall to separate entities in the public system, roles and responsibilities for basic functions are clear. Over time, the program has seen significant improvements in product availability, but room for improvement remains.

Reaching this level requires design of a system to perform essential logistics functions of plan, buy, deliver, and control—forecasting, procurement, storage, distribution, inventory control, and general management. This is often done through an initial system assessment and a design workshop in which stakeholders are brought together to agree on a system design, parameters for system operation, and need to collect essential logistics data. This is followed by development of

SOPs and manuals, training-of-trainers (TOT), nationwide roll-out of the system, and follow-up monitoring and supervision. Often this is complemented with efforts to strengthen forecasting, quantification, and procurement capacity of central program and procurement units, and efforts to strengthen system warehousing and distribution. In addition, identification of logistics managers at

each level or in each function, development of supervision and monitoring tools, and creation of an LMIS strengthen forecasting and management functions.

The LMIS represents a core investment in the supply chain's evolution. At this stage, it supports operational decisionmaking by giving personnel insight into SDP level demand for commodities. For example, at the organized level, health facility staff can place orders based on patient consumption (for pull systems), and program staff can develop forecasts and quantifications based on this data. To manage and use LMIS data at a central level, an MOH may establish an LMU. However, at this stage, the LMU may be expected only to collect data from the LMIS for basic consumption reports.

Some systems have taken the important steps of developing and implementing standardized procedures but have not seen significant gains in supply chain performance. This may happen because of low adherence to established procedures. While processes may technically be defined, ensuring that they are followed is also critical. MOHs and partners can support this through thoughtful design of SOPs to allocate tasks appropriately, provision of resources for staff to complete tasks, and resources for training, monitoring, and supervision.

In moving toward the organized stage and beyond, MOHs may outsource some functions to third-party service providers depending on existing capacity of the public organization to manage contracted services and availability of qualified service providers. Use of a private third party can help to achieve the organized stage by leveraging processes already in the private sector rather than working to develop them in the public sector.

When processes and roles have been defined, the focus in the organized stage is on continuing to strengthen logistics functions, which typifies much of what the USAID | DELIVER PROJECT and its predecessors have worked toward. Strengthening the functions includes—

- adjustment of processes to make better use of available resources
- development and provision of tools for task completion such as computer hardware and software for electronic data collection and processing
- warehouse dejunking and provision of equipment, which may occur before or in conjunction with warehousing process standardization
- improvement and institutionalization of quantification
- building capacity of human resources to manage the flow of information and commodities effectively.

Integrated

At this stage, the MOH has raised the profile of supply chain management as a strategic approach to improving customer service and achieving health improvement objectives. Individuals and separate institutions in the MOH not only understand their respective roles but also see them as part of the larger supply chain process and team effort to make commodities and information flow efficiently through the health system. On its own or in collaboration with contracted organizations, the MOH deliberately and strategically manages the supply chain, setting goals and monitoring performance of the entire system and its individual functions. Typically, an LMU serves as the focal point for strategic supply chain decisionmaking and coordinated management of a program's logistics functions.

Achieving this stage involves creation and strengthening of connections that bind the supply chain across individual functions, various health programs that compose the MOH, and between the MOH and donor partners. This helps to develop a more seamless entity responsible for SDP

availability of health commodities. Metrics are in place and routinely monitored to assess progress against objectives. For true success, visibility of demand information must be available across the MOH, and the LMU must have a voice in overall ministerial policy so supply chain and commodity considerations are incorporated into programmatic and resource planning decisions and supply chain performance goals are aligned with service delivery and public health goals.

Using a well-functioning LMIS and an influential position in the MOH, the LMU can advocate use of technical information and performance data to ensure that human resources exist and personnel have skills necessary to perform responsibilities effectively. The LMU may also use logistics data to support identification of priority areas for improvement and to inform strategic redesigns of service delivery models through data-driven approaches such as supply chain segmentation, supply chain costing, and network optimization. The LMU is also responsible for facilitating donor and stakeholder coordination around logistics activities.

In Zimbabwe, the logistics sub-unit (LSU) uses a team of dedicated logistics staff to manage “downstream” coordination of distribution activities in the health system and “upstream” coordination among supply chain partners for antiretrovirals (ARVs) and other commodities. Based on monitored and proven success, the LSU was also given responsibility for essential medicines. In the Zimbabwe MOH hierarchy, the LSU reports directly to the permanent secretary, not a program director.

For more information on Logistics Management Units, see *Logistics Management Units: What, Why, and How of the Central Coordination of Supply Chain Management* (USAID | DELIVER PROJECT, Task Order 1, http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiManaUnits_Guide.pdf)

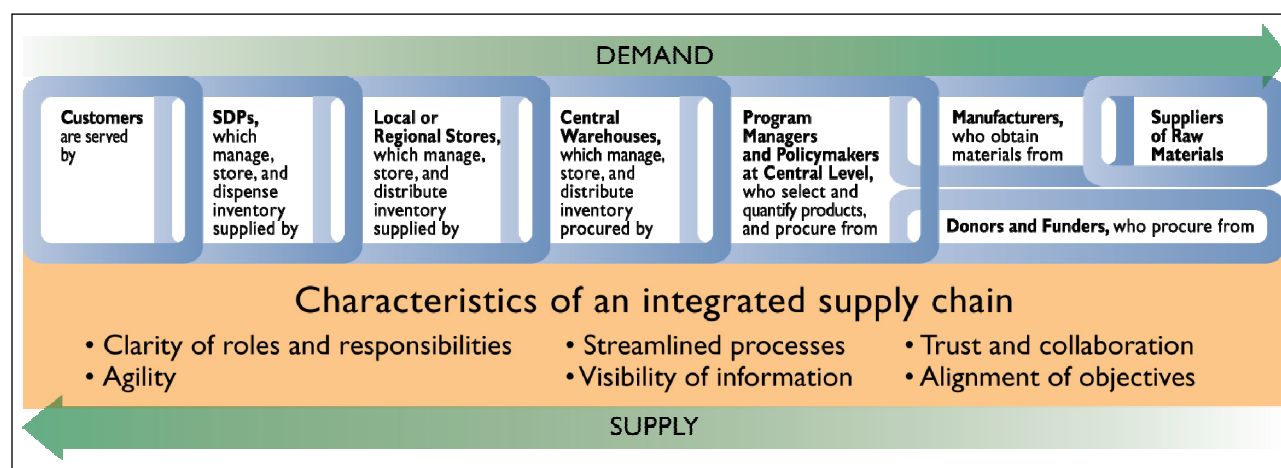
Technical working groups may also support cross-program and cross-partner coordination through regular sharing of plans and aligning of objectives and strategies for product procurement and system strengthening.

At this stage, processes and procedures have been streamlined to remove non-value-added steps, supply chain performance becomes more predictable, and targets are achieved more often.

Compared with the vision of a seamless or integrated supply chain (see figure 3), programs at the integrated stage in this model have built on clear roles and visibility of logistics information by—

- streamlining logistics processes using a more end-to-end perspective
- developing a level of trust and collaboration, a sense of team among all actors that support logistics functions throughout the health system
- aligning objectives of supply chain partners by strengthening the stewardship role of supply chain managers in the MOH
- using empowered supply chain managers to advocate and support process agility, and being able to respond effectively to sudden changes.

Figure 3. Characteristics of an Integrated or Seamless Supply Chain



Required SC Strengthening Efforts to Reach This Stage

Achieving this stage requires empowerment in terms of technical capacity, staffing, and authority of a dedicated logistics management unit serving as a central planning and monitoring body across all supply chain functions and an increasing number of product categories. It provides data for planning and monitoring. Long-term success of this entity depends on central-level visibility of high-quality logistics data, which may require continued training for facility personnel on reporting processes and efforts to streamline the process through redesign, implementation of new technologies, or outsourcing to leverage existing private sector capacity. From here, coordination efforts may be iterative: Based on an effective LMIS and process monitoring, the LMU can document success and impact, and then gain greater authority, responsibility, and ability to coordinate MOH logistics activities.

The LMU will be responsible for managing and monitoring the MOH's strategic vision for supply chain management that aligns partners, logistics functions, and health system levels around common goals. Supply chain staff in and beyond the logistics management unit must have leadership skills and authority to act as stewards or overseers of all supply chain-related tasks across multiple distribution systems and levels. Even when these managers are not directly responsible for managing product categories or distributing products, they will have leadership capacity to oversee and support those systems and leverage resources between them.

LMIS data can also support decisionmaking of technical working groups for supply chain management. Establishment and facilitation of these groups helps to foster an integrated supply chain by increasing the level of supply chain coordination among public sector institutions responsible for various aspects of the supply chain management process and with external partners.

Coordination of logistics functions may also be fostered by improving the ability of electronic data systems to interact, for example by introducing applications to allow a warehouse management system to be fed by LMIS data. The LMU will use these data to inform strategic redesign of the health system supply chain through segmentation, network optimization, and costing exercises.

Extended

At the extended level, public health supply chain management has expanded to cover institutionalized coordination between public and private sector distribution systems, and suppliers that serve both markets. This stage represents a challenge even for private sector supply chains in developed countries because it requires significant amounts of operating trust among separate organizations. At this stage, alignment of incentives and demand visibility across supply chain entities, including multiple distributors, suppliers, and manufacturers, leads to network-wide optimal performance. Efforts to improve data visibility through systems such as EDI give supplier partners a better picture of downstream demand and improve their ability to support the broader health system—public and private sectors—in achieving supply chain objectives.

In the public health context, supply chain management continues to serve a significant role for the health system, and whether working for a true public entity or a partnership between public and private sector organizations, supply chain managers can consistently secure and oversee resources—skilled personnel, funding, and required tools – for successful operation.

Compared with the vision of a seamless or integrated supply chain, programs at the extended stage have expanded the scope of previously mentioned characteristics to apply not only to downstream MOH partners but also to upstream suppliers and partners. This includes extending visibility of demand to these partners and fostering collaboration and alignment of objectives throughout the supply chain.

See table 1 below for a summary of these stages and types of investments that can be applied to help move from the ad hoc stage to the integrated stage.

Table 1. Summary of Supply Chain Evolution Stages and Required Supply Chain Strengthening Investments

	Ad Hoc	Organized Logistics System	Integrated Supply Chain	Extended Supply Chain
Degree of Supply Chain Process Definition	None. Personnel make decisions based on what they perceive as appropriate for the situation, with limited understanding of their role in the broader system or process.	Logistics tasks are officially defined, and system has been mapped out. All relevant health system personnel follow SOPs for logistics activities, as captured in the logistics cycle, and can visualize their role in the system.	The health system articulates and implements a comprehensive supply chain strategy that aligns partners, logistics functions, and health system levels on common goals.	Supply chain managers coordinate processes across public and private sector distribution systems. The health system incorporates supplier and upstream partner collaboration into its supply chain strategy.
Structure of Supply Chain Management	None. Health system personnel informally undertake logistics tasks as part of their broader job duties.	Logistics officers in a health program track existing data and lead improvement efforts.	The health system uses a body of dedicated supply chain personnel (an LMU) to track logistics performance data, advocate for and implement supply chain improvement efforts, and oversee logistics operations at a central level of the system.	The LMU's duties include management of collaboration and coordination efforts with external partners.
Visibility of Logistics Information	None. No system exists for collecting and disseminating logistics information.	An established LMIS and reporting system support visibility of demand at relevant administrative levels, though a paper-based system may prevent "real time" visibility.	Strengthened reporting processes and use of technology support substantive visibility across functions, health programs, and administrative tiers.	Expansion of previous visibility to include private sector distribution partners and non-health system, upstream entities such as suppliers.
Type and Use of Collected Logistics Information	None	The LMIS collects essential data points related to consumption and stock status to inform resupply decisions, and management staff track function-specific key performance indicators for management purposes.	The system collects cost data and uses total inventory and demand data to inform strategic redesign of the health system supply chain through segmentation, network optimization, and costing exercises.	Data used to support strategic, cross-partner supply chain improvement.
Collaboration and Coordination Between Supply Chain Entities	None. No formal arrangements exist to support supply chain coordination beyond transactions.	Coordination occurs through formal reporting structures and meetings at various levels in the health system.	Centrally managed coordination of logistics operations occurs across functions, administrative tiers, and health programs.	Formal arrangements for coordination with multiple supply chain partners exist, tied mainly to shared data visibility.

	Ad Hoc	Organized Logistics System	Integrated Supply Chain	Extended Supply Chain
General Supply Chain Performance	Low – frequent stockouts and high inefficiencies	Greatly improved over ad hoc phase but may still face inefficiencies because of non-optimal network structure or limited coordination across separate organizations.	High-level performance (consistently low stockouts and high efficiency) through optimized network structure and improved logistics management capacity.	High and continuously improving performance through extensive upstream and system-wide partner coordination.

Table 2. Table of Required Supply Chain Strengthening Investments

	Organized Logistics System	Integrated Supply Chain	Extended Supply Chain
Required Supply Chain Strengthening Investments for Reaching This Stage	<p>System assessments, design of SOPs, TOT and national roll-out for individual logistics functions and LMIS</p> <p>Definition and strengthening of individual logistics functions through provision of tools, capacity building, and supervision</p> <p>Potential establishment of LMU to support receipt and basic use of collected logistics data for forecasting and central use</p> <p>Strengthening of information systems to improve visibility in organization, development and implementation of electronic systems, and connection of existing data systems or development of cross-functional information systems</p> <p>Mapping of overlapping distribution streams in the broader health system and various actors and levels that support multiple logistics functions</p>	<p>Continued strengthening and improvement of logistics functions</p> <p>Supply chain re-engineered through segmentation, costing studies, network optimization, etc., based on supply chain data to distribute resources rationally and strengthen central-level oversight role across entire system</p> <p>Empowerment through advocacy and capacity building of specialized central logistics personnel who comprise a dedicated LMU</p> <p>Support of supply chain champions throughout health reform process to produce stronger supply chain unit, and efforts to achieve upstream, downstream, and horizontal coordination through centralized supply chain management</p> <p>Development and support of technical working groups to support cross-program and partner coordination</p> <p>Outsourcing of logistics activities to private third parties if appropriate to leverage existing, cost-effective private sector capacity</p>	<p>Continued efforts, including shared market analysis, to achieve collaboration with upstream, downstream, and horizontal supply chain partners</p> <p>Policy reform and systems strengthening to facilitate further definition, monitoring, and coordinated management of all logistics operations for multiple product segments</p> <p>Adoption of advanced procurement approaches such as reverse auctions and framework contracts that support supply chain integration across partners</p> <p>Extension of visibility to external partners through web-based applications and EDI</p>

Adaptations from Lockamy and McCormack's Model

Several notable differences between the developing country public health context and the developed world, private sector environment prevent Lockamy and McCormack's model from directly applying to supply chain strengthening work conducted by the USAID | DELIVER PROJECT and others.

- In the public sector, procurement restrictions typically placed on public health systems limit the extended-level vision of long-term collaboration between networks of firms based on supplier-customer procurement relationships. However, coordination and sharing of information among public sector entities, private sector distributors and suppliers can still yield supply chain benefits without violating these procurement regulations. Several initiatives supported by the USAID | DELIVER PROJECT, including market analysis and support of framework contracts, may potentially provide coordination and integration benefits between private and public sector partners. Reform of procurement policy to allow more flexibility in the procurement process, can also help to support these coordination efforts.
- Several case studies depicted the impact of health reform and service integration on organization of logistics management, which has significant impact on the supply chain and represents a potential hurdle in its development. With product and service integration, previously defined supply chain roles and responsibilities may become unclear, and responsibility for distribution and LMIS management may fall to separate units. Service integration should account for supply chain considerations by establishing or maintaining internal capacity to coordinate logistics activities. Devolution of authority or decentralization may produce a similar effect.
- In many instances, organizational structures of health supply chains and use of particular distribution strategies are products of decisionmaking based on political, rather than logistical, considerations. This occurs due to lack of strong logistics data to inform these decisions and recognition of the strategic importance of good logistics system design through approaches such as network optimization. MOHs and health service programs may segregate particular logistics activities, namely LMIS, to maintain a level of political control over the program, or may include an unneeded intermediary tier in the distribution system to accommodate general administrative organization.
- In some countries, public decisionmaking authority and health program management responsibility has been devolved or decentralized from the federal to state or regional level. In this context, centralized supply chain management could prove difficult but should still be the objective if certain logistics activities occur at the national level, i.e., if procurement occurs on a national scale. When subnational entities operate completely independent distribution systems, they should pursue advancement in this evolution model on a subnational scale.
- Because many health programs in poorer countries receive development assistance, progress toward improved logistics performance is often driven by an entity outside the actual logistics system. In private sector organizations, progress in the maturity model comes from an internal drive for performance improvement, while for developing country public health organizations, this improvement may initially be driven by a donor's desire to create a secure environment for access to donated commodities or general health services through technical assistance and support. However, evolutionary progress of health programs can still be facilitated or hampered by the level of internal political support for centralized logistics management.

What This Model Can Tell Us

This model articulates a road map for supply chain strengthening of developing country public health systems to take them from a state of low logistics capacity and minimal organizational structure for logistics management to a fully integrated supply chain, characterized by high performance and effective coordination between internal partners and external stakeholders. This road map, while tailored for public health systems, parallels Lockamy and McCormack's depiction of private sector supply chain evolution from systems in which individuals complete logistics tasks without standardized guidelines to systems in which all supply chain partners make coordinated decisions and support optimized performance of the overall supply system. This model illustrates how MOHs can use supply chain strengthening investments to reach a state in which multiple supply chains support and advance health program objectives by delivering value at a level greater than the sum of their parts.

In this model, two main phases of supply chain strengthening accomplish this evolution. To move out of the ad hoc state, MOH departments and donor partners must focus on establishing roles and procedures for basic logistics functions. This “definition” phase also includes design and effective implementation of an LMIS to capture essential logistics information. The next phase, supply chain integration, focuses on structural changes of logistics management in the health program and includes empowerment of dedicated logistics management capacity (typically an LMU) to increase supply chain process management and control. Personnel in this unit must be—

- empowered, through organogram position and human resource capacity, to manage centrally, or in the case of decentralized systems serve as a central steward of, logistics activities for all distribution channels and product segments
- able to use logistics data to make operational and strategic design decisions
- capable of building a supply chain management team across internal and external partners and advocating for management resources to support this team.

The LMIS is a key component of both phases. In each case study, it played a significant role in allowing program personnel to manage the logistics system effectively and ensure performance, and was a clear determining factor in overall performance capacity of the system. The LMIS is a critical backbone in supporting upward and horizontal flow of logistics information to facilitate internal and external partner coordination and advocacy. This information system over time is the focus of occasional reinvestment to accommodate service delivery changes or technology improvements. Both phases may include investment in infrastructure and human resource capacity to help give practitioners tools to complete their jobs efficiently.

Between the two phases, the role and type of capacity building requirements evolve. Moving from the ad hoc to defined stage requires roll-out of SOPs to train personnel in specific functional tasks, while capacity building needed to move a supply chain toward the integrated stage is focused on a smaller number of personnel but includes a wider skill set across an increasing number of product categories. At this stage, a select group of personnel must be empowered to advocate for strategic logistics decisions and serve as supply chain champions in the MOH. These champions must develop ability to understand what their system looks like, how to join its piece, potential ways to align supply chain partners to help achieve common goals, and ultimately how to operate more effectively and efficiently in the broader contextual environment.

How This Model Can Be Applied

As a road map for supply chain strengthening, this model can help a program qualitatively determine where it falls in relation to goals of integrated and extended level supply chain management, and what types of investments must take place to support progress.

First, using descriptions of the stages, decide where a particular program falls. Programs may be at a higher or lower end of a particular stage, but the most important factor is structure of logistics and supply chain management or lack of it. Answer these questions:

- Does the system effectively use SOPs to define roles and guide logistics functions, and include a process for training staff on their use?
- Does the system have and use a functional LMIS that supports higher-level visibility of demand and tracking of metrics for supply chain performance monitoring?
- Does the system have an LMU sufficiently empowered to manage overall logistics across separate entities in the organization to the service delivery level?
- For coordinating with upstream supply chain partners, particularly suppliers, has the system developed mechanisms such as extending visibility of real-time demand information?

Answering “no” to these places a program in earlier evolutionary stages, while answering “yes” to all puts a program in the extended stage. In any stage, a program may fall at a lower or higher end, depending on several factors. Answer these questions:

- Are elements of the next highest stage being developed?
- Do elements of the next highest stage exist but suffer from poor performance because they were inadequately implemented or resourced?

Consideration of these questions depicts, at a high level, the program’s evolutionary level in terms of its supply chain management approach and capacity for supply chain performance. Based on this, a program should seek improvements leading to process definition and organization—see “Required SC Strengthening Efforts to Reach This Stage” above for the organized stage. Or it should seek improvements that strengthen supply chain coordination between internal entities and programs, or the public health system and its upstream partners.

Additional qualitative metrics are needed to capture organizational structure of logistics management, presence of dedicated staff, and level of strategic priority placed by the MOH on supply chain management. Such qualitative metrics will help to complement existing logistics assessment tools by providing insight into the amount of, or potential for, supply chain evolution through high-level supply chain strengthening investments

Next Steps for Tracking Performance Improvement Using This Model

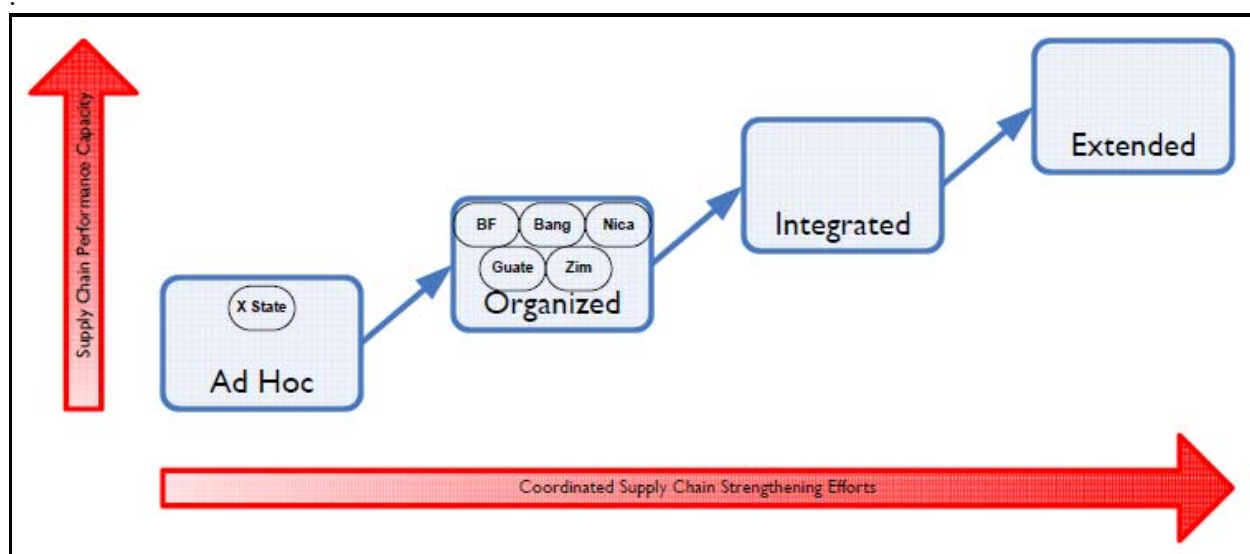
Following the qualitative process above, the six case studies can be placed into the evolutionary stages (see figure 4 below).

While this evolution’s quantitative impact has been proven in private sector studies such as Lockamy and McCormack’s, its adaptation to the developing country public health context has occurred only through qualitative analysis of case studies. Where captured in these case studies, quantitative performance is measured in logistics performance outcomes—typically stockouts—and reporting rates. Among various country programs, these outcomes may vary widely due to environmental or

contextual factors such as donor commitments to various programs, country commitment, general economic development, etc. Quantitative tracking of supply chain evolution may require more detailed supply chain process metrics such as internal costs of delivery, inventory turnover, and order fill rates.

This model can help development of supply chain benchmarks for public health supply chains in developing countries. Comprehensive analysis of logistics and supply chain metrics, with isolation of environmental variables, can lead to quantitative performance targets for individual functions and activities. An individual program can plot its assessed performance against these benchmarks to develop a clear sense of which logistics and supply chain components require the most attention, and provide a more specific list of supply chain strengthening efforts required to foster performance improvement. More information on this “gap analysis” approach can be found in *Key Performance Indicators* (USAID | DELIVER PROJECT 2010).

Figure 4. Relative Evolutionary Stages of Case Study Programs



How This Model Relates to a Broader SC Strengthening Framework

As a conceptualization of the path that supply chains follow toward performance capacity improvement, this model helps to envisage not only the end goal of supply chain strengthening but also general steps required to get there. This model can also be the basis for further efforts to measure and track supply chain process improvement, and develop country-specific performance targets that account for synergistic and detrimental environmental factors.

In sum, this evolution model can be considered part of a broader supply chain strengthening framework, including four key components:

1. ***Understanding the goal.*** Ultimately, countries strive toward a situation in which different elements of the supply chain – including people, programs, levels and functions – are seamlessly woven so products and information flow smoothly through the supply chain

management system and into the broader operational environment to health facilities and individuals who need these supplies.

This requires building an “integrated supply chain” that streamlines chain management processes so information about demand and supply is widely available in a timely manner. An integrated, or seamless, supply chain is characterized by clarity of roles and responsibilities, agility, streamlined processes, visibility of information, trust and collaboration, and alignment of objectives (see figure 3, Characteristics of an Integrated or Seamless Supply Chain).

2. ***Developing a road map for getting there.*** The “Supply Chain Evolution Model” shows countries how to implement and sustain an integrated supply chain. It illustrates how public health systems can move through a process management trajectory to improved supply chain management capacity, from ad hoc to organized to integrated to extended.
3. ***Learning to assess, define, and monitor progress, and make required adaptations to ensure that investments pay off over time.*** A set of supply chain metrics can help countries identify where they are on the continuum, what benchmarks they should target to reach the next stage, how to best align supply chain components with surrounding environment, and what investments to prioritize to develop and maintain an integrated supply chain.
4. ***Developing a tool for evaluating country contexts while identifying risks and opportunities.*** Since the political, economic, and social environment plays a significant limiting or enabling role in strengthening a country’s supply chain, it is important to conduct an environmental analysis to better understand a country’s context, identify champions and spoilers, assess risks, and determine mitigation strategies.

Using this framework, health managers and other key stakeholders can learn to build a cohesive supply chain management system, understand how it interacts with its broader environment, and ultimately contribute to building systems that respond to customers’ needs. The USAID | DELIVER PROJECT is working with partners to fully develop all relevant tools for operationalizing this framework.

Tools for Reference

- Contraceptive Forecasting Handbook for Family Planning and HIV/AIDS Prevention Programs
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/ContForeHand.pdf
- Delivery Team Topping Up: Bringing About Reliable Distribution in Difficult Environments
http://deliver.jsi.com/dlvr_content/resources/allpubs/logisticsbriefs/ZW_DTTUBrin.pdf
- Emerging Trends in Supply Chain Management: Outsourcing Public Health Logistics in Developing Countries
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/EmerTrenSCM_Outs.pdf
- Reengineering Public Health Supply Chains for Improved Performance: Guide for Applying Supply Chain Segmentation Framework
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/ReenPublHealSC.pdf
- Guatemala: Using Supply Chain Modeling and Simulation to Analyze the Ministry of Health Supply Chain
http://deliver.jsi.com/dlvr_content/resources/allpubs/countryreports/GT_SCModeling.pdf
- Guidelines for Warehousing Health Commodities
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/GuidWareHealComm.pdf
- Lessons in Logistics Management for Health Commodities (online training course)
<http://www.jsi.com/Independent/Deliver/LogisticsCD/htdocs/>
- Logistics Handbook: A Practical Guide for the Supply Chain Management of Health Commodities http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiHand.pdf
- Logistics Indicators Assessment Tool (LIAT) (MSWord document)
<http://deliver.jsi.com/dhome/resources/publications/guidelines>
- Logistics Management Units: What, Why, and How of the Central Coordination of Supply Chain Management
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiManaUnits_Guide.pdf
- Logistics System Assessment Tool (LSAT) (MSWord document)
<http://deliver.jsi.com/dhome/resources/publications/guidelines>
- Measuring Cost to Optimize Health Commodity Delivery in Zimbabwe
http://deliver.jsi.com/dlvr_content/resources/allpubs/logisticsbriefs/ZM_MeasCostOptiHealCommDel.pdf
- Planning and Implementing a Logistics System Design Activity
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/PlannImplLogiSyst.pdf
- Putting Integration into Perspective: Proven Practices to Strengthen Public Health Supply Chains http://deliver.jsi.com/dlvr_content/resources/allpubs/logisticsbriefs/InteProvPrac.pdf

- Quick Reference: Logistics System Design and Implementation
http://deliver.jsi.com/dlvr_content/resources/allpubs/factsheets/QuickRef_LogsSysDesImpl.pdf
- Segmenting Laboratory Commodities for Logistics System Design
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/SegmLaboCommLogSysDesi.pdf
- Supply Chain Integration: Seamlessly Linking the Pieces
http://deliver.jsi.com/dlvr_content/resources/allpubs/logisticsbriefs/SCIntSeamLinkPiec.pdf
- The Logistics Workbook: A Companion to the Logistics Handbook
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/LogiWork.pdf
- Transport Management: A Self-Learning Guide for Local Transport Managers of Public Health Services
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/TMS_Guide.pdf
- Turning the Digital Corner: Essential Questions for Planning for a Computerized Logistics Management Information Systems
http://deliver.jsi.com/dlvr_content/resources/allpubs/guidelines/Turn_Digi_Corn.pdf

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Appendix A

Using Case Examples to Adapt This Model for the Developing Country Public Health Context

The following case study examples help to answer questions about the general trajectory of country programs and types of investments that produce supply chain improvements.

These studies are not an attempt to evaluate performance or identify specific areas for improvement but seek instead to depict progression of organization of supply chain activities. Rates of progression and performance levels from country to country cannot be compared due to the wealth of complex factors contributing to objectives and outcomes of individual programs.

To understand development over time, each case study looked at current organizational structure of logistics and supply chain management, and recent and projected changes to this structure. The studies also examined types of investments that have proven successful in each context.

The studies included a range of programs in different geographic settings and economic contexts, and were supported by various levels of donor-funded supply chain system strengthening.

“X State”, Nigeria

For public health care, Nigeria has devolved some authority for management and operations to the state level. Typically, states do all procurement, storage and distribution for essential medicines while acting as an administrative tier for nationally managed programs such as Family Planning and Tuberculosis. States employ personnel to manage incoming shipments from national or zonal stores and distribute to state-controlled secondary facilities and primary health care facilities via local government authorities.

Structure for Logistics

In “X State”, the greatest amount of resources and deliberate organization for logistics can be seen in the essential medicines program, the one commodity resupply operation entirely state-controlled. Product selection for this program falls to the Drug and Therapeutics Committee, which meets on an ad hoc basis to form the Essential Drug List (EDL), detailing generic drugs and consumables that should be available to patients through health facilities from the Essential Drug Programme and its Central Medical Stores (CMS) in the capital.

The drug program is responsible for procurement through ad hoc tenders from local suppliers based on estimates of required amounts for each product. Exact procedures for this procurement process conform to state and national regulations but are otherwise not formally defined. No long-term

forecasting occurs because procurements are more like shopping and cover estimated issues for several months.

The program has no centralized distribution capacity. Suppliers deliver commodities to CMS, and receiving facilities are required to pick up orders using their own vehicles and resources. Previously, CMS owned and operated delivery vehicles, but these were not subject to formal scheduling or fleet management procedures.

The program uses a large warehouse at CMS for product storage and program administration, although it is in poor condition. Stock levels of inventory are maintained in a store ledger while transactions are recorded in the store and program accounting records.

Health workers at secondary facilities also distribute commodities to patients, tracking inventory, making requisitions, and collecting orders.

The program does not operate an LMIS or see commodity consumption at the SDP. Secondary facility personnel place orders on an ad hoc basis, some more frequently than others depending on proximity to CMS. Although facility personnel track their stock on hand and amounts dispensed, their requisition forms indicate only how much they are requesting, which is not based on a standardized rule. The program collects and archives these paper requests but does not analyze or make this information widely accessible. As noted above, the program makes procurements based on current need.

The result of the program's operations is that secondary facilities often find CMS stocked out of required products and must wait an unpredictable amount of time to receive orders, leading to stockouts at the SDP. Facility personnel have also noted that prices paid by patients are sometimes higher than those at the private sector pharmacy.

Historical Development

The drug program began as a donor-implemented revolving fund in the 1990s but is not subject to ongoing financial or technical support. Through staff turnovers, inflation, losses and expiries over the years, capitalization of the revolving fund has decreased and necessitated financial injections from the state government. While standardized role and process definitions may have existed initially for the program in "X State", they no longer guide operations.

The state MOH has identified logistics and each of its functional components as key areas for improvement and expansion of essential medicine coverage to increase MOH's capacity to manage distribution and improve health indicators for its population. It has also attached a logistics improvement plan to its state health development plan to articulate needed improvements that address processes and infrastructure.

The future for public health logistics in "X State", as articulated in the improvement plan, lies in infrastructure investment in warehousing and administrative office space, adoption of best practices for warehousing, inventory control and procurement, and eventual establishment of capacity in direct delivery to SDPs. Donor-funded partners have begun to provide assistance in these areas by thoroughly refurbishing the essential medicines warehouse, seconding skilled personnel to work with state store officers, and overseeing development of SOPs for procurement.

Comparison to Lockamy and McCormack's Model

Most significantly, “X State” has not fully defined logistics roles and processes in its operations. Several dedicated logistics personnel work at CMS managing the drug program or as store officers, but procedures for conducting their jobs have not been standardized. Program personnel conduct many logistics tasks such as procurement and recording of warehouse transactions as requirements of public accounting and transparency measures. SDP health workers complete other tasks as a matter of necessity to maintain stock of essential medicines.

The program does not facilitate stakeholder or upstream coordination beyond the state MOH. The program tracks only a few metrics related to performance, namely sales to facilities in terms of naira and other monetary flows.

For other “X State” health programs such as family planning, national counterparts train staff in logistics procedures to help ensure that those commodities reach the service delivery level, but these staffs make up a small proportion of “X State” resources and operate without coordination with the drug program.

Logistics activities in “X State” can be characterized as reactive, occurring in direct response to demand for services with little forward planning. Achievements in product availability are the product of individual effort rather than defined roles and processes. Compared with Lockamy and McCormack's model, “X State” would fall closest to the ad hoc stage in terms of structure and approach to logistics. In terms of the state's longer term evolutionary trajectory, standardized roles and procedures for logistics may have existed once but are no longer used. However, the state MOH is rapidly trying to recover logistics capacity by prioritizing and pursuing investments in infrastructure and process improvement and standardization.

Burkina Faso

Structure

For family planning commodities, logistics management responsibility falls primarily to two MOH organizations, *Centrale D'Achat des Medicaments Essentiels Generiques et des concommables Medicaux* (CAMEG) and the family planning directorate. The directorate reports to the minister of health and oversees product selection and forecasting. These people compose the logistics-focused personnel at the central level for family planning – one staff member designated as a logistics officer, a United Nations Population Fund (UNFPA) staff member seconded to the directorate, and one CAMEG staff member dedicated to managing family planning supplies.

Forecasting is done annually and collaboratively includes relevant stakeholders such as CAMEG, the MOH pharmacy department, regional pharmacists, and donor partners. The directorate leads this effort and collects relevant data before the exercise, while UNFPA covers expenses.

Based on these forecasts, donor partners procure most of the requirements, although the Government of Burkina Faso has a budget line for purchase of family planning products. CAMEG serves as procurement agent and buys commodities using this funding.

The directorate manages the LMIS, through which SDPs report monthly to districts, which share quarterly reports with their respective regions. Regional pharmacists then aggregate and share these reports with the directorate at the central level. The directorate uses this information solely for forecasting and does not track logistics system performance.

To help central and health facility personnel perform logistics roles properly, a World Bank-funded TOT and rollout occurred in 1999. Since then, the USAID | DELIVER PROJECT and UNFPA have supported routine training. The directorate is also responsible for monitoring and supervision of clinical and logistics practices as SDPs.

While the directorate manages flow of information, CAMEG manages physical distribution, delivering products to its seven regional agencies, where district personnel collect them and make them available for SDP stores.

Historical Development

A significant development for structure of logistics management occurred in 2004 when CAMEG assumed responsibility for storage and physical distribution of family planning commodities. As noted in a 2003 assessment, the directorate did not have adequate space or infrastructure to support proper storage practices, so this responsibility was moved to CAMEG. While this integration of family planning commodities into essential medicines distribution has greatly improved storage conditions for family planning products, coordination has not occurred between CAMEG and the directorate on managing the LMIS and system performance.

Over the past decade, the Government of Burkina Faso has begun to procure contraceptives, and although donors still supply the majority of requirements for the family planning program, this transition has helped to build the internal capacity of MOH and CAMEG to manage more parts of the logistics management process. During this time, the directorate also assumed responsibility for leading forecasting and pipeline monitoring efforts, and it continues to use methodologies originally employed by donor partners.

For the near future, UNFPA has supported providing computers to district offices with Channel software to facilitate and improve data collection and quality for LMIS. Before this, only regional- and central-level personnel had access to this software, meaning district personnel had to aggregate and share paper LMIS reports.

Finally, donor partners have recently supported a revision to SOPs for this system to help update and further clarify personnel roles

Comparison to Lockamy and McCormack's Model

In comparison to Lockamy and McCormack's maturity model, Burkina Faso's family planning program supports functioning, defined logistics roles for its personnel centrally and at lower-level facilities. LMIS, too, is well-defined, although adherence to processes remains an issue in the form of fairly low reporting rates.

Significantly, although the system uses several specialized logistics personnel at the central level, this does not constitute a formal logistics team with coordinated oversight of logistics operations. Instead these central personnel complete logistics tasks while housed at separate administrative areas in the family planning directorate and CAMEG. Despite increasing coordination between the two for family planning warehousing and distribution, information management is not formally coordinated. Thus internal coordination and organizational linkage can be improved. External coordination with stakeholders does occur, although primarily through quantification workshops. The directorate does not track and share logistics performance metrics.

Investments required to strengthen the supply chain system and achieve this level of logistics organization and performance include system assessments, design and dissemination of program

SOPs through a TOT and roll-out, dissemination of proper storage guidelines, and seconded personnel to support logistics operations as part of the reproductive health (RH) commodity security plan. Also needed are specialized training and support for the dedicated logistics specialist at the central directorate and, most recently, provision of computers, software, and training for improved LMIS performance.

Zimbabwe Logistics Sub-Unit

Structure

Zimbabwe's logistics sub-unit (LSU) resides in the Directorate of Pharmacy Services (DPS) in the Ministry of Health and Child Welfare (MOHCW). This dedicated unit of government personnel focuses on logistics management for MOHCW's ARV, essential drugs, and male circumcision commodities.

The LSU manager reports directly to the DPS director and is supported by 18 central personnel, including upstream logistics coordinators for the two main programs (HIV/AIDS and essential drugs), logistics officers, and data analysts.

This structure places programmatic and geographic responsibilities on upstream logistics coordinators and officers, reflecting a desire to facilitate coordination upstream among the MOHCW, donor partners, and suppliers, and downstream among LSU, MOHCW facilities and donor partners. These personnel are housed at the National Pharmaceutical Corporation (NatPharm) warehouse, which stores commodities the LSU supports.

In managing logistics for ARVs and essential drugs, LSU leads many activities and coordinates closely with operating partners for others.

LSU leads periodic collaborative forecasts for ARVs and other commodities, and it develops and maintains the respective supply plans. It conducts these activities using quantification methodology and relevant software for which its personnel have received training. In coordination with other stakeholders, procurements are issued to suppliers based on these quantifications. LSU then monitors shipment status and facilitates customs clearance on arrival in-country. This inbound shipment support also includes product sampling through the Medicines Control Authority of Zimbabwe (MCAZ).

Storage of ARVs, essential medicines and other co-managed commodities occurs at the NatPharm warehouse in Harare, where LSU staff can also provide support and technical assistance. LSU drivers and vehicles conduct monthly deliveries of commodity resupply to ART sites across Zimbabwe based on requisitions packed at the NatPharm warehouse.

LSU is also the focal point of LMIS for HIV/AIDS commodities. ART sites report consumption and stock on hand through the Zimbabwe Information System for HIV/AIDS Commodities, and LSU receives, reviews and approves orders for fulfillment at NatPharm. These data also form the basis of program performance reports and quantifications.

For ART sites, LSU provides supervisory visits using monitoring vehicles. In these visits, the staff provide support for proper adherence to SOPs on logistics and clinical treatment.

Finally, a key LSU role is that of logistics coordination between stakeholders. It provides monthly stock status and supervision updates to MOHCW and donor partners based on collected LMIS data. LMU also reports quarterly on logistics management performance indicators, which helps to highlight progress and identify areas for strengthening the supply chain system.

Historical Development

LSU was formed in 2007 after a 2006 assessment of HIV/AIDS commodities logistics management in Zimbabwe. During 2006, USAID | DELIVER and the Supply Chain Management System (SCMS) supported a national roll-out of a new logistics system for HIV/AIDS commodities, which included seconding three logistics officers to MOHCW. At the time of the assessment, logistics activities for the HIV/AIDS system fell under three separate units: the AIDS and TB Unit, which managed the ART program; DPS, which oversaw general drug management; and NatPharm, which stored and distributed commodities.

Stakeholders expressed desire to coordinate activities among the three and agreed to establishment of an interim LSU under NatPharm to harmonize forecasting by the AIDS and TB unit, multiple donor-funded procurement streams, and requisitions placed by ART sites. The USAID | DELIVER PROJECT agreed to provide three trucks to support NatPharm deliveries to ART sites.

This sub-unit became responsible for managing the recent LMIS system and developing logistics system performance indicators for sharing with partners. Based on proven successes, MOHCW and partners agreed to expand LMU's role to cover essential drugs and 28 male circumcision commodities. These successes included maintenance of low stockout levels, high reporting and training rates, and ultimately successful support of ART scale-up.

Plans include improvement of LMIS data quality and on-time reporting rates, and advocacy of using data for decisionmaking.

Transition of LSU from the AIDS and TB Unit to DPS effectively expanded LSU's scope of commodity oversight to include all essential medicines and malaria commodities, managed under three distribution streams. This expansion represents a major effort to harmonize delivery systems and concentrate coordination in LSU. Donor partners have supported increases in staff and infrastructure and continue to assist LSU activities.

Comparison to Lockamy and McCormack's Model

Each health program included in LSU's scope of logistics management has clearly defined roles, processes, and logistics outcome performance measures. Design of positions and organizational structure, which includes a relatively large group of dedicated logistics personnel, allows effective logistics management of these programs and, most importantly, ensures capacity for well-managed coordination downstream and upstream.

Although LSU does not manage storage or order picking, its physical presence in the NatPharm warehouse allows close coordination between the two. Because donor partners still handle procurement, LSU has effectively developed processes for coordination with and between these external partners by ascertaining that a strong LMIS can support visibility of system performance. This successful extension of coordination to upstream partners begins to approach Lockamy and McCormack's descriptions of "coordinated" and "integrated" supply chains, although direct interaction with manufacturers does not occur in this environment.

LSU's example stands out from others for several reasons. One is the short amount of time required to establish such a relatively "evolved" system. In just several years, the program introduced and rolled out SOPs before creating an organizational structure that linked responsibility for logistics functions and ensured strong coordination with internal and external partners. The unusual level and nature of donor support is also illustrated by its willingness to fund an entire team of qualified

logistics professionals. That happened because of the emergency level of commitment to establishing effective ART supply chains.

One factor that may have facilitated this rapid development is that the ART supply chain had to be built nearly from scratch and was not well established. In other settings, reorganization and prioritization of logistics roles would have to overcome firmly entrenched “legacy” mindsets about respective roles and responsibilities, making internal linkage and coordination more difficult. Placing the essential medicines program under LSU oversight came in response to LSU’s demonstrated management capacity and desire to reduce functional redundancy among distribution systems.

In general, this system has benefited from many investments in strengthening the supply chain system – supply chain assessment advocating LMU development, SOP training and roll-out, transportation and LMIS infrastructure, and LSU staff salaries.

Bangladesh

Structure

The Logistics and Supply Unit (LSU) oversees logistics management in the Directorate General of Family Planning (DGFP), one of two wings of the Ministry of Health and Family Welfare (MOHFW). The unit has management staff in Dhaka and facility staff at a central warehouse and 20 regional warehouses. These total 16 central staff and about 270 warehouse staff. Central staff includes a director, who reports to DGFP, and deputy directors and support staff. LSU exists to support product availability at the SDP.

To facilitate forecasting, LSU assisted in developing two projection documents that are periodically reviewed and compared against current stock status to prepare procurements. These reviews occur in the logistics coordination forum chaired by the Director General of Family Planning. LSU also prepares supply plans and required shipment schedules using Pipeline software. The International Procurement Cell manages procurement and resides in LSU. It was established in the early 1990s to achieve country ownership and avoid service fees of procurement agencies. Donor partners conduct some procurement of contraceptives on behalf of donors.

LSU directly manages storage at central and regional warehouses and distribution to upazila stores. In recent years, the USAID | DELIVER PROJECT successfully helped MOHFW outsource about 50 percent of required capacity going from the central to regional level, while LSU managed distribution operations covering remaining delivery needs to upazila stores.

A web-based LMIS, managed by the management information system (MIS) in DGFP, allows real-time access to stock status information from facilities and allows tools to track procurements and pending stockouts.

For coordination and development of contraceptive security, MOHFW leads partner coordination meetings in the Logistics Coordination Forum (LCF), which examines periodic stock status reports and seeks to identify supply chain bottlenecks.

Historical Development

The Government of Bangladesh has supported family planning programs for several decades and began receiving assistance for family planning logistics in 1988. In subsequent decades, contraceptive prevalence increased while total fertility rate declined, reflecting a rise in DGFP’s capacity to distribute family planning commodities effectively.

Major developments during the past two decades in the distribution system for family planning include a 1999 consolidation of delivery tiers from five to four. This involved turning district stores into small regional stores and delivering to all of these directly from the central level. The combined regional and districts stores distribute directly to upazilas. With this reduction in national Pipeline requirements, MOHCW saved about \$5 million and continues to save money due to reduction in lead time and distribution requirements.

Other major developments include use of private carriers to efficiently fill transportation requirements not met by the existing government fleet and development of in-house government management of procurement. The estimated savings is 26 percent. With partner assistance and capacity building, the International Procurement Cell assumed some responsibility from donor partners and has steadily improved its lead time, although concern remains about this unit's capacity.

The central warehouse and some regional warehouses have benefited from introduction of a software-based warehouse management system and numerous trainings in LMIS, logistics management, and procurement. Development of the web-based LMIS also improved data visibility.

Comparison to Lockamy and McCormack's Model

Atop defined logistics roles and organized responsibilities, Bangladesh's LSU exhibits levels of internal (to MOHCW), cross-functional linkages, and coordination. The program has also maintained strong internal visibility through initiatives such as the web-based LMIS.

Key differences between Bangladesh's logistics management and other developing country public health programs include strong use of technology, not only the web-based LMIS but also use of warehouse management software at facilities below the central level. Donor partners have supported these activities, which are potentially more feasible due to the general economic development of Bangladesh. Another driving trend in logistics management has been the desire for country ownership, seen most notably in transition to LSU management of international procurement.

Nicaragua

Structure

The Division of Essential Medicines reports to the MOH vice-minister. This division manages most elements of the logistics cycle under its various departments – Rational Use Department, Regulatory Body for Warehousing and Distribution, and CMS, which manages actual warehousing and distribution of products.

The central level is responsible for setting norms for warehousing, distributing, and dispensing products. The regional level is responsible for managing implementation of these processes. Significant coordination must occur between regional and central levels. Procurement is done primarily at the central level except in emergencies. The regional level helps to manage distribution, transport, and storage of all services and products with its allocated budget but according to norms and regulations set at the central level. Essential Medicines supervisors are responsible for coordinating much supply chain management work at the regional level, including training, supervision, and reporting. (USAID | DELIVER PROJECT 2011).

Historical Development

At the central level, the Division of Essential Medicines has gained importance in MOH during the past five to ten years. This division was formerly under the Division of Finance and Administration but has been elevated to the level below the vice-minister to help streamline supply chain management and allow commodities management more effectively and quickly.

At the regional level, Essential Medicines supervisors have also been given more management importance. Previously, they did not have full authority or information to make strategic decisions about supplies management or to help lower-level staff avoid stockouts at the facility level. Today, they are at the highest manager position at the regional level, and regional directors often consult them on overall health management issues. Regional directors also prioritize logistics at their level and the need to keep products and logistics information flowing to provide essential health services.

These organizational changes accompanied a roll-out of standardized logistics management information and inventory control systems for all essential medicines at all health system levels. This new approach has provided much more visibility into stock status from the central to service delivery level, and stock availability at all levels has improved.

No major structural changes are planned for the near future, but MOH wants to implement more incentive programs in this structure to motivate staff at regional, warehouse, and facility levels to increasingly prioritize logistics-related tasks in day-to-day routines. It is also working to increasingly automate LMIS and make logistics data visible on the MOH intranet and website.

USAID is supporting MOH to institutionalize all logistics-related tasks for all essential medicines in MOH structure and eventually “graduate” them from donor support.

Additional supply chain strengthening activities supported by donors include LMIS, warehousing, product integration, rational use of medicines, and logistics training. Generally, these have been product specific, and MOH has worked to take advantage of this vertical support to strengthen the entire system.

Strengthening of logistics data and training in how to best use this data have been central to logistics improvements and elevation of logistics management in MOH. Having applied many principles proven to work for the contraceptive logistics system, such as collection of essential logistics data, and extending these to logistics management of all medicines, the MOH has strengthened the Division for Essential Medicines and logistics management capacity at the regional level in a more sustainable way.

A focus on commodity security through creation of a commodity security (CS) committee and empowerment of personnel responsible for managing logistics functions has also proven successful. With such empowerment, these personnel can monitor and advocate increasing support for this system in MOH structure. CS committee leaders such as the CMS head, the USAID | DELIVER PROJECT, and health services directors, have helped to hold decisionmakers accountable for stockouts and to maintain political support throughout the system for prioritizing financing and commodities procurement. This is accomplished by monitoring and sharing data such as prices paid for contraceptives, quantification amounts, stockout rates, etc. Continuing capacity building for individuals on this committee to monitor CS data and become main spokespersons in and outside MOH for commodity security has helped to elevate supply chain importance in the health system.

Throughout the product integration process, training on how different individual roles have changed has also been key to a smooth transition. For example, Essential Medicines supervisors were taught

basic supervision processes through interactive exercises and in-service training from the central level. They were taught that their main job is to support health providers at the frontlines and that providing mentorship rather than oversight of their colleagues' work would most likely be more effective at strengthening supply chain management practices at lower levels and integrating themselves into regional health teams.

This focus on building interpersonal skills helped the supervisors ease into their new roles with very limited resistance from managers, doctors, and nurses at various health system levels. In fact, many health providers were very eager to transfer some of these supply-related responsibilities to the supervisors. As a result of these efforts, the supervisors' role was recently promoted to the director level in the regional health management system. Essential Medicines supervisors now form part of the highest-level regional management teams, and regional directors often consult them on overall health management issues.

Over the last ten years, the Ministry of Health of Nicaragua (MINSa) has worked to consolidate and institutionalize various supply chain management improvements in the broader health system. Supply chain managers and policymakers have worked to maximize donor support throughout this process so that when donor funds and technical support are no longer available, supply chains for all health commodities will be fully absorbed and managed effectively by the ministry.

The ministry began this process by applying many tools and characteristics successfully developed and tested for the contraceptive supply chain during the last ten years to the broader supply system for essential medicines and the HIV/AIDS system.

These efforts have helped to strengthen supply chain performance for many health commodity groups, although many challenges have developed. The ministry is still working to consolidate this process but has made progress toward seamless linkages between various actors, levels, and functions in the multiple supply chains managed in-country to optimize customer service.

Greater focus is placed on systems strengthening rather than working on specific individual programs as partners and MOH had done.

Comparison to Lockamy and McCormack's Model

Building on standardized roles and functional linkages formed at the central level, Essential Medicines achieves strong centralized coordination among health administration levels. The administrative focus and priority given health system logistics occurs partly because of strengthening and capacity building of individuals on the committee. Although this coordination does not include suppliers or manufacturers directly, technical capacity of individuals on the committee has helped to secure support for supply chain system strengthening efforts such as automation of LMIS.

Importantly, Nicaragua has maintained performance and adherence to logistics roles throughout the health reform and product integration process by retraining on evolving system roles. During this process, the government has sought to take advantage of supply chain strengthening efforts by expanding successful interventions from one program to another.

The Essential Medicines supervisor plays a critical role at the regional level by ensuring downstream visibility at the central level while reinforcing and absorbing logistics roles of facility personnel, effectively performing a linking and coordinating role in each region. Part of this reinforcement of roles includes fostering facility personnel motivation to complete LMIS roles and improve data quality. At the central level, training in how to use data for effective decisionmaking has complemented this improvement of data quality.

Compared to Lockamy and McCormack's model, Nicaragua would fall closest to completing the "Defined" and beginning the "Linked" stage in terms of structure and approach to logistics. Current efforts to use logistics data to improve supply chain performance and create efficiencies in supply chain management throughout the health system may potentially contribute to continued supply chain evolution.

Guatemala

Structure

The Guatemalan MOH logistics unit reports directly to the administrative vice-minister. Technically, this is relatively high in MOH structure, but in practice the logistics unit requires additional authority and staff to fully assume oversight responsibility of multiple overlapping supply chains managed throughout the health system. Logistics managers, sitting in health programs, continue to manage supplies with limited oversight and support from the logistics unit.

In addition to central-level managers, personnel throughout the decentralized health system have a key role in managing the supply chain. Some key logistics manager roles include regional pharmacists, warehouse managers, nurses, and statisticians managing the LMIS.

Pharmacists who compose part of the regional management team are responsible for overseeing all logistics-related activities at the regional level. They have great responsibility and authority for managing all logistics functions for essential medicines. For vertical programs, these individuals are also responsible for providing support and oversight, but various program logistics officers at the central level determine most procurement, financing, and reporting requirements.

Authority to manage most logistics functions has been decentralized to the regional level, particularly for essential medicines – financing, quantification, procurement, storage, and transport. In other words, although the logistics unit manages the information system, monitors stock availability, and performs some training related to the information system, almost every other logistics function is managed by the regional level, for essential medicines, or the central level, for HIV/AIDS, family planning, and vaccines.

For each more vertical program, the program staffs logistics directors. Each program has a central warehouse and staff to manage these commodities. Vertical programs are managed more centrally.

Historical Development

Logistics management has gained importance in MOH during the past ten years. Before 2006, disparate health programs managed logistics functions more vertically. The logistics unit was formed under the Directorate of Finance and Administration and later elevated to the level below the vice-minister. However, although the unit was originally fully staffed and financed by MOH with a director, systems manager, two pharmacists, an LMIS manager and a logistician, only two positions are currently being financed and maintained.

These structural changes accompanied implementation of a standardized and automated logistics management information and inventory control system for all essential medicines and contraceptives at all system levels. This has provided more visibility into stock status from the central to SDP level. This increased visibility of essential logistics data has helped the central level play a stronger stewardship and oversight role in ascertaining that essential medicines are available, even though the regional level manages many logistics functions.

Although no formal developments are planned, the RH program will continually try to advocate with MOH to fully finance, delegate sufficient authority, and staff the logistics unit with capable and adequate personnel so it can help better streamline logistics management processes.

USAID and the Inter-American Development Bank originally supported MOH to institutionalize all logistics-related tasks for all essential medicines, including RH and family planning products, in the MOH structure. They originally supported creation of the logistics unit to help make sure that commodity groups about which they were most concerned would still be made available during and after MOH moved toward a more product integrated approach. USAID supported the technical assistance for establishing the LMIS and inventory control system, among other activities, to strengthen the logistics cycle, first for contraceptives and later for essential medicines when LMIS integration began.

USAID's support of the logistics system has decreased in the past year or two but may resume under the Global Health Initiative by further strengthening the logistics unit and transferring capacity to it from donor-supported "vertical" programs. UNFPA continues to support the RH and family planning program and management of related commodities

Adapting the LMIS and inventory control system developed for contraceptives to essential medicines has helped improve data visibility throughout the system and the stewardship role of the central level, and had significant impact on in-country supply chain performance. The automated system has been critical in this change since hundreds rather than dozens of commodities were dealt with when this shift happened. Close coordination between the logistics unit and MOH management information systems department was critical to success of design and implementation of the automated system.

A focus on commodity security and monitoring and evaluation through creation of a CS committee and empowering personnel responsible for managing different logistics functions have been key to help monitor and advocate for increasing support for this system in MOH. Committee program directors, civil society members, and logisticians have helped to hold decisionmakers accountable for stockouts by monitoring and sharing data such as prices paid for contraceptives, quantification amounts, stockout rates, etc. Specifically for contraceptives, civil society has played a large role in monitoring security risks and acting swiftly to hold the public sector accountable for efficiently procuring and distributing these products.

Although this has not happened, equipping the logistics unit with adequate and capable staff would be critical to furthering this institutionalization process. This would require financial and political commitment from MOH and organizational development and capacity-building support from donors.

During the past few years, the MOH increasingly recognized the importance of logistics, but commitment from key MOH decisionmakers has wavered, mainly because of politics such as a change in political party. The fact that a logistics unit exists has helped MOH begin to forge links among various actors in logistics management and to improve and make data managed throughout the system more visible.

Comparison to Lockamy and McCormack's Model

Building on defined processes and procedures for the various vertical programs, Guatemala's public health system has developed the Logistics Unit in an effort to centrally link and manage coordination of logistics management. However, only some functions have been centrally

coordinated in this way. The unit successfully developed a computerized LMIS for downstream visibility, but for most vertical programs, logistics functions remain centrally controlled. Meanwhile, these functions for essential medicines are primarily managed at the regional level based on oversight and guidelines from the central level.

Compared to Lockamy and McCormack's model, Guatemala would fall closest to completing the "Defined" stage in terms of structure and approach to logistics. Whether MOH will strengthen or weaken this unit is unclear, and with such uncertainty, the challenge is to find coordination among donor partners to help MOH develop a holistic and strategic vision of supply chain management and start dialogue with donors to support strengthening the supply chain at all levels.

Table 3. Country Case Study Summary

	“X State”, Nigeria Essential Drug Program	Burkina Faso Family Planning Distribution	Zimbabwe Logistics Sub-Unit	Bangladesh Family Planning Logistics and Supply Unit	Nicaragua Essential Medicines Division	Guatemala Logistics Unit
Current Structure	<p>Little definition for logistics roles or processes</p> <p>Very little visibility of logistics data in terms of capture, analysis and use</p> <p>Predominantly dependent on individual effort</p> <p>Frequent stockouts, limited product availability</p>	<p>Central and facility staff follow SOPs for logistics activities</p> <p>LMIS and forecasting managed by family planning directorate while CAMEG runs storage and distribution</p> <p>Some downstream visibility through LMIS, though low reporting rates</p> <p>Two dedicated logistics personnel at family planning directorate</p>	<p>Centralized logistics management for ARVs, male circumcision commodities and essential medicines</p> <p>18 dedicated personnel, including downstream and upstream logistics coordinators</p> <p>Oversees all logistics functions apart from storage, overseen by NatPharm and donor-led procurement</p> <p>Leads and facilitates stakeholder coordination using LMIS data and tracked performance</p>	<p>Centralized logistics management for family planning</p> <p>Unit reports to DGFP, which is vertical system</p> <p>16 central and 270-plus personnel oversee all logistics functions through distribution to upazilas and donor coordination</p>	<p>This central division oversees most logistics functions and reports to vice-minister</p> <p>Significant authority vested in Essential Medicines supervisors at regional level</p> <p>CS Committee capable of advocating for family planning logistics needs</p>	<p>Central, high-profile logistics unit has limited authority</p> <p>Oversees LMIS</p> <p>Most Essential Medicines logistics functions managed at regional level</p> <p>Logistics for vertical programs managed centrally</p>

	“X State”, Nigeria Essential Drug Program	Burkina Faso Family Planning Distribution	Zimbabwe Logistics Sub-Unit	Bangladesh Family Planning Logistics and Supply Unit	Nicaragua Essential Medicines Division	Guatemala Logistics Unit
Historical Development	Originally established as donor-supported drug revolving fund Performance has deteriorated Working with donor partners to define and improve warehousing and procurement practices	Follows SOPs developed in 1999 though currently revising Family planning distribution integrated into CAMEG’s Essential Medicines portfolio in 2004	Rapid development following 2006 rollout of logistics SOPs and assessment advocating formation of LMU Documented success in product availability led to absorption of Essential Medicines logistics management, which accompanied LSU transition to higher organizational position	Consolidation of delivery tiers in 1999 from five to four Transition to government-led procurement Demonstrated contract management for transport Data visibility improved through web-based LMIS	In past ten years, Essential Medicines Division given greater standing Essential Medicines supervisors enjoyed similar rise in status LMIS strengthened for greater visibility	Unit had quickly been staffed and given hierarchical position but has since been de-staffed, while other programs remain partially vertical and centralized
Key Supply Chain Strengthening Investments	Undergoing process definition and strengthening efforts	SOP development and rollout, subsequent revision Strengthening of logistics functions for warehousing at facility and LMIS execution	SOP development and roll out, strengthening of logistics functions Creation of LSU and support of 18 staff for management of this	Logistics Support officers maintained adherence to SOPs Development of web-based LMIS Support of government-led procurement	Strengthening of logistics data and training on data use Empowerment of MOH logistics staff Strengthening CS committee monitoring and coordination role Functional	Original staffing of Logistics Unit Creation and empowerment of CS committee Creation and strengthening of LMIS of Essential Medicines

	“X State”, Nigeria Essential Drug Program	Burkina Faso Family Planning Distribution	Zimbabwe Logistics Sub-Unit	Bangladesh Family Planning Logistics and Supply Unit	Nicaragua Essential Medicines Division	Guatemala Logistics Unit
					strengthening of individual programs	
Comparison to M&L’s Model	Closest to ad hoc	Has functional definition, is improving internal linkages	High levels of internal linkage/coordination through centralized, dedicated staff	High levels of internal linkage/coordination Improving ability to interact with suppliers	Significant logistics management at central and regional levels Programs have reinvested in functional roles and definition throughout health-reform process	Defined roles and processes Coordination of process on regional level, but development of coordinating body at national level slowed

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USAID | DELIVER PROJECT

John Snow, Inc.

1616 Fort Myer Drive, 11th Floor

Arlington, VA 22209 USA

Phone: 703-528-7474

Fax: 703-528-7480

Email: askdeliver@jsi.com

Internet: deliver.jsi.com