

IMMUNIZATION SUPPLY CHAIN AND LOGISTICS

A NEGLECTED BUT ESSENTIAL SYSTEM FOR
NATIONAL IMMUNIZATION PROGRAMMES



A CALL-TO-ACTION

FOR NATIONAL PROGRAMMES AND THE GLOBAL COMMUNITY BY
THE WHO IMMUNIZATION PRACTICES ADVISORY COMMITTEE

GENEVA, SWITZERLAND - MARCH 2014

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e the Immunization Practices Advisory Committee (IPAC) members, call on national immunization programmes and the global community to review and renew investment in their Immunization Supply Chain and Logistics (ISCL) systems; otherwise, the benefits of immunization programmes will be jeopardized by obstacles limiting access to, and use of, effective vaccines.

Call-to-Action

The Immunization Supply Chain and Logistics (ISCL) systems, which were designed in the 1980s, have supported the achievement of acceptable vaccination coverage, using coping mechanisms to overcome enduring challenges in vaccine storage, distribution and management. The dedication, intelligence and creativity of health workers acting within outdated ISCL systems have substituted for much-needed assets and capital. Despite many efforts, national immunization programmes, already struggling to meet the demands of routine immunization and supplemental campaigns, may not be in the best position to respond to the introduction of all the new vaccines.

A widening variety of new vaccines and immunization schedules, a diversity of service delivery strategies, an expanding target population, increased cold-chain infrastructure requirements and insufficient funding, are just a few of the new realities that will further stress ISCL systems, which were initially designed to manage fewer, less expensive and less bulky vaccines and related supplies. Existing systems cannot keep pace with the changing landscape of national immunization programmes, resulting in stock-outs, potential administration of ineffective vaccines, avoidable wastage and inadequate cold-chain capacity, all of which have considerable coverage, performance and cost implications. These inefficiencies not only hinder the ability to provide much-needed immunizations, they also yield a lower return in health outcomes for those investing in the research, production, procurement and delivery of vaccines, threatening the dependability of future funding sources.

The growth in complexity of immunization programmes is occurring at the same time as the development and application of innovative supply chain strategies and technology, especially in the private sector. In the public sector, national immunization programmes, and the global community that supports them, have an opportunity to improve their performance and a mandate to provide the right vaccines in the right quantities, in the right condition, at the right time, in the right place and at the right supply chain cost.

Recommendations

National immunization programmes

Measure and monitor the health of the ISCL system

Apply the Effective Vaccine Management (EVM) Initiative tool and process to assess the state of the ISCL system, identifying strengths and weaknesses to prioritize improvements. Emphasize routine programme monitoring and performance improvement.

Plan and implement improvements

Prepare and implement improvement plans that address system weaknesses with pragmatic responses, and introducing supply chain innovations that produce increased visibility and flexibility to manage future changes in ISCL systems.

Global community of partners

Increase awareness and investment

Call attention to the complexities of ISCL systems. Increase funding to recruit, train and incentivize people and prioritize the collection and analysis of data needed to run national immunization programmes.

Address ISCL in immunization recommendations

Place implementation issues and evidence of ISCL impacts into the core of immunization recommendations and decision-making.

Harmonize ISCL systems

Take purposeful advantage of new vaccination initiatives, to build upon and strengthen an integrated ISCL system across programmes.

Resolve knowledge gaps to accelerate learning

Highlight ISCL knowledge gaps, identify what is working, create learning opportunities and accelerate the spread of proven approaches.

The Department of Immunization, Vaccines and Biologicals thanks the donors whose unspecified financial support has made the production of this publication possible.

This document was published by the Expanded Programme on Immunization of the Department of Immunization, Vaccines and Biologicals.

Ordering code: WHO/IVB/14.05

Published in July 2014

This publication is available on the Internet at: <http://www.who.int/immunization/documents/en/>

Copies of this publication as well as additional materials on immunization, vaccines and biologicals may be requested from:

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Design and layout by L'IV Com Sàrl, Villars-sous-Yens, Switzerland.

Printed by the WHO Document Production Services, Geneva, Switzerland.

TABLE OF CONTENTS

- ACKNOWLEDGEMENTS..... vi
- ACRONYMS..... vii
- TERMS..... viii
- SUPPORTING EVIDENCE 1
 - ISCL CHALLENGES 1
- RECOMMENDATIONS 4
 - RECOMMENDATIONS FOR NATIONAL IMMUNIZATION PROGRAMMES 4
 - 1. Measure, monitor and evaluate the health of the ISCL system..... 4
 - 2. Plan and implement improvements 5
 - RECOMMENDATIONS FOR THE GLOBAL COMMUNITY OF PARTNERS 8
 - 1. Increase awareness and investment 8
 - 2. Address ISCL when formulating immunization recommendations 9
 - 3. Harmonize ISCL systems..... 9
 - 4. Identify and resolve knowledge gaps to accelerate learning and spread solutions 10
- ENDORSEMENT..... 11
- REFERENCES 12

ACKNOWLEDGEMENTS

This document was endorsed by the Immunization Practices Advisory Committee of the World Health Organization in March 2014. The committee thanks the expert working group for their key contributions in the development of this publication: Robin Biellik, Xavier Bosch-Capblanch, Shelley Deeks, Chris Morgan, Jean-Marc Olivé, and Robert Steinglass. Gratitude is also expressed to the following for facilitation in research and drafting: Osman Mansoor (UNICEF), Ryan McWhorter (WHO consultant), Patrick Lydon (WHO), and Diana Chang-Blanc (WHO).

ACRONYMS

EVM	Effective Vaccine Management
HIV	human immunodeficiency virus
HSS	health systems strengthening
IPAC	Immunization Practices Advisory Committee
ISCL	Immunization Supply Chain and Logistics
KPI	key performance indicator
LMIS	Logistics Management Information System
MDVP	multi-dose vial policy
UNICEF	United Nations Children’s Fund
USAID	United States Agency for International Development
VMI	vendor managed inventory
VVM	vaccine vial monitor
WHO	World Health Organization

TERMS

Avoidable wastage	Also known as unopened vial wastage, vaccine wastage due to being lost, stolen, broken, expired, or any other cause to make the vaccine unusable prior to being opened.
Cold-chain capacity	The total volume of functional temperature-controlled storage, including refrigerators, cold rooms, carriers or other temperature-controlled storage equipment.
Cold-chain inventory	A record of the quantities and types of temperature-controlled storage and transport equipment, including refrigerators, freezers, cold rooms, cold boxes and vaccine carriers.
Direct delivery	The movement of inventory directly from a vendor to a buyer. Also, the movement of inventory directly from a national storage warehouse to a district warehouse or health facility.
Immunization supply chain and logistics system	The people, data, assets and processes that manage the data collection, forecasting, ordering, distribution, storage and delivery of vaccines and other supplies.
Inventory holding point	A location where inventory is stored, which could be a warehouse, a health facility or transport equipment.
Inventory service level	A measurement of the performance of inventory replenishment policies, taking into consideration the amount of safety stock, the speed of use and the number of stock-outs.
Order response time	The amount of time between a product being ordered (requested) and the product arriving at the destination.
Stock-out	When a product is not available.
Third party logistics provider	A firm that provides outsourced (or "third party") logistics services for part, or all, of the supply chain management functions.
Transportation sourcing	The process of establishing a contractual relationship with transportation providers.
Vaccine availability	A measurement of the amount of time that a vaccine is available for shipment from a warehouse, or is available for use at a health facility.
Warehouse efficiency	A measurement of how efficiently a warehouse stores and moves product in terms of cost, human resources and space utilization.
Wastage rate	A measurement of the amount of vaccine that is not administered (due to both open and unopened vial wastage), compared to the amount of vaccine issued.

SUPPORTING EVIDENCE

ISCL challenges

The introduction of new vaccines and higher coverage targets has increased demands on ISCL systems. Comparing the requirements of ISCL systems in the 1980s to the present, it is clear that the landscape has grown inherently more complicated, as national immunization programmes prepare to:

- » provide protection against 2.5 times as many diseases¹;
- » to increase age ranges from infants to adults²;
- » to administer three times as many doses per person³;
- » to store and transport four times more vaccine volume per fully immunized person⁴;
- » to increase six-fold the spending on vaccines to fully immunize one person⁵;
- » to serve a global target population size that has doubled⁶.

ISCL systems, originally designed to manage fewer and less expensive vaccines, are not keeping pace with the changing landscape of immunization programmes. As a result, countries are experiencing inventory unpredictability, inadequate cold-chain capacity and insufficient funding, as exemplified in Table 1.

Table 1. Examples of ISCL challenges

Inventory unpredictability	Inadequate cold-chain capacity	Insufficient Funding
<ul style="list-style-type: none"> ▪ Ethiopia 2012¹: Average of 5 levels of inventory holding points (1). ▪ Nigeria 2012: In one month, 30% of states had no syringes, and 20% of states experienced vaccine stock-outs (2). ▪ 2011: 50% of GAVI-eligible countries reported a vaccine wastage rate in excess of WHO recommendations (3). 	<ul style="list-style-type: none"> ▪ 2011: 2.8 million vaccine doses lost in five countries due to cold-chain failures (4). ▪ Nigeria 2011: 41% of refrigerators were non-functional (5). ▪ Turkey 2008: New vaccine introduction increased required storage capacity 20-fold (6). 	<ul style="list-style-type: none"> ▪ Ethiopia 2011: Lack of maintenance leading to 30% of cold-chain equipment being non-functional (7). ▪ Tanzania 2006: Operating at 25% of required staffing levels (8). ▪ Ukraine 2012: Funding only sufficient for 60% of vaccine needs forecast. Reported DTP3⁷ coverage in 2011 was 46% (9). ▪ 2013: Less than 10% of countries meet WHO recommendations for effective vaccine management practices (10).

1 Varies by national immunization schedule; represents maximum. In 1980, standard vaccines included diphtheria, pertussis, tetanus, measles, polio and tuberculosis. In 2010, additional vaccines include pneumococcal conjugate, rotavirus, hepatitis B, Haemophilus influenzae type B, yellow fever, rubella, Japanese encephalitis and meningitis A.

2 Generally, vaccinations for the first 30 years focused on infants and women of reproductive age. The current mix of vaccines is provided for infants, children (measles), pre-teens (human papillomavirus) and adults (meningitis A and tetanus/diphtheria).

3 Represents maximum, assuming the maximum number of doses as above. In 1980, this included 1 Bacillus Calmette-Guérin, 3 diphtheria, pertussis and tetanus, 3 oral polio vaccine, 1 measles. In 2010, the total number is based on 2012 WHO immunization position papers.

4 Based on projected volume per fully immunized child for 20 countries according to introduction plans. This compares 2001 volumes for traditional vaccines with 2020 expected volumes, where growth is driven by pentavalent, pneumococcal conjugate, rubella and human papillomavirus. Additional surge capacity is required for mass campaigns.

5 Based on 2008 projections. Bull World Health Organ. 1984;62(5):729–736; Optimize vaccine supply chains. Optimize. 2009; WHO. State of the world's vaccines and immunization. 2009; Kone S. Vaccine volume calculator. WHO. 2011; WHO Immunization position papers. 2012; Brenzel L, Politi C. Historical analysis of cMYPs in GAVI-eligible countries; 2012.

6 United Nations Population Division. World population prospects: The 2010 revision, medium variant. 2011.

7 Third dose of the DTP-containing vaccine used in Ukraine, which consists of diphtheria, pertussis and tetanus, Haemophilus influenzae type B and inactivated polio vaccine.

Effective Vaccine Management (EVM), launched by the World Health Organization (WHO) and UNICEF in 2010, is a quality improvement process for ISCL systems to compare their effectiveness against best-practice benchmarks. It is both a consultation and a survey tool, designed to identify the strengths and weaknesses of immunization programmes. By periodically repeating the process, programme managers can measure their programme's health, chart a course for improvement and measure progress against their improvement plans.

EVM measures a wide spectrum of programmatic activities, including the following.

Vaccine arrival

All pre-shipment and arrival procedures ensure that every international shipment of vaccines from a manufacturer reaches its first destination in a country (a primary vaccine store or central medical store) in satisfactory condition (no breaks in the cold chain and no damaged vaccines) and is accompanied with all the recommended paperwork.

Temperature control

All vaccines and their diluents are stored and distributed within a cold-chain system that maintains, at all times, the WHO-recommended temperatures ranges for all types of vaccines.

Storage capacity

The national supply chain system has sufficient and quality cold storage, dry storage and transport storage capacity to accommodate all vaccines, diluents and injection supplies needed for the national immunization programme.

Infrastructure

The status and the layout of storage buildings, cold-chain equipment and vehicles enable the supply chain system to function effectively.

Maintenance

Preventive and curative maintenance systems are standard and operational for storage buildings, cold-chain equipment and vehicles used to distribute vaccines.

Stock management

Systems and procedures for managing the stocks of vaccines are effective, in terms of vaccine handling, physical inventory, stock-control systems, adequate stock-level policy, good warehousing practice, and disposal procedures for damaged and expired vaccines.

Distribution

The transport of vaccine between each level in the supply chain is effective, including the correct use of passive containers (cold boxes), packing practices with coolant packs (conditioned ice-packs or cool water packs), temperature indicators and maintaining transport contingency plans.

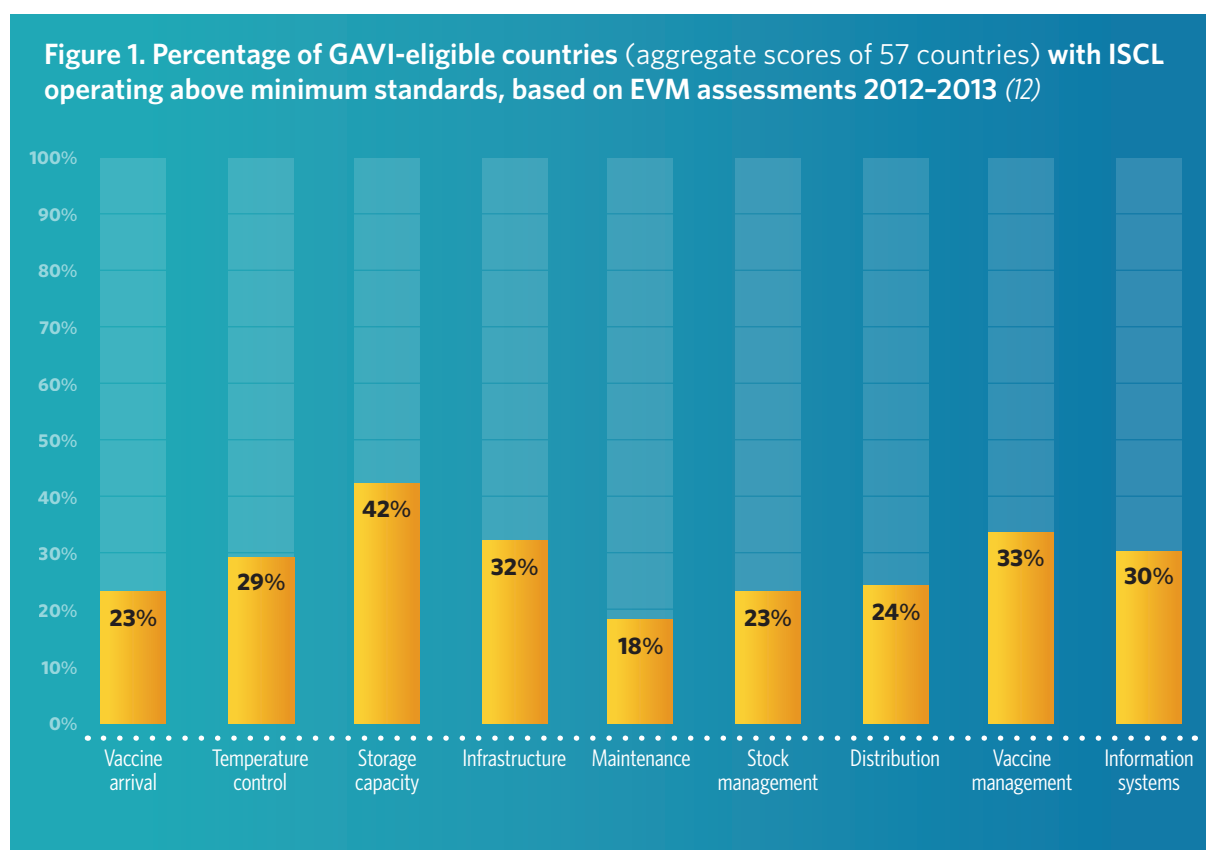
Vaccine management

All recommended policies for vaccine management are adopted and implemented, including the use of vaccine vial monitors (VVMs), the shake-test, the multi-dose vial policy (MDVP), the use of diluents and the monitoring of vaccine wastage rates.

Information systems

Logistics Management Information Systems (LMIS) and supportive management functions are effective, including standard operating procedures and vaccine-needs forecasting.

While this Call-to-Action applies to all countries, a recent study (11) of 57 GAVI-eligible countries shows that a majority of country ISCL's are underperforming. Analysing the average EVM scores per criterion, as depicted in Figure 1, reveals that less than 25% of countries are operating at even a minimum standard within the criteria of maintenance, stock management and distribution. Furthermore, only 29% of countries are meeting minimum standards for temperature control.



Clearly, current processes and coping mechanisms are not adequately keeping pace with the changing vaccine landscape. To be able to continue to serve their populations, it is essential that national immunization programmes analyse their supply chains as a means to improve availability of potent vaccines and related supplies, and to reduce avoidable wastage without compromising the goals of increasing vaccination coverage.



RECOMMENDATIONS

Recommendations for national immunization programmes

Recognizing that improved ISCL practices during this Decade of Vaccines could alleviate the current strain on national programmes and protect more individuals against more diseases with better quality and at lower cost, we call on countries to:

1. Measure, monitor, and evaluate the health of the ISCL system

Measure, monitor, and evaluate performance for availability, quality and cost. Apply the Effective Vaccine Management (EVM) tool and process to assess the state of ISCL systems, identifying strengths and weaknesses in order to prioritize improvements.

2. Plan and implement improvements

Based on EVM assessments, prepare and implement costed improvement plans that address system weaknesses with pragmatic responses, as well as introducing supply chain innovations that produce increased visibility and flexibility to manage future changes in ISCL systems.

1. Measure, monitor, and evaluate the health of the ISCL system

To properly assess a country's ability to effectively forecast, store, supply and deliver vaccines, programme and logistics managers need to know what to measure and must also establish the tools and processes to enable the timely and complete collection of routine, regular and reliable data. This also means deploying, empowering and supporting sufficient programme staff to undertake these critical management roles.

Effective Vaccine Management is a continuous quality improvement process, for ISCL systems to compare their effectiveness against best-practice benchmarks. It is both a consultation and a survey tool designed to identify the strengths and weaknesses of national immunization programmes. By periodically repeating the process, programme managers can assess their performance, chart a course for improvement and measure progress. WHO and UNICEF have published a joint statement calling on countries to embrace the EVM initiative. For more information on the EVM process, please refer to the WHO UNICEF Joint Statement on Effective Vaccine Management (13).

To fully measure the health of an ISCL system, it is essential to gather supply chain data and to analyse the data to identify strengths and weaknesses and to continuously monitor performance.

A. Gather data: Data are the essential first step to measure the ISCL system's capabilities. Developing the datasets with which to assess the programme can be the first signal that information systems may be weak at the national or sub-national levels. This is not an insignificant task as although data are the key building

blocks for managing and measuring a programme's effectiveness, they are often not readily available. They may be lost, not recorded on paper, or digitally, or geographically dispersed. Establishing a baseline dataset of assets, commodities and transactions is fundamental to guiding future decision-making

B. Analyze data: Using the data gathered, programmes can analyse their ISCL system's effectiveness to identify and prioritize areas that require attention and improvement, including the adequacy of skilled human resources for ISCL. The EVM analysis measures the ISCL system against nine key criteria:

- vaccine arrival
- temperature control
- storage capacity
- infrastructure
- maintenance
- stock management
- distribution
- vaccine management
- information systems

C. Continuously monitor: In order to determine if the ISCL system is functioning properly on a continuous basis, programme managers must establish a monitoring system using key performance indicators (KPIs) to track performance. The reality of any supply chain is that the world presents a more chaotic series of events than the planned process is constructed to support. To allow decision-makers to remain informed, and to help reduce the number of decisions made solely on instinct, managers can use KPIs as an objective means to gauge the health of the supply chain. Although the supply chain community has a wealth of KPIs, for monitoring everything from warehouse efficiency to transportation sourcing, the ISCL system can best capture the six rights (product, quantity, condition, time, place and cost) using the following metrics:

- availability or access, which measures stock-outs and over-stocking at storage depots;
- quality or suitability, which measures temperature exposure and cold-chain equipment performance;
- cost, which measures the cost per fully immunized person, dose delivered, or volume delivered.

In summary, to properly measure the health of the ISCL system, one must

1. Regularly monitor its ability to store, supply and deliver vaccines and related commodities against established benchmarks to identify strengths, weaknesses and opportunities for improvement.
2. Continuously track its performance against metrics, to understand the system's productivity and efficiency..

2. Plan and implement improvements

After measuring the health of the ISCL system, the EVM assessment provides effectiveness scores against nine ISCL criteria. Programme and logistics managers can use this knowledge as the foundation for improvement planning. The improvement plan identifies and addresses the key challenges, with strategies to achieve measurable improvement.

A. Consider tomorrow: During this planning stage, it is important to emphasize not only the existing ISCL system, but also to plan against future needs (such as new vaccine introductions), design for uncertainties (such as flexibility to respond to epidemics or an influx of refugees) and build in resiliency to respond to natural disasters or conflicts. An improvement plan that fares well only in the best conditions will not succeed. Therefore, national immunization programmes should consider the EVM improvement plan as an opportunity to resolve the challenges of today and prepare for the unknowns of the future.

B. Introduce supply chain innovations: Planning and implementing EVM improvement plans is an opportune time for countries to address large-scale ISCL changes, think about solutions differently, take advantage of new knowledge and technology and support both proven and novel approaches. Although impact evidence of various innovations is limited, national immunization programmes are applying new technologies, processes and incentives to respond to their challenges. The examples below highlight some supply chain innovations. Note that this is a summary and does not represent a complete report on all projects or improvement plans.

- **Supply chain redesign** is the economic and logistical analysis and reconfiguration of ISCL processes, such as changing warehouse locations, moving from an inventory push to an inventory pull system, or increasing the frequency of shipments between warehouses and health clinics. In 2008, the Ministry of Health in the Cabo Delgado province of northern Mozambique, measured the impact of redesigning their supply chain, in which they removed inventory levels, invested in technology to improve information flow, consolidated tasks into a small group of workers focused full-time on supply chain operations and provided reliable sources of energy to clinics. They found that their efforts dramatically increased vaccination coverage, from 69% to approximately 95% of children, reduced stock-outs to less than 1% of health centres and improvth centers, and improved the cold chain by ensuring that 93% of health facilities had reliable refrigeration (14).
- **Supply chain modelling** predicts the impact of changes to supply chain processes, such as supply chain redesign, modifying inventory safety stock levels, or integrating health commodities. In 2010, the Ministry of Health in Tanzania modeled the impacts of various supply chain decisions on their distribution network in order to assess supply chain changes needed for their future growth, including studying the use of a new direct delivery model. Through supply chain modelling, they discovered that there would not be enough warehouse or transport capacity to manage the growth of programmes without significantly affecting availability. They also found that the expected costs for direct delivery were much higher than budgeted, suggesting that changes in network structure or outsourcing to a third-party logistics provider must be considered, in addition to increased investment (15).
- **Vendor managed inventory (VMI)** is the process by which the buyer of a product provides information to the vendor of a product, and the vendor takes full responsibility for maintaining agreed-upon service levels for the inventory. The buyer benefits from better service and the vendor benefits from more control of the demand for their product. In 2011, the Ministry of Health of Thailand outsourced the distribution and inventory management functions to a third party, resulting in overall supply chain costs that were 20% less than their in-house supply chain costs. The change was driven mostly by the lower number of procured vaccines required in the VMI model (16).
- **Outsourcing** is the practice of sourcing processes from third parties to fulfil various roles in the supply chain, such as transportation, warehousing, or information technology. In 2012, the Ministry of Health of Gambia, outsourced the management of their transportation fleet to a third party, which fulfilled vehicle maintenance and driver-training roles for the Ministry of Health. As a result, the health programme increased their frequency of visits three-fold, could visit three times more villages and was able to improve vaccination coverage by almost 20 percentage points (17).
- **Logistics Management Information Systems (LMIS)** are software tools to improve information, such as stock-on-hand, received, administered or wasted, or flowing between partners, such as health workers and logistics managers. In 2013, the Department of Health and Family Welfare, Karnataka, India, implemented a LMIS across 133 sites and 151 health commodities. After recording over 200 000 transactions in 12 months, the programme has improved order response times ten-fold in times of emergency or stock-outs and the system has contributed to vaccine service levels above 95% (18).
- **Incentive pay** is the payment to an employee based on performance. The incentive can be a bonus, part of the standard payment structure, or be a non-monetary reward. In 2011, the Ministry of Health of Rwanda, studied the impact of Pay-for-Performance incentives on health-care delivery in mother and child health-care services. They found that institutional deliveries increased by 23% and preventive care visits increased by between 56% and 132%, depending on the age of the baby (19).

- **Worker training** is the professional development of staff for personal development, career advancement and the routine implementation of new processes and technology. This includes identifying and addressing gaps in the human resources required for ISCL. Although worker training appears to be an obvious requirement of national immunization programmes, it is rarely viewed as an innovative investment. In 2009, the Ministry of Health of Nepal, measured the impact of training on their new LMIS. They discovered that sharing training duties between the implementing technology partner and the Ministry of Health, as well as educating users on the value of the LMIS, helped the programme realize a 50% reduction in stock-outs (20).

C. Link implementation plans: To ensure that improvement plans have the support of leadership and the foundation for long-term success, it is critical that the plan be linked to broader immunization strategic plans or health-sector plans, such as a comprehensive multi-year plan. Tying the improvement plans to other programmatic objectives helps to raise the visibility of the resources required to implement the tasks, such as the addition of people or technology. However, the added visibility may not produce sufficient funding to support the improvement-plan activities and proactive programme managers could consider using GAVI Health Systems Strengthening (HSS) funding, and other funding sources, to fill the budgetary gaps.

D. Use resources: In addition to the examples above, information about various supply chain innovations exists in online resources that provide valuable reference materials, technology reviews and collaborative forums. Prominent ISCL and global-health resources are cited below.

- **Project Optimize (21):** A library of ISCL improvements covering topics such as technology, packaging, policy, and process, summarized in the document, *Achieving the Global 2020 Vision for Future Immunization Supply and Logistics Systems (22)*.
- **Technet-21 (23):** A collaborative forum for experts in the field of immunization technology, cold chain, injection safety and health logistics to share their experiences, coordinate activities and discuss major global policy issues.
- **USAID | DELIVER PROJECT (24):** A library of tools, studies and policies that support improved commodity security and logistics management for a variety of global health programmes.
- **International Association of Public Health Logisticians (25):** A collaborative forum to support knowledge transfer and professionalization for supply chain managers working in public health logistics for a variety of global health programmes.
- **People That Deliver (26):** A network to support human resources for supply chain and logistics in health.



RECOMMENDATIONS

Recommendations for the global community of partners

The organization and functioning of national ISCL systems are often heavily influenced by global forces beyond individual borders. For national ISCL systems to be successful, the global community of partners must address common issues that hinder progress. This Call-to-Action recommends that the global community of partners take the following actions:

1. Increase awareness and investment

Call attention to the complexities of immunization supply chains, culminating in the need to support ISCL systems with increased funding to invest in the vital elements of all national immunization programmes, people and data.

2. Address ISCL when formulating immunization recommendations

Factor in the best available field evidence on implementation and ISCL system performance when formulating policy recommendations.

3. Harmonize ISCL systems

In the context of a broader health system, take more deliberate advantage of new vaccination initiatives to build upon and strengthen an integrated ISCL system across programmes.

4. Identify and resolve knowledge gaps to accelerate learning and spread solutions

There is need for further evidence on effectiveness of supply chain innovations. The global community of partners must highlight ISCL knowledge gaps, identify what is working, create learning opportunities and accelerate the spread of proven approaches.

1. Increase awareness and investment

In order to organize and respond, the global community needs a clear and convincing picture of the urgent needs of ISCL systems. The key ISCL challenges, such as those presented in this paper, must be shared through forums, conferences and publications. Naturally, increased awareness is a necessary component for increasing investment.

Immunization programmes require people, data and funding (in addition to other important considerations such as population acceptance) to achieve high coverage and prevent disease. Based on the high proportion of countries operating below EVM minimum standards, it is clear that change is required at both the national level, to identify and communicate needs, and the global level, to reply in kind with the necessary strategies and investment.

- A. People:** Human resources, such as logisticians, managers, data managers, drivers and warehouse workers, are the backbone of ISCL systems. Investment is needed to train, incentivize and reward their dedication, creativity and enthusiasm.
- B. Data:** Just as national ISCL systems must prioritize data-gathering for continuous monitoring and analysis, the global community must facilitate the process of generating actionable, complete and timely data, at all levels, to identify needs and track performance. Until information systems are treated as a necessary and expected budgetary line item, data will continue to be assumed, anecdotal, or missing, thereby preventing meaningful and essential ISCL improvements.

2. Address ISCL when formulating immunization recommendations

Recommended immunization policies, generated by expert committees, have a direct impact on national ISCL systems. For example, before a minister of health decides to introduce a new vaccine into his national immunization programme, an assessment should be conducted to ascertain if the ISCL system will have enough cold-storage capacity to hold the new vaccine, enough transport vehicles to carry the vaccine and enough trained staff to competently deliver the new vaccine. Implementation issues such as these can jeopardise the deployment and uptake of new, and otherwise effective, interventions.

Evidence regarding burden of disease and vaccine immunogenicity, efficacy, effectiveness and safety, alone, is insufficient to allow meaningful issue of recommendations on courses of action in health care. Evidence on implementation issues (such as costs, opportunity costs, equity and logistics) need to be considered alongside evidence on effectiveness. Technical strategies need to be crafted with an eye towards if, and how, they can be operationalized. Expert committees must adopt or refine procedures to incorporate operational implications in immunization recommendations

3. Harmonize ISCL systems

Various vaccine-preventable disease control and elimination initiatives, including measles, meningococcal disease and yellow fever, among others, were planned and organized with a focus on their immediate ISCL needs. By concentrating on individual ISCL needs, the resulting operations have tended to create parallel systems for financing, procurement, distribution, transport, training, communication and reporting. The focus on individual initiatives, instead of strengthening and integrating existing ISCL systems and building their links to other health initiatives, presents a missed opportunity, and is not an optimal use of resources.

When planning new initiatives, or re-planning existing ones, the ISCL system should be rationalized by consolidation of the existing system(s) under uniform processes and control. For example, incorporating data capture on a reduced number of standardized forms, and eventually moving to electronic data capture at all levels, will reduce long-term overhead costs and data errors, resulting in better data quality, analysis and decision-making. Likewise, a new initiative presents the opportunity to re-examine the cold chain, transport, and maintenance capacity and needs. Better harmonization of ISCL components will produce economies of scale, efficiencies and more unified public health policies.

Furthermore, immunization systems should be considered in the context of broader health systems and their reforms. For example, a ministry of health may be seeking investment in the cold chain to support a new paediatric HIV programme where HIV test kits and paediatric anti-retrovirals require storage between 2–8°C. Such scenarios present an opportunity to engage health managers in assessing cold-chain inventories and seeking mutually beneficial storage and transportation strategies.

4. Identify and resolve knowledge gaps to accelerate learning and spread solutions

There is little published evidence on successful ISCL practices and innovations or their impacts on national vaccination systems. Knowledge gaps and new opportunities must be brought to the top of the research and policy agenda. For example, can removing an inventory level in the supply chain reduce the amount of time needed to re-supply vaccines? If so, how does this impact transportation costs, reporting and decision-making? More importantly, does this improve vaccine availability, reduce avoidable wastage, or increase coverage? Academics, health workers and global partners can work together, through forums and expert committees, to highlight areas of research, subjecting studies to the same rigorous conditions that are routinely employed in vaccine, drug and medical trials.

Finally, it is critical that researchers document and publish the evidence on effectiveness and cost, as a result of good or innovative ISCL practices, to accelerate learning about what is working, and what needs improvement. Knowledge of successful ISCL innovations must be broadcast through forums, journals, expert committees, regional conferences and within countries, to support the adoption of promising practices more rapidly and enable national immunization programmes to adapt and respond to the complexities of the changing immunization landscape.

ENDORSEMENT

Existing ISCL systems are not keeping pace with the rapidly changing vaccination landscape, as a result of new vaccine introductions and immunization schedules, a diversity of service-delivery strategies, a growing target population and increased cold-chain infrastructure requirements. In response to these challenges, national ISCL systems and the global community must rethink their ISCL systems in order to provide the right vaccines, in the right quantities, in the right condition, at the right time, in the right place and at the right supply chain cost.

We call on national immunization programmes to measure, monitor and invest in their ISCL systems, and to plan and implement improvements. In addition, we call on the global community of partners to increase awareness and investment, to harmonize ISCL silos, to address ISCL when formulating immunization recommendations, and to identify and resolve knowledge gaps.

Immunization Practices and Advisory Committee

Endorsed by unanimous vote

March 2014

Geneva, Switzerland

REFERENCES

1. WHO. Vaccine management, logistics and cold chain assessments in Ethiopia; 2011.
2. WHO. Vaccine management, logistics and cold chain assessments in Nigeria; 2012.
3. Includes 50 GAVI-eligible countries that reported Bacillus Calmette-Guérin (BCG) wastage rate in at least one year 2008-2010; Nicaragua was excluded due to unrealistic reporting (100% in 2010, 250% in 2009). The expected rate is 50% for 20-dose/vial lyophilized BCG vaccine. WHO uses guidelines to direct countries on typical and reasonable wastage rates by presentation. They do not necessarily coincide with the optimum wastage levels, and countries can set different wastage rates where national wastage guidelines from in-depth assessments are available. Source: JRF wastage data from WHO country immunization profiles (September 2011).
4. 4. Estimation based on aggregated WHO SMT evaluations in 2011.
5. 2010/2011 EVM Assessment, CHAI Report on vaccine supply chain in Nigeria; 2010 Data from 2010-2011 EVM assessment; 2011 Data from Q3 2011 CC assessment.
6. Ozdemir H. Turkey's experiences on new vaccine introductions. In: Proceedings. Technet Meeting, Tunisia, December 2008.
7. WHO. Vaccine management, logistics and cold chain assessments in Ehtiopia; 2011.
8. Manzi et al. Human Resources for Health 2012;10:3. Human resources for health care delivery in Tanzania: a multifaceted problem 1. Expert interviews. 2. Saracino, former Minister of Health, Côte d'Ivoire. TFI Members briefing, Harare, October 2006.
9. Ukraine immunization programme management review, Kyiv, February-March 2012, conducted by Ministry of Health, WHO, UNICEF, BMGF, ECDC, USAID and USCDC. Unpublished report.
10. GAVI analysis of EVM Assessments of 24 countries, including Angola, Armenia, Bangladesh, Burundi, Cameroon, Chad, Congo, Djibouti, Gambia, Ghana, Guinea, Guinea-Bissau, India, Lao People's Democratic Republic, Liberia, Mauritania, Republic of Moldova, Niger, Nigeria, Papua New Guinea, Senegal, Sierra Leone, Togo and Viet Nam.
11. Colrain P. Study of EVM assessments from 57 GAVI-eligible countries, 2012-2013.
12. Ibid.
13. WHO UNICEF Joint statement on effective vaccine management, 2014 DRAFT.
14. Kane M. Evaluation of the Project to Support PAV (Expanded Programme on Immunization) In Northern Mozambique, 2001-2008: An independent review for villagereach with programme and policy recommendations (<http://villagereach.net/vrsite/wp-content/uploads/2009/08/Evaluation-ExecSum-only.pdf>), DTP3 coverage in Cabo Delgado province, 2008.
15. USAID | DELIVER PROJECT. Tanzania: 2020 Supply chain modelling forecasting demand from 2020-2024 (http://deliver.jsi.com/dlvr_content/resources/allpubs/countryreports/TZ_2020SuppChai.pdf, 2011).
16. PATH, World Health Organization, Health Systems Research Institute, Mahidol University. An assessment of vaccine supply chain and logistics systems in Thailand. Seattle; 2011.
17. Ceesay D. Ministry of Health and Welfare, The Republic of The Gambia. The Gambia: Success with full service vehicle leasing. In: Proceedings. Technet21 Conference, Dakar, 2013.
18. Collaborating with Karuna Trust (<http://www.samaanguru.org/wordpress/?p=384>, October 2013).
19. Basinga P, Gertler PJ, Binagwaho A, Soucat ALB, Sturdy J, Vermeersch CMJ. Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. *Lancet*. 2011;377:1421-1428.
20. USAID | DELIVER PROJECT. After receiving USAID | DELIVER PROJECT logistics training, access to health products improves in Nepal (http://deliver.jsi.com/dlvr_content/resources/allpubs/logisticsbriefs/NP_LogTrainImp.pdf, 2009).
21. (http://www.who.int/immunization_delivery/optimize/en/).
22. (http://www.who.int/immunization_delivery/optimize/Achieving_global_vision_for_future_immunization_supply_and_logistics_systems.pdf).
23. (<http://technet21.org/>).
24. (<http://deliver.jsi.com/dhome>).
25. (<http://iaphl.org/>).
26. (<http://www.peoplethatdeliver.org/>).



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