Technical Report

Integration: Guidance for the Reproductive, Maternal, Neonatal, and Child Health Context

JSI Research & Training Institute, Inc.

May 2014

Health Logistics

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Recommended Citation:
JSI Research & Training Institute, Inc. 2014. *Integration: Guidance for the Reproductive, Maternal, Neonatal, and Child Health Context.* Arlington, Va.: JSI Research & Training Institute, Inc., for the UN Commission on Life-Saving Commodities for Women and Children, Supply and Awareness Technical Reference Team.

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Acronyms

EWEC	Every Woman, Every Child
ILS	integrated logistics system
JSI	John Snow, Inc.
MOH	Ministry of Health
PFSA	Procurement Fund and Supply Agency
UN	United Nations
UNCoLSC	UN Commission on Life-Saving Commodities for Women's and Children's Health
USAID	United States Agency for International Development
WHO	World Health Organization

Introduction and Executive Summary

Under chairmanship of the former Prime Minister of Norway and the President of Nigeria, the UN Commission on Life-Saving Commodities for Women's and Children's Health (UNCoLSC) was created in 2012 as part of the Every Woman, Every Child (EWEC) effort to mobilize global resources toward saving the lives of 16 million women and children by 2015.

In support of the reproductive, maternal, newborn, and child health (RMNCH) continuum of care, 13 life-saving and under-utilized commodities were selected as part of the UNCoLSC's focus. The Commission believes that five years of scale-up to support availability and access to these commodities would cost U.S.$ 2.6 billion and could save 6 million lives (United Nations Foundation 2013).

This scale-up in availability and access will require, among other efforts, increased country level supply chain capacity. Beyond basic investment in capacity in the form of warehouses, vehicle fleets, and staff, integration of commodity supply chains offers a general mechanism for pursuing supply chain performance improvements and improved use of available capacity. However, to country level decisionmakers, integration may hold multiple meanings, and the proper approach for achieving this end state may be even less clear. Additionally, the diversity of country contexts requires careful case-by-case consideration of integration's implications on management and strengthening of the supply chain.

Purpose of this Guide

This document provides technical guidance to country supply chain stakeholders on how to best apply product integration, particularly in relation to the 13 life-saving and under-utilized commodities of the UN Commission. It outlines important considerations related to integration, providing pathfinder countries with practical guidance for ensuring appropriate, efficient, and effective management of supply chains for the 13 UN Commission priority life-saving commodities in an integrated context. For country supply chain stakeholders this document provides guidance on where to look for opportunities for integration that is likely to provide benefits and, subsequently, how to approach integration efforts. Through document review and development of country case examples, this document covers the *what, why,* and *how* of supply chain and commodity integration.

This document is complemented by three country case studies (for Nigeria, Tanzania, and Sudan) that help to contextualize the variety of applications of integration.

Key Messages

Definition of integration for this guide: efforts to strengthen the health care supply chain to reduce operational redundancies and reorient policies to accommodate product and recipient logistics characteristics, often supported by supply chain capacity strengthening efforts.

Intended benefits of integration: reduced total capital and operational costs, reduced management complexity, improved oversight and coordination, improved supply chain performance.

Stakeholders attempting integration of the 13 commodities should generally consider the following:

- The current context for integration related to UNCoLSC commodities and pathfinder countries.
- The logistics characteristics of products, consumer groups, and functions to integrate.
- The previous integration experiences of developing country health care supply chains.

Acknowledgments

The author wishes to thank several staff who provided critical input in shaping and refining this document. Maeve Magner, Clinton de Souza, and Michael Harrigan all provided considerable technical review of the country case studies and an early version of this guide. The case studies would not have been possible without the input, assistance, and review of the following people: Innocent Ibegbunam, Delali Bonuedi, Chris Wright, Stephen Harsono, and Gamal Khalafalla Muhammed.

Integration for Health Care Supply Chains: Key Concepts and Drivers

Understanding the general approaches to achieving integration first requires an understanding of what integration might mean for country-level health care supply chains, and why country stakeholders would want to pursue it.

A dictionary definition might point toward an understanding of integration as any effort that brings separate pieces into a cohesive whole. However, this term can have many interpretations within public health, as it is used in multiple contexts (both within and outside of supply chain management) for various reasons.

A common conceptualization of integration in health care supply chains is of an effort to merge previously parallel country-level supply chains to mirror health sector reform toward provision of public health services as a “one-stop shop” (Allain et al. 2010). This may include merging vertical health system operations, merging systems that supported the same commodities in parallel, or potentially adding a “new” commodity to an existing country supply chain mechanism. For any of these approaches, integration can include merging management structures and/or merging operational functions and infrastructure (e.g., moving commodities into the same warehouse or combining the information systems of commodity groups) (Yadav et al. 2013).

As a hypothetical example of this type of integration, one country might have a parastatal central medical store responsible for storage, distribution, and logistics information collection related to essential medicines, whereas individual health programs and external funders are responsible for these activities as they relate to the commodities that support their health services. An integration effort in this context might involve consolidation of all logistics and supply chain responsibilities within the central medical store.

Another applicable term in this context is harmonization, which implies that, rather than blindly assuming that all management and operations should be fully consolidated, partners look for specific areas and functions that will most likely produce the desired performance and efficiency benefits.

Continuing the hypothetical example from above, harmonization in this context might involve country partners consolidating the distribution operations of some programs but not all, based on shared complementary distribution cycles and commodity handling requirements. Or it could involve partners consolidating all separate logistics information systems into one reporting system while allowing individual programs to make use of that information independently, given the similarity of data points needed from service delivery points.

The interest and pursuit of this general type of commodity integration are driven by a desire to reduce redundancy and increase resource effectiveness, potentially in support of health sector management or service provision reform efforts and, in some cases, to better comply with initiatives such as the 2005 Paris Declaration on Aid Effectiveness or the 2009 Global Health Initiative. Theoretically, fixed costs, such as installation of infrastructure or establishment of contracts, can be better spread over larger volumes if operations are consolidated. If two partners are distributing similar commodities to similar

locations but using parallel infrastructure and operations, the two partners could potentially experience lower average costs by combining their commodities into a single system. Additionally, further system strengthening investments can be targeted in a way that they benefit more program commodities.

Merging or harmonizing supply chain resources might also be pursued to reduce perceived management complexity in the supply chain caused by the number of independent organizations involved. A noted driver of the efforts to integrate parallel HIV supply chains in Nigeria (see attached case study) was the significant level of stockouts and expiries experienced by the system due to the large number of partners involved and the lack of coordination and data sharing between them. This type of integration then becomes a potential mechanism for reducing management complexity and allowing for more effective control over country operations.

Outside of this general public health perspective of the term, integration also appears in generic supply chain management materials. Commercial sector and academic supply chain literature uses the term integration to refer to efforts that improve overall supply chain performance by increasing the levels of alignment of objectives, coordination, and data visibility across intrafirm business functions as well as the external upstream and downstream partners that make up a supply chain (Fawcett and Magnan 2002). The concept fits directly into many definitions of superior supply chain management. Coyle, Langley, Novak, and Gibson define a supply chain as “a series of integrated enterprises that must share information and coordinate physical execution to ensure a smooth, integrated flow of goods, services, information and cash throughout the pipeline” (2013). Along these lines, integration is a crucial stage in improving supply chain performance—strengthening the linkages between logistics functions (e.g., planning, procurement, and storage) and the individual business entities that conduct these functions partly by creating dedicated supply chain management capacity (Lockamy and McCormack 2004).

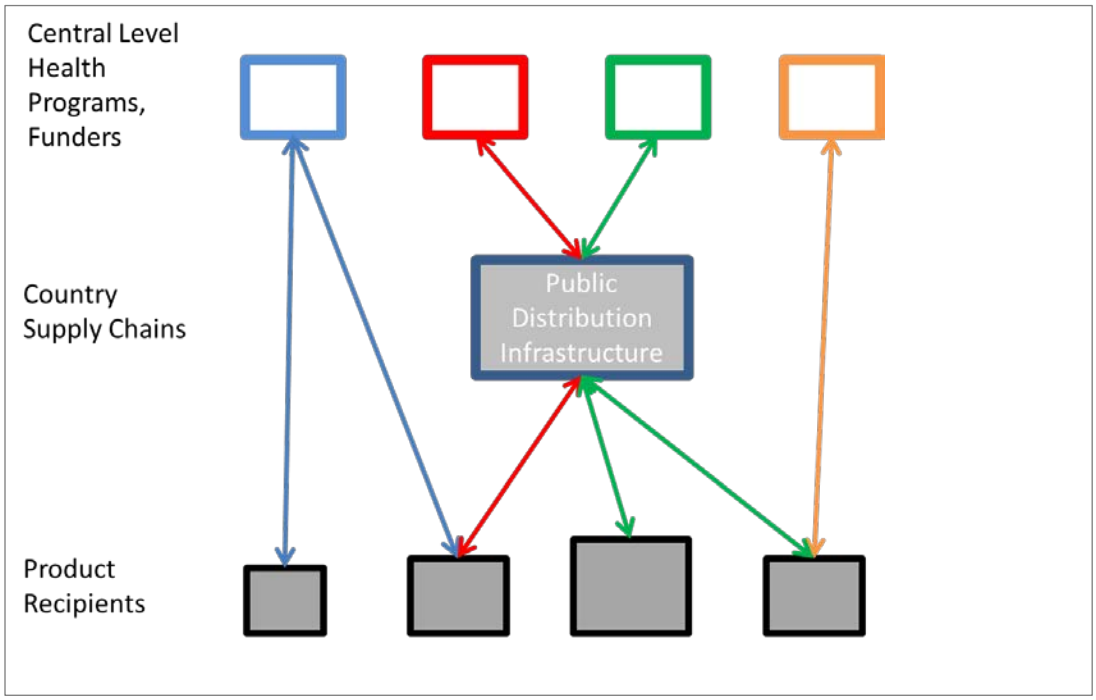
IBM, the information system hardware and data services company, conducted an effort in 2003 to create a dedicated supply chain management unit within its organization structure. With the creation of the Integrated Supply Chain (ISC) unit, staff from numerous functional and product divisions were brought together to harmonize approaches and better align operations. The new unit placed emphasis on creating customer value and strengthening the end-to-end supply chain processes rather than individual department silos. In the words of the unit lead, “we haven’t tossed out the individual metrics, but we have added new ones that tie the entire supply chain together with common goals and objectives” (Goodman 2006).

As illustrated by the IBM example, the academic and commercial sector conceptualization of integration does not directly contradict the common public health usage of the term. Instead, it provides an additional perspective of achieving performance improvement by strengthening interactions across functions and partners rather than solely focusing on cost reduction, although cost and redundancy reductions are still important elements.

In this way, integration within a health care supply chain can be seen as a tool with two broad purposes: (1) reduction of redundancy and (2) orientation of operating partners and supply chain policies toward satisfying customer demand rather than commodity funders.

For the purposes of this document, the research and recommendations relate most directly to merging and harmonizing in-country commodity supply chains (the common public health definition) but are not decontextualized from related supply chain strengthening efforts (which tie more closely to the supply chain academic use of the term) and from the desire for end user-oriented supply chain design.

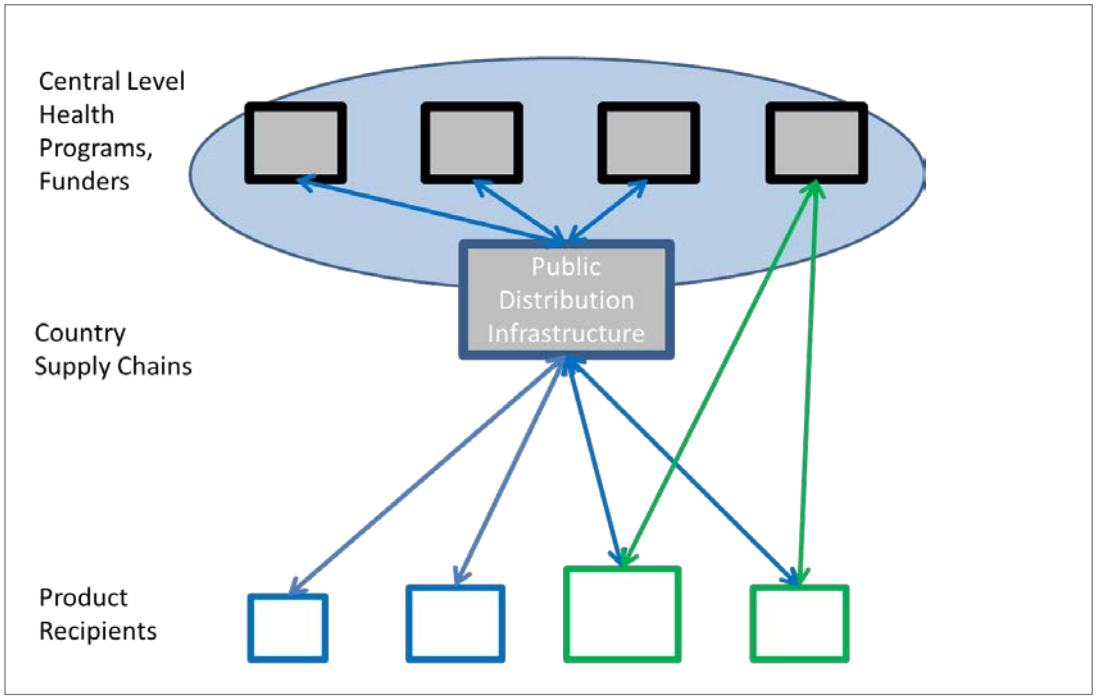
Figure 1. Common Pre-integration Health Care Supply Chain Landscape.



This diagram depicts a highly simplified version of the wiring diagram commonly used to depict the complexity of in-country health care supply chains. In this setting, there are multiple parallel supply chains supporting, in some cases, the same products destined for the same health facilities. The design and scope of these supply chains are driven largely by program management organizational structure and by the funding source of the commodity. For example, the yellow could depict a set of specialized commodities funded and delivered by a nongovernmental organization (NGO) to a select set of facilities, whereas the blue might represent a health program that manages its own operations outside of the main national system.

Integration in this setting would transition to the situation in figure 2.

Figure 2. Hypothetical Post-integration Health Care Supply Chain Landscape.



This diagram depicts the same funder and product recipient environment as figure 1 after an integration effort. Most importantly, the supply chain designs are driven by product and recipient logistics considerations (e.g., campaign or routine service provision, accessibility of facilities, or product shelf life—described further in this guide) rather than program and funding source. Additionally, products are distributed together using the same procedures and resources where it makes sense to do so. Hypothetically, the green distribution channel represents a specialized set of supply chain capacity dedicated to short shelf life laboratory reagents and collection of testing samples, which would not be well served by the predominant resupply system. Finally, an element of coordination (depicted by the blue circle) and supply chain oversight exists among planners, stakeholders, and supply chain operators.

Integration: efforts to strengthen the health care supply chain to reduce operational redundancies and reorient policies to accommodate product and recipient logistics characteristics, often supported by supply chain capacity strengthening efforts.

Intended benefits: reduced total capital and operational costs, reduced management complexity, improved oversight and coordination, and improved supply chain performance.

Considerations for Product Integration: How Should Country Programs Approach and Implement Integration in Their Context?

Once stakeholders have a sense of what integration includes, and what the intended benefits are, a remaining question is how they should pursue it. This section covers the following implementation considerations:

- The current context for integration related to UNCoLSC commodities and pathfinder countries.
- The logistics characteristics of products, consumer groups, and functions to integrate.
- The previous integration experiences of developing country health care supply chains.

Current Country Contexts Regarding UNCoLSC Commodities Define the Range of Relevant Integration Activities

The path a particular country or health program takes toward integration will depend on local contextual factors, including the current landscape of country health care supply chains. Many developing countries have already brought most health program supply chains together within a unified national public health supply chain, but the exact extent of this inclusion does vary even among countries that operate self-described integrated supply chains.

In Ethiopia in 2007, for example, the Procurement Fund and Supply Agency (PFSA) was established and tasked with forecasting, procuring, and distributing all health commodities in the public sector's supply chain (RMNCH Landscape Synthesis Summary Report 2013). Supply chain management of new or niche reproductive health commodities therefore can already be assumed to fall under PFSA's domain. However, according to a survey conducted among National Immunization Programme managers across the World Health Organization (WHO) African region, several supply chain functions including national procurement and national receipt of vaccines are not integrated into the predominant national supply system (Yadav et al. 2013). From an RMNCH perspective, there is little room for further integration of commodities.

Tanzania also operates an integrated logistics system (ILS) that covers most logistics functions for most commodities. Some commodity groups, such as laboratory commodities, technically fall within the ILS but operate under different inventory control policies from the majority of commodity groups. Additionally, quantifying and budgeting family planning commodities, including implants, is conducted by the Reproductive and Child Health Section of the Ministry of Health rather than a single catch-all forecasting effort (United Nations Foundation 2013). Meanwhile, female condoms and emergency contraceptives have not been a part of the public sector previously, meaning that further integration could involve introduction of these commodities to the ILS and harmonization of family planning quantification with other programs' efforts.

Uganda operates national medical stores (NMS), which support integrated storage and distribution for public health commodities in Uganda's health system. Additionally, health facilities report under an integrated logistics management and information system. However, as of 2012, oral rehydration salts (ORS) and zinc were being procured and managed by NGOs outside of this system, and female condoms were not included in the health information system or the national quantification process. Additionally, chlorhexidine for cord care was not included in the national supply chain, and oxytocin was not able to take advantage of cold chain resources dedicated to the Expanded Program on Immunization (United Nations Foundation 2013). Under this context, integration could involve numerous efforts to introduce new products, reduce existing redundancies, and expand existing processes to cover more products.

These examples show that, within the current under-utilized and life-saving RMNCH commodity context, there is a range of potential integration possibilities. These include:

- Introduction of new commodities into the public health supply chain.
- Extension of existing logistics information, distribution, or forecasting capacities to include specific commodities that have historically been excluded.
- Incorporation of commodities or facilities currently being served by parallel NGOs and external funder supply chains into fewer national government systems.
- Harmonization or integration of health program-specific systems (e.g., logistics information or forecasting) into wider national systems.
- Strengthening of existing information and delivery systems to be better oriented toward inclusive and cost-effective satisfaction of client and service provider demand rather than funding source.

Generally, given the new or under-utilized nature of the commodities, many have not been provided by national health care systems at all, or have only been included in targeted, NGO-supported health services. Across developing countries, this gives the UNCoLSC commodities a broad target of thoughtful inclusion into currently functioning systems.

Stakeholders Should Rationally Determine Which Products and Logistics Functions Make Sense to Integrate

Once stakeholders have a sense of what should broadly be pursued through integration in their setting, they should carefully identify which specific systems should be combined, which products should be managed together, and what kinds of supply chains should be used to deliver products to specific facilities. Although efficiencies, reduction of redundancies, and simplification of complexity are desirable benefits, it should not be assumed that these can be attained with a single one-size-fits-all system. Generally, supply chains should be designed to support the characteristics of the commodities they handle and the customers they serve (Fisher 1997).

Across commercial industries, the types of supply chains implemented vary based on supply, demand, and product characteristics. For example, a grocery chain needs to handle many different products with short shelf lives and potentially unpredictable demand, whereas an office product supply chain manages

fewer products with less concern for expiration. For the grocery chain, they may be willing to invest in technologies and shippers that allow them to have strong visibility of their sales and the ability to put products on the shelf while they're still fresh. The office product company would likely try to save as much money as possible by stocking their products in fewer locations and accepting longer lead times within their system.

However, sometimes supply chains must deliver many different kinds of commodities to a diverse customer group. Dell Computers, for example, identified specific groupings within its home and business computer customers. These customer groups were distinct in their relative preference for product price, available options, lead time, and level of customer service: home computer users favored low price over product feature customization whereas business users preferred high service and customization over low price. These distinctions led Dell to design specific stocking and order fulfillment strategies for their distinct product and customer groups (Thomas 2012).

The wide variety of commodities and health services supported by an integrated public health system requires deliberate, broad groupings of commodities and facilities, and subsequent tailoring of supply chain processes to support those groupings (Allain et al. 2010). Taken as a whole, health care systems in developing countries implement a wide variety of health services to address the health needs of their populations. These include routine treatment for common diseases, testing services, medium to long-term treatment of diseases such as tuberculosis or AIDS, point-in-time campaigns, and mobilization for disease outbreaks. These services occur in rural communities, at fixed health centers, and at large urban hospitals, among others. It is unlikely that a single set of logistics policies and procedures could effectively and efficiently accommodate this wide range of requirements. A system that includes quarterly demand-based ordering at multiple levels might efficiently handle common, heat-stable commodities, but would be too slow for time-sensitive laboratory reagents. An inventory control system that bases the next period's requirements on an average of recent consumption might work well for products with relatively stable demand, but might also be too slow and reactionary to determine efficient inventory levels for seasonal or outbreak-based products. Practically, country supply chains can accommodate this by including specialized processes or resources within the larger framework of an integrated system. Some countries, for example, have retained specialized logistics processes for HIV/AIDS commodities or laboratory reagents even through these commodities technically fall under an integrated system.

Segmentation is the process of formally identifying these distinct requirements within a supply chain and then tailoring processes to serve those requirements, with the goal of finding the right fit between the two (Thomas 2012). This approach has been applied at commercial enterprises such as Dell as well as public health systems, and could serve as a valuable tool for stakeholders in the UNCoLSC context deciding exactly how new and under-utilized products should reach the service delivery level.

In Zambia, a laboratory product supply chain was designed to have distinct resupply procedures for fast and slow-moving reagents, as stakeholders realized that having a single resupply process might result in overstocks of the slow moving reagents and stockouts of the faster moving ones (JSI 2013). The designation of particular reagents as fast or slow moving can be made qualitatively using service provider knowledge.

In Tanzania, the Medical Stores Department was tasked with effectively managing over 700 individual products. A segmentation process first identified 123 of these as priority items, with the remaining +600 to be ordered and stocked automatically according to the enterprise resource planning software. Then the 123 priority products were split into four groups using quantitative historical data on two dimensions: low demand versus high demand and steady versus variable demand. Each of these four groups was assigned a specific order frequency and target inventory levels. For example, the steady, high demand products could be ordered two to four times per year in larger volumes whereas the variable, low demand products would be ordered once every 15 months (Llewellyn 2013).

Both qualitative and quantitative segmentation approaches can be used to help RMNCH stakeholders decide how best to integrate their products with each other and with other product groups.

Qualitative Factors

These include factors such as the type of health services the products are used for, the location of the services, general variability of demand for the product, location and availability of supply, shelf life, and temperature sensitivity. Using service provider knowledge, these factors can help match and differentiate products in order to inform supply chain design decisions such as the desired length of the in-country pipeline; where products should enter the public system; whether social marketing, the private sector, and the community level should be given access to public sector inventory; and whether safety stock levels should be high or low.

Appendix A includes a table of these factors as they generally apply to the 13 UNCoLSC commodities, sourced from United Nations Foundation 2013, and WHO 2012. Key takeaways include:

- Most of the 13 products are heat stable with two- to five-year shelf lives. This means that there are no major handling impediments that would prevent them from being included in predominant essential medicines national ordering systems.
- Oxytocin is a notable exception, requiring cool or cold chain to maximize its effective shelf life. Theoretically, oxytocin could “piggyback” on cold chain capacity for vaccines, although preexisting policies, locations of service provision, and timings of distribution may inhibit this.
- Several of the products can potentially be distributed by community health workers without a medical background, or be purchased by users without a prescription. These include female condoms, emergency contraceptives, chlorhexidine for cord care, zinc tablets, and ORS. If community service providers are trained in their provision, these products could be included jointly in community health supply chain-specific information and distribution systems.
- Several others require clinical health providers and would probably not be used outside of a health facility, including injectable antibiotics, antenatal corticosteroids, and oxytocin.
- Given their drivers of demand, most of the products should present low demand variability once their demands are known. Safety stocks for these commodities could be set relatively low.

- Some products, such as dispersible amoxicillin, zinc, or ORS, could be needed to treat seasonal or unpredicted outbreaks of disease incidence. Safety stocks could be set higher for these commodities, and should be resupplied using demand-based requisitions.
- Resuscitation bags and masks are effectively equipment if cared for properly. These would not have to be included in routine resupply systems like the other 12 products and, from a supply chain perspective, could be managed like other service delivery equipment.
- Most of the 13 products could potentially be available in developing countries from local manufacturers or distributors, meaning that procurement lead times could be shorter and, if procurement policies allow, could be purchased by lower levels of the supply chain.
- Several of the commodities, including female condoms and implants, must be procured internationally. This must be planned for during forecasting and supply planning processes.

Quantitative Factors

These include factors such as total volume, total value, seasonality, and variance of demand. Although some of these factors can be broadly assumed (as high, low for example), they can also be quantitatively determined using historical logistics records or forecasts at the country level. Looking across all products and delivery systems at once, a Pareto analysis, for example, can determine if a small subset of commodities is responsible for the majority of value or cubic volume being delivered. Knowing cubic volumes can also demonstrate whether it is feasible to add additional products to an existing system. Quantitatively determining variance can show which products have high or low variability of demand from one period to the next, and whether there are seasonal spikes in demand.

After analyzing these qualitative and quantitative factors at a country level, broad segments of facility demand can be identified that suggest tailored supply chain operating procedures (JSI 2013). This approach requires availability of historical logistics data such as consumption reports, order records, or records of quantities issued.

Functional Considerations

Certain logistics functions may also generally make more sense to integrate than others. Yadav et al. suggest that when considering the integration of vaccine supply chains into other health commodity supply chains, certain functions (namely forecasting, procurement, ordering, storage, transportation, and information systems) may provide a better rate of return than others, in terms of the benefit of integration compared to difficulty of implementation (2013). Although the findings presented may not extend exactly to the RMNCH context, the approach of considering the potential for integration on a function-by-function basis could be helpful. Potentially, integration that merges some but not all activities could be sought. For example, an NGO managing a parallel supply chain for a particular set of commodities could agree to add those commodities to the predominant system for storage and distribution while maintaining direct control over procurement.

From the perspective of vaccine and immunization supply chains, Yadav et al. (2013) considered each individual function in terms of the benefits, disadvantages, and relative ease of implementation. Based

on this approach, integrating vaccine commodities into other supply chains would make the most sense for storage, distribution, and information systems, given the potential for sharing of fixed assets, reduction of redundancy, and relative ease of implementation. Quantification and procurement, on the other hand, were deemed to make less sense for integration, as the difficulties in overcoming managerial silos and regulations would probably not be outweighed by the potential benefits of integration.

For the RMNCH context this comparison may be less straightforward, as the 13 commodities do not comprise a single parallel supply chain in countries the way that EPI vaccines do. Looking at commodities individually, however, most could benefit from storage and distribution integration into the predominant essential medicines logistics system if they are currently distributed in parallel. If the three contraceptive products are procured separately, they could potentially be integrated into the main procurement mechanism of family planning products in the country. Forecasting and ordering might pose fewer challenges than vaccines to integrate, as the 13 commodities are not distributed through campaigns, and forecasting methods should be largely similar to other routine resupply commodities.

Lastly, practical questions about the current functions can help stakeholders decide where integration might be feasible and beneficial. In the case of adding new RMNCH products to existing systems or bringing previously parallel systems into the fold of a major national system, stakeholders should look across the existing systems and answer the following questions:

- Do the products slated for possible integration share the same origins and destinations as the system they are moving in to?
- Do the systems have compatible resupply cycles?
- Which levels of the system are used for storage?
- What inventory levels are currently stored?
- How much physical volume is represented by the products in question and is there storage, distribution, and human capacity to handle combined volumes?
- Who is responsible for forecasting and how is it conducted?

Also consider employing network analysis software to identify optimal network structures (number of storage tiers, locations of facilities, and warehouse service areas) and inventory levels under the future integration environment. Answering these questions at a country level will provide stakeholders with a sense of how easily systems and products can actually be combined: whether the addition of certain products to a particular system will require new storage and distribution capacity, how easily new products could be incorporated into the requisition system, and generally whether the new products will force changes on the existing system or fit neatly into existing system capacities.

Stakeholders Should Apply Lessons Learned From Previous Product Integration Efforts

Integration of products within health care supply chains is an ongoing phenomenon. Numerous country systems have undergone some level of product integration, and some of these have been documented as case studies on the subject. Although integration is not a specific enough intervention to be considered a best practice in its own right, the wide variety of contexts and lessons learned from these experiences can be distilled into general lessons to inform future efforts. The following are basic recommendations and considerations that can apply to any product integration effort, drawn from the country case studies developed for this guide as well as several other existing resources (Yadav et al. 2013; Diallo 2006; Olson, Sánchez, and Quesada 2008; WHO 2013; USAID | DELIVER 2009; USAID | DELIVER 2011; and Beith et al. 2006).

- Integration efforts should build upon in-depth assessment of the individual systems involved.
  - Assessments that evaluate the current performance and process quality of systems being expanded or combined will provide an understanding of what strengthening efforts are needed to help the new system meet performance expectations. Integration efforts in the public health supply chain context have typically been accompanied by design and rollout of new inventory control and logistics reporting systems.
- For integration of large or well-established product groups, assume multi-year, widely collaborative efforts involving all key stakeholders from the very beginning.
  - Integration can represent major changes to large systems. Given the complexity and scale of these systems, integration efforts can last several years from inception to full implementation and require support from diverse stakeholders. Several cases required collaborative supply chain design workshops to incorporate user input into formalized design decisions for the integrated system, and to secure basic buy-in for the new system. In cases that new procedures will apply to staff across the system, trainings will need to be conducted.
- Phase in transition to new systems gradually, with routine monitoring and refinement throughout the implementation process.
  - Gradual phase-in of major system changes (on a geographic basis, for example) can allow managers to learn from implementation experiences of early adopters and adjust approaches as necessary. The rollout of the HIV Unified Supply Chain in Nigeria, for example, was extended across the country in six sequential zones, with a technical working group to review progress periodically. Expensive, major efforts should also prioritize rigorous monitoring and evaluation, at a minimum including pretest/posttest methodologies, or preferably nonequivalent control or time series methodologies. To avoid setbacks during lengthy and complex implementation processes, apply risk management approaches to identify and anticipate potential pitfalls to success.
- Staff and stakeholders should have specific performance targets as well as clear incentives to adopt any new system over the old ones.

  - As a basic principle, current service levels of any supply chain should not be reduced as a result of the integration. A benchmarking effort, combined with a baseline evaluation, can give stakeholders a sense of where performance is currently, where other similar programs perform, and what level they expect to reach in their own program. Common performance metrics include product availability at the service delivery level, percentage of facilities providing timely reports, frequency of stockouts, and on-time delivery. Less common metrics, but potentially relevant to integration efforts, include total supply chain costs or costs per performance or throughput levels. Communication of these targets and intended benefits can help motivate users to adopt the new system. In Tanzania's case, the anticipated reduction in order completion time (from the consolidation of required logistics reports) and cost savings drove commitment from all stakeholders. Partner alignment toward performance improvement is important for sustaining progress in the face of shifting priorities over time.

- Clarity of central (or subnational in decentralized contexts) government and stakeholder ownership and leadership is required.
  - Coordinating bodies at the central and intermediate health system levels should play a strong role, centered around logistics data and focusing on proactive management of the supply chain. Even in contexts with outsourced storage or distribution, government stewardship is required to orient progress toward public health objectives. Integration of vertical systems has political implications in public health systems, and requires consideration as to how merged systems will be managed. Logistics management units, where they exist, offer a viable mechanism for management of an integrated system.
- Given the potential political implications of changes in responsibility, having an external or relatively impartial negotiator is helpful.
  - The role of a technical implementing partner can be used to provide expertise to support potentially difficult decisionmaking.
- Integration efforts should start with the easiest elements and use existing systems to the extent possible.
  - In Tanzania, distribution was seen as the easiest function to integrate, and stakeholders began by adding family planning to the existing distribution for essential medicines, rather than creating an entirely new mechanism. Review of existing functions as described above should support this effort. Additionally, stakeholders should identify areas of opportunity based on current supply chain performance and cost /benefit analysis.

Incorporating these considerations and recommendations should improve efforts to integrate products in the RMNCH context. The new and under-used commodities that form the UN Commission's focus are excluded from well-established country supply chains in many instances, and with proper integration should benefit from greater visibility to stakeholders and greater availability to the patients and customers who use them.

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Appendix A: Global Characteristics of 13 Life-Saving and Under-Utilized RMNCH Commodities

Commodity	Specific Products	Public Health System Use(s)	Demand Variability	Primary Drivers of Demand within Public Sector	Health Service Provider Requirements	Health System Levels Used/Dispensed at	Supply Situation and Constraints	Shelf Life	Special Temperature Considerations
Female Condoms	FC2, others in development, specific markets	Contraception, preventing transmission of STIs	Base demand is small, likely low variability, could potentially grow (probably higher than other FP)	Client uptake and preference Provider awareness, coverage of FP services	None	Primary FP service sites, secondary	International supplier base	60 months	None
Implants	Jadelle, Implanon, Sino-Implant	Contraception	Low	Client uptake and preference Provider awareness, coverage of FP services	Qualification for insertion	Primary FP service sites, secondary	Three main manufacturers globally	60 months	None

Commodity	Specific Products	Public Health System Use(s)	Demand Variability	Primary Drivers of Demand within Public Sector	Health Service Provider Requirements	Health System Levels Used/Dispensed at	Supply Situation and Constraints	Shelf Life	Special Temperature Considerations
Emergency Contraceptives	1.5 mg levonorgestrel, packaged as one or two tablets per dose	Contraception (emergency)	Low	Client uptake and preference Provider awareness, coverage of FP services	No prescription required in over 50 countries	Primary FP service sites, secondary	Over 60 manufacturers of generic product, one manufacturer with WHO prequalification	60 months	None
Oxytocin	5 or 10 IU 1 ml glass vials, also Uniject	Prevention or treatment of PPH	Low	SBA, incidence of PPH	Trained health worker	Primary sites with delivery services, secondary,	More than 100 manufacturers globally, local wholesaler or manufacturer supply in many countries	Two years if stored properly	Loses effectiveness after three months of storage above 30°C
Misoprostol	100, 200 mcg tablet	Prevention or treatment of PPH	Low	Proportion of births at home or in community, incidence of PPH	Trained health worker, community assistant in some countries	Community, primary sites with delivery services where oxytocin	Available from at least 35 developing country suppliers	18–36 months	None
Magnesium Sulfate	Injection, various formulations	Prevention or treatment of eclampsia, various others	Low	SBA rate, incidence of eclampsia	Trained health worker	Primary sites with delivery services, secondary	Widely available	18–60 months	None

Commodity	Specific Products	Public Health System Use(s)	Demand Variability	Primary Drivers of Demand within Public Sector	Health Service Provider Requirements	Health System Levels Used/Dispensed at	Supply Situation and Constraints	Shelf Life	Special Temperature Considerations
Injectable Antibiotics	Procaine benzylpenicillin as powder for injection, gentamicin vial, ceftriaxone as powder for injection	First and second line treatment of neonatal sepsis, other antibiotic requirements	Low (possibly higher than other conditions here)	SBA, incidence of neonatal sepsis	Trained health worker	Primary sites with delivery services, secondary	Widely available	24–36 months	None when stored as dry powder
Antenatal Corticosteroid	Betamethasone in solution or suspension for injection, dexamethasone ampoules for injection	Prevention of preterm RDS (administered to mother)	Should be low once coverage is high	SBA, incidence of preterm birth Provider awareness	Trained health worker	Primary sites with delivery services, secondary,	Beta: global supply shortages Dexa: widely available	24–36 months	None
Chlorhexidine	7.1% chlorhexidine gluconate aqueous solution or gel	Prevention of umbilical cord infection	Should be low but has not been introduced widely yet	Birth rates, provider and community awareness	Home application with training (from health worker or community representative)	All, including at home in the community	Will likely be widely available in the future, but chlorhexidine for cord care not registered in many countries	Long	None

Commodity	Specific Products	Public Health System Use(s)	Demand Variability	Primary Drivers of Demand within Public Sector	Health Service Provider Requirements	Health System Levels Used/Dispensed at	Supply Situation and Constraints	Shelf Life	Special Temperature Considerations
Resuscitation Equipment	Bag and mask devices, suction devices, training mannequins	Treatment of newborn asphyxia	Very low—reusable equipment	Number of birthing facilities, SBA	Trained health worker, community health worker, or trained mother	All sites with delivery services, potentially community midwives	Widely available, but few standards exist for procurement specification, design changing and improving	Reusable if properly cared for	None
Amoxicillin	250mg scored, dispersible tablet (also 125mg)	Treatment of childhood pneumonia, potentially other infections	Moderate to high	Incidence of pneumonia, proportion who seek public sector services, provider prescription approaches, availability of RDTs, other uses of amoxicillin	Trained health worker, community health workers trained to prescribe antibiotics	Primary, secondary, and potentially community levels	Numerous manufacturers, but limited compared to other forms of amoxicillin	24 months	None, but humidity is a threat to tablets packaged in bottles
Oral Rehydration Salts (ORS)	Sachets of ORS powder for dilution in 200, 500, and 1,000 ml	Treatment of newborn and childhood diarrhea	Moderate to high	Community and health care provider awareness, incidence of diarrhea	No prescription required	All health care levels, including community and home	Widely available	24–36 months	None

Commodity	Specific Products	Public Health System Use(s)	Demand Variability	Primary Drivers of Demand within Public Sector	Health Service Provider Requirements	Health System Levels Used/Dispensed at	Supply Situation and Constraints	Shelf Life	Special Temperature Considerations
Zinc	20 mg scored dispersible tablet or 10 mg/5 ml solution (may be copackaged with ORS)	Treatment of newborn and childhood diarrhea	Moderate to high	Community and health care provider awareness, incidence of diarrhea	No prescription required	All health care levels, including community and home	Widely available, minimal regulatory requirements	36 months	None

FP, family planning; PPH, pre- and postpartum hemorrhage; RDS, respiratory distress syndrome; RDT, rapid diagnostic test; SKA, skilled birth attendant; STI, sexually transmitted infection.