



Other Duties as Required: Efficient Use of Human Resources

Vaccine Supply Chains:
Reaching the Final 20 Policy Paper Series
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VILLAGE REACH.
STARTING AT THE LAST MILE...

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Policy Series Overview

We are mid-way through the *Decade of Vaccines*, marking a period of significant activity to prevent millions of deaths through a more equitable access to vaccines. Today, more than 80% of children around the world receive a complete routine of life-saving vaccines during their first year of life. The *Decade of Vaccines* was established to bring attention to the importance of reaching that final 20% of children without access to these life-saving vaccines. This decade is bearing witness to many exciting efforts to strengthen routine immunization, accelerate control of vaccine-preventable diseases, and introduce new and improved vaccines.

To a large extent, the evaluation of this decade's success will be based on the degree to which vaccines reach the people who need them. A strong end-to-end supply chain should adapt to the resource constraints of these communities to ensure that delivery is complete: from the point of production of the vaccine at the manufacturing unit to the point of immunization.

This policy series considers the different components of the supply chain, addresses the challenges faced at the last mile for distribution, and presents examples of innovative approaches to address those challenges. This second paper in the series focuses on the role of human resources and the specific challenges facing individuals within the health system to adequately address the needs of vaccine supply chains, particularly in low resource communities.

VillageReach Overview

VillageReach has worked for more than a decade to develop, test, and refine system innovations to improve the performance of in-country vaccine supply chains. Working closely with the Ministry of Health in Mozambique and with support from the Bill & Melinda Gates Foundation, the *Final 20 Project* (aimed at reaching the final 20% of children without access to vaccines) is building a sustainable model of innovative supply chain design, enhanced data collection and reporting, and public-private partnerships to improve the vaccine supply chain.

To address the unique challenges of last mile distribution, VillageReach is engaged in a multi-year program in Mozambique to improve the performance of the vaccine supply chain, focusing on rural communities that represent over 50% of the country's population. The approach – *the Dedicated Logistics System (DLS)* – was developed in collaboration with provincial governments and the Mozambican organization *Fundação para Desenvolvimento da Comunidade* (FDC). The DLS uses task shifting, level jumping, and dedicated resources to improve vaccine supply chain effectiveness and efficiency.

Requirements at the Last Mile:

The Importance of Health Workers at the Last Mile

The importance of motivated and competent health workers throughout the supply chain and particularly at the service delivery point cannot be understated. Without qualified health workers to manage the logistics of forecasting, procurement, and distributing commodities to health facilities, medicines will not be available at the service delivery point. Without competent health workers at the final step of the supply chain, these important life-saving commodities could not be dispensed to patients.

Challenges to Last Mile Human Resources

The crisis in human resources for health in low-income countries has been documented many times over by research and experience.^{1,2} WHO has defined the critical threshold for health workers at 23 doctors, nurses and midwives per 10,000 population, yet only five of the 49 low-income countries meet that threshold, with particular challenges in remote and rural areas.³ Mozambique, for example, has three health workers per 10,000 people. In a country of more than 18 million, this leaves a serious gap in health service delivery.

At the service delivery point of an immunization program, this shortage of human resources results in overworked health workers tasked with many responsibilities for primary care of patients as well as supply chain functions. Supply management tends to become incidental or passed on to anyone else who is available, including non-health professionals such as cleaners and drivers.⁴ Few countries have dedicated supply chain management roles within their cadre of health workers, exacerbating the problems with supply chain management as well as inhibiting the support health workers need in order to adequately manage the supply chain-related tasks they are accountable for.

Inadequate training in logistics and supply chain management is another challenge faced by health workers in the vaccine program. In Mozambique, basic logistics is included in pre-service training for most levels of health workers; however, this is one small part of a training program that emphasizes care and treatment over supply chain management. By the time a health worker is posted at a rural health center, logistics is just a small part of his or her job with neither on-going training nor supervision to maintain the knowledge gained during pre-service training.

In the common multi-tier vaccine supply chain shown in Figure 1 (page 4), health workers from the health centers fill in a requisition form each month for vaccines needed, calculated based on existing stock and expected consumption for the next month. Often, these requisitions are sent up the hierarchical chain, but the quantity of vaccines received is different than what was requested. Feedback loops do not exist from the district level to the health center to explain why the quantities may be different. This results in a disempowered work force, unmotivated to fulfill their tasks as the tasks go unacknowledged.

When you use a nurse or a physician as a logistician, you lose the nurse or physician and you don't get a good logistician!"

Prof. Saracino,
former Minister of Health,
Côte d'Ivoire

A fundamental issue in human resources in the vaccine supply chain is the system in which the health worker is working. As in the common multi-tier system example, vaccines should be delivered directly to the health center based on requisition forms. However, often resources such as personnel, vehicles, and fuel are not available to ensure distribution. The system then collapses into an ad hoc

¹ Chen L, Evans T, Anand S, etc. Human resources for health: overcoming the crisis. *Lancet* 2004; 364.

² Scheffler R, Mahoney C., Fulton B., etc. Estimates of health care professional shortages in sub-Saharan Africa by 2015. *Health Aff.* 2009, vol 28.

³ WHO. Achieving the health-related MDGs: It takes a workforce! 2014; http://www.who.int/hrh/workforce_mdgs/en/. Accessed 10 April 2014.

⁴ VillageReach. District logistics capacity study: Examining the capacity of 53 districts in Mozambique to carry out health logistics and supply chain activities. 2013.

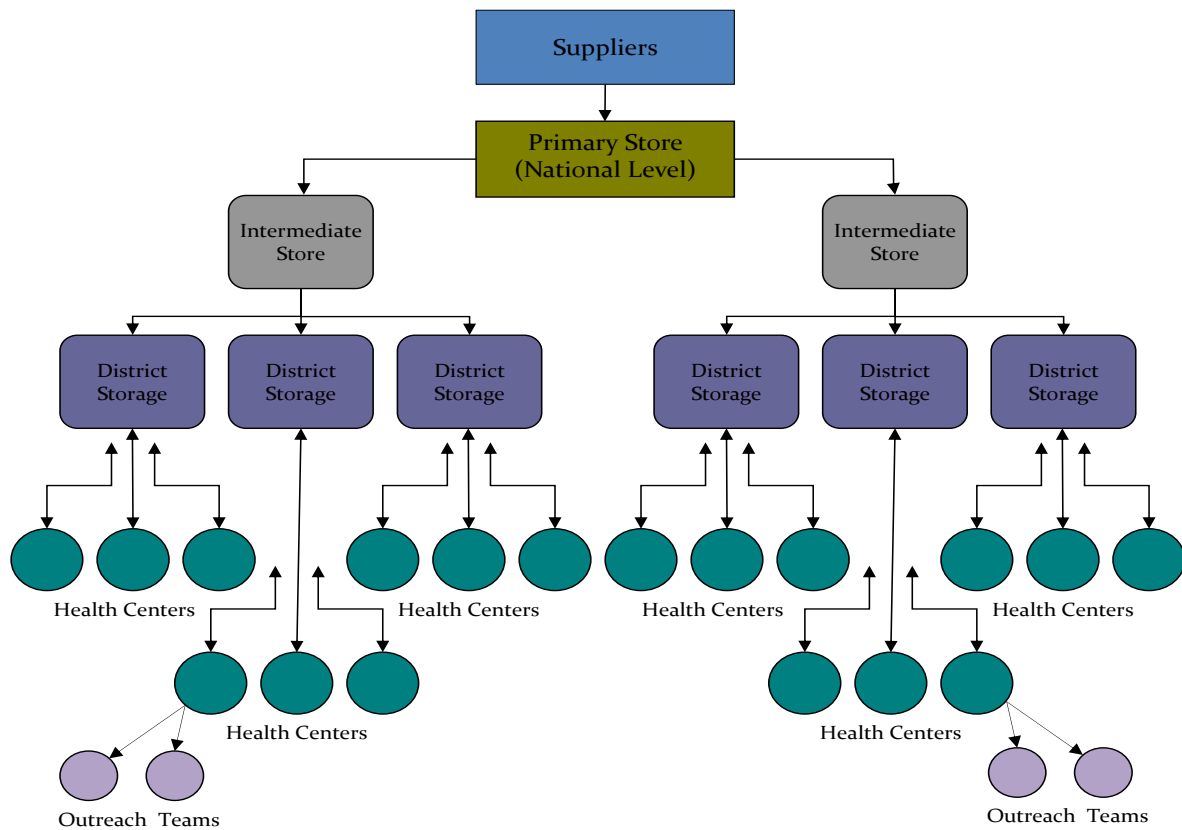


Figure 1: Common multi-tiered vaccine supply chain

approach, where health workers arrange for transport and spend a day or more away from the health center to fetch the vaccines themselves. This is outside the health worker's job description, yet it is required for the functioning of the health center. A last mile health worker must become a jack of all trades and a master of none.

Often, training is provided to improve supply chain management; however, training and revised guidelines do not take into account an overall distribution system that has adapted to an ad hoc approach to be able to respond to the reality on the ground. Thus training provided does not meet the requirements of the system.

Project Optimize, a collaborative effort between PATH and WHO to strengthen vaccine supply chains, summarized these key gaps in human resources for the vaccine supply chain⁵:

- The role of the supply chain manager does not receive the same **recognition** and **motivation** as other health care workers.
- Supply chain management typically does not require pre-service training and adequate certifications as other cadres do, which would document the **competence** in the area.
- The health system has an inadequate **number** of supply chain specialists, passing logistics functions to other health workers. Additionally, less attention is paid to supply chain management at the last mile where health workers are stretched between many responsibilities.
- **Synergies** typically do not exist among programs and donors; for example, support for supply chain management may exist in HIV programs but is lacking in maternal and child health programs.

For the vaccine supply chain, these gaps have serious implications for ensuring vaccines are available at the last mile.

⁵ Optimize, PATH, WHO. 2011. Vision of future immunization supply and logistics systems: Tenet 5 landscape analysis summary. 2011. http://www.path.org/publications/files/TS_opt_vision_2020.pdf.

Promising Practices for the Last Mile

An emerging promising practice for supply chain management is shifting responsibilities away from overworked health workers to dedicated logistics personnel to work solely on supply chain and logistics tasks.⁶ This approach brings advantages of having well-trained personnel to manage stock and distribution and allowing clinicians to focus on providing care. Depending on the country and system design, these dedicated personnel can be placed at the national level to focus their expertise on forecasting and procurement, at the central level warehouse to improve distribution systems, or at even lower levels of the supply chain to streamline distribution and ensure vaccine availability at the last mile.

The DLS Approach

The Dedicated Logistics System (DLS) (Figure 2) works through a few dedicated personnel to manage the vaccine supply chain in each of the four provinces in Mozambique where it is operating. Due to the lack of resources and infrastructure at the lower levels of the supply chain, the DLS moves supply chain management functions as high up in the supply chain as is geographically feasible. It consolidates functions at the provincial level where the limited resources that are available can be focused. Depending on the size of the province, two to three field coordinators follow transport loops to deliver vaccines from the provincial level directly to the health centers.

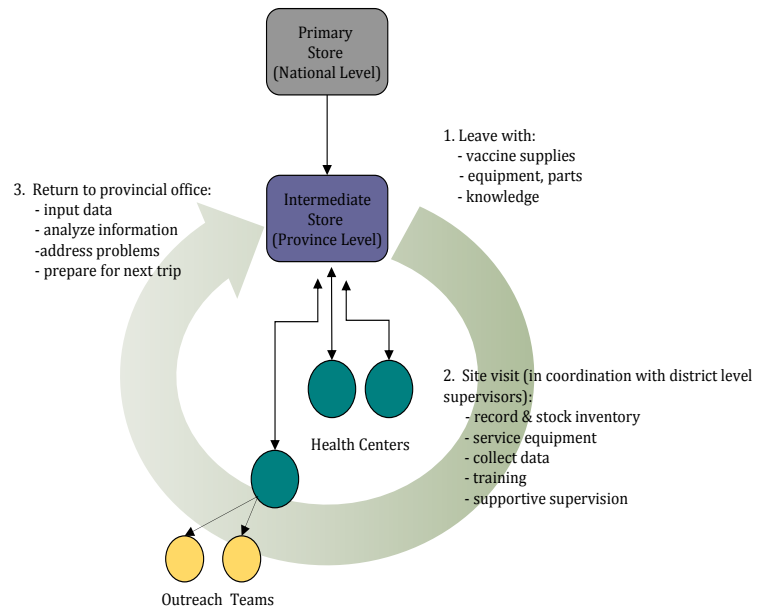


Figure 2: Dedicated Logistics System. The replenishment decision and distribution responsibility are moved up to the tier where resources for inventory management are available.

During distribution they provide supportive supervision at the health centers, perform preventive maintenance for the cold chain, ensure the quality of data, and distribute the appropriate amount of vaccines based on real-time consumption data.

"I am more present in the health unit since the DLS started because I don't have to travel to the district to collect vaccines. I have vaccines available every day, and I have more time to do my job, see the patients, and organize data. Before, I used to do at least two to three trips in a month to collect vaccines."

– António Victorino, Nurse at Malehissa Health Center
Gaza Province, Mozambique

⁶ Brossette, V. Workforce excellence in health supply chain management: Literature review. People that Deliver. 2010. <http://peoplethatdeliver.org/sites/peoplethatdeliver.org/files/People%20that%20Deliver/files/Literature%20Review%20EN.pdf>

The advantages of this system in contexts where human resources are constrained are best described by comparison. In the common multi-tier system, one province in Mozambique would need a vehicle, driver, and vaccine program specialist at the provincial level to distribute vaccines to the ten districts. Each of the ten districts would then need the same human resource and equipment components to reach about ten to twelve health centers in each district. This also requires about 100 health workers at the health center level who perform supply chain tasks as a minimum part of their overall responsibilities. Total equipment and human resource requirement is 11 vehicles, the accompanying fuel, and more than 130 personnel who are adequately trained and skilled in supply chain management.

	Common Multi-Tier Model	DLS
Description	<ul style="list-style-type: none"> HWs responsible for picking up vaccines & supplies from the districts/provinces Health centers closed during this time instead of providing services HWs face challenges in securing transport to make vaccine run Difficulty maintaining vaccine temperature during transport 	<ul style="list-style-type: none"> Dedicated teams focused on logistics, cold chain, inventory management, supportive supervision, data collection Responsibility, accountability, authority assigned to small dedicated team, instead of being diffused among all HWs Frees up HW time to focus on patient care
Personnel	Task diffused to 134 workers	Task consolidated to 6 workers
Personnel Costs	<ul style="list-style-type: none"> \$75,482.23 (\$40,106 more) Per diems for many HWs Personnel costs are 28% of vaccine logistics costs 	<ul style="list-style-type: none"> \$35,376 Negotiated per diems for small number of full-time distribution workers Personnel costs are 12% of vaccine logistics costs
Staff Days/Month	348	138
Results	<ul style="list-style-type: none"> 498,624 vaccines delivered (per year) \$1.50, total cost per dose of vaccine delivered 70% DTP-3 coverage rate 	<ul style="list-style-type: none"> 889,152 vaccines delivered (per year) \$1.18, total cost per dose of vaccine of delivered 95.4% DTP-3 coverage rate

➤ The additional 210 staff days required to run the Ad-hoc Model falls **entirely** on the HWs; the DLS reallocates this time to HWs providing healthcare rather than collecting supplies and filing stock inventory reports

Figure 3: Multi-Tier System versus DLS

Source: VillageReach. Comparison of costs incurred in Dedicated and Diffused Vaccine Logistics Systems: Cost-effectiveness of vaccine logistics in Cabo Delgado and Niassa provinces, Mozambique. October 2009.

On the other hand, in the DLS, supply chain tasks are consolidated in the hands of two to three field coordinators and drivers who do the job full-time. As trained logisticians, the field coordinators determine the quantities of vaccines to distribute based on actual consumption at the health center, requiring less forecasting skills from a health worker and freeing up time to focus on patient care. As such, training and provision of technology can be focused on these key supply chain personnel. The placement of these personnel at the provincial level also matches the reality of the system as financial resources required for distribution are more likely to be available at the provincial level than the district level. With dedicated personnel at higher levels of the system instead of at every health center, there is more efficient use of human resources.

Results from the initial pilot project of the DLS in the province of Cabo Delgado in Mozambique demonstrate the effectiveness and efficiency of this system (see Figure 3).^{7,8} Cost per dose of vaccines was reduced, vaccine coverage increased, and the personnel costs as part of total vaccine logistics costs were half of what they were in the multi-tier system. Most importantly, this approach reduced stock-outs and improved vaccine coverage.

“With the DLS, mothers started trusting the program. They come now because they know they will find vaccines. This system solved the problems of vaccine stock-outs. Before I didn’t have money to get public transport to go to the district to collect vaccines.”

– Emilia Albino Chilaule
Nurse at Alto Changane Health Center
Gaza Province, Mozambique

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From the people perspective, this system frees up a health worker’s time to allow him or her to focus on clinical care instead of the logistics of picking up vaccines and filling out stock inventory reports. With improved system efficiencies and fewer non-clinical demands, a health worker can provide improved care to children, not having to turn anyone away due to a stock-out or having to travel to pick up vaccine supplies.

The effectiveness of the field coordinator position is largely due to its synergy with the overall system design which has been specifically adapted to the on-the-ground realities of these provinces in Mozambique. The people component of the supply chain is one of many components and must consider the reality in which it operates.

Global Innovations at the Last Mile

Systems like the DLS, which deploy dedicated logistics personnel as an integral component of vaccine supply chain design, are also being tested and implemented in other countries, as in Senegal and Benin. Since 2011, a moving warehouse in the Saint-Louis region of Senegal transports vaccines and supplies from regional stores directly to 110 district warehouses and health posts.^{9,10} Dedicated personnel travel in delivery circuits each month and are responsible for confirming existing vaccine stock at the health center as well as the previous month’s consumption. The moving warehouse has been a very popular and successful innovation and now includes reproductive health products and other commodities for malaria, TB and HIV programs. In Benin, within the context of system optimization, the MoH and immunization partners evaluated the common multi-tier system and three optional supply chain models.¹¹ Based on the results of this assessment, the stakeholders agreed on several points to pursue in the strategy to optimize the supply chain, one of which was the professionalization of operations management of the supply chain at the district level.

These examples have all helped to build the evidence base needed to encourage new thinking across many countries on how to best deploy limited human resources to improve vaccine supply chain

⁷ VillageReach. Comparison of costs incurred in dedicated and diffused vaccine logistics systems: Cost-effectiveness of vaccine logistics in Cabo Delgado and Niassa provinces, Mozambique. Seattle, Oct, 2009.

⁸ Kane, M. Evaluation of the project to support PAV (Expanded Program on Immunization) in northern Mozambique, 2001-2008: An independent review for VillageReach with program and policy recommendations. Seattle, Nov, 2008.

⁹ Guèye T., Coulibaly M., Leye I. Senegal says yes to the moving warehouse. Optimize Newsletter. Issue 13, July 2012.

¹⁰ World Health Organization, PATH. Optimize: Senegal Report. Seattle: PATH; 2013.

¹¹ Ministry of Health – Benin, AMP, LOGIVAC, WHO. Report of the vaccine supply chain optimization second workshop in Benin. Cotonou. Sept, 2012.

efficiency. Other approaches for the people component of the supply chain are being tested and documented as well.^{12,13}

Outsourcing- Some ministries of health are starting to outsource supply chain management functions to the private sector in order to free up human and financial resources. Outsourcing can be used to leverage private sector expertise effectively for warehousing and distribution of commodities, for example, bringing efficiencies to distribution routes or improving fleet utilization, management and maintenance. Outsourcing allows ministries of health to focus on their core competencies of health service delivery and health system management and to redistribute non-core tasks to experts from other sectors. More information on outsourcing can be found in the Private Sector Engagement [Guidance Document](#).

Performance Management- Performance management has recently become a popular term and practice which entails establishing clear performance expectations and providing firsthand and practical feedback through supportive supervision. This can include non-financial incentives such as recognition for good performance and supporting the achievement of professional goals, as well as participation in professional networks. The objective is to create on-going opportunities to improve knowledge, skills, and performance, which will increase a health worker's motivation and job satisfaction.

Optimizing Human Resource Policies and Plans- Ministries of health and stakeholders are beginning to focus on workload modeling to determine the number of staff required within the current system design and if changes are made to the system. These exercises can lead to a rethinking of the types and numbers of personnel needed to manage logistics tasks, and can provide countries with a clearer understanding of the financial efficiencies of one human resource plan over another which may be otherwise difficult to quantify. In these models, a health worker's terms of reference must match the reality of the system in which he works and must consider a realistic workload.

Each approach has its benefits and challenges and must be carefully considered within the context in which it is introduced. Outsourcing procurement may be appropriate for a ministry of health that can provide careful management and oversight, for example, but less appropriate for a ministry without the capacity to manage the third party. At the same time, improved training and certification for health workers is ineffective if within a distribution system that does not function.

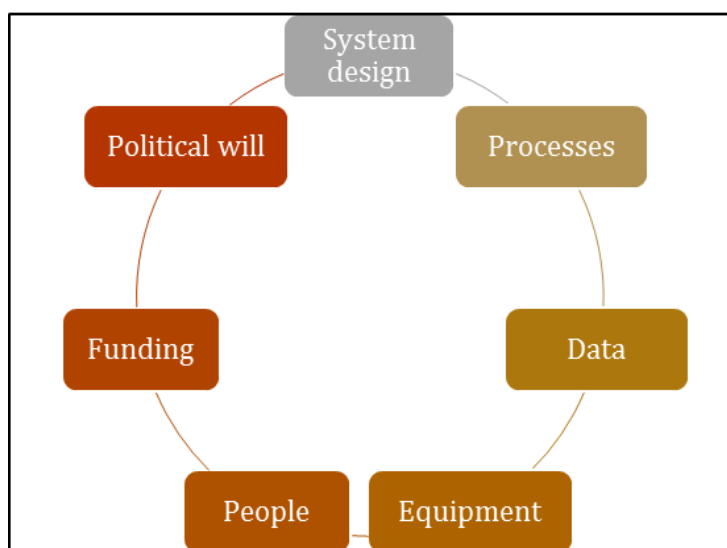
Conclusion

In much of the literature around human resources for health, training is suggested as a solution to personnel shortages; however, reality shows that training and circulating guidelines is insufficient to develop a strong, functioning vaccine supply chain. Other approaches are needed that involve considering the overall system design and how effective and efficient deployment of human resources fits into that design. Having dedicated logistics personnel has proven successful in Mozambique, Senegal and Benin within the context of system optimization for the vaccine supply chain. Dedicated positions were created to fit the context, available resources at the appropriate levels, and the system design itself. Other approaches may be more suitable in a different context. The simple message is that the people component of the vaccine supply chain requires competent personnel with skill- and resource-appropriate responsibilities for the system in which they are working. Additionally, they must be supported by supervisors, clear procedures and strong policies.

¹² Brossette, V. Workforce excellence in health supply chain management: Literature review. People that Deliver. 2010.

¹³ United Nations Commission on Life-Saving Commodities, Technical Reference Team. Private sector engagement: A guidance document for supply chains in the modern context. 2014.

Policy Series Background



Components of the Vaccine Supply Chain

This paper is the second in a series addressing the components of the vaccine supply chain. The health supply chain is a dynamic ecosystem which can increase access to high quality products by efficiently bringing the different components together to ensure delivery of commodities, as seen in the figure above. *System design* involves the set-up of the components of the supply chain system and how they interface with each other. The *processes* and policies determine how logistics practices get implemented in the field. Information and *data* flow influence forecasting, procurement, and daily management of the system, both at the global and in-country levels. *Equipment* ensures vaccines are delivered and have proper storage at every point of the supply chain. A key component is the *people* who operate and influence the supply chain and their capabilities, expertise, culture and behavior. The availability of *funding*, and particularly the flow of funding for each of the different levels of the system, is vital to ensuring delivery of vaccines. Finally, *political will* and the aspirations of leaders and champions can influence the performance of a supply chain by regulation and creating an enabling environment. Determining how the seven main components of the vaccine supply chain work together ultimately influences the degree of availability of vaccines at the point of immunization.

Future papers in this series will address other components, drawing on the evidence from the last mile of vaccine distribution through the *Final 20 Project* and global experience.

For more information, please visit www.villagereach.org.

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