



Report to the GAVI Alliance Board

18-19 June 2014

Subject:	GAVI Alliance immunisation supply chain strategy
Report of:	The Immunisation Supply Chain Steering Committee
Authored by:	Daniel Thornton, Director, Strategic Initiatives and Benjamin Schreiber, UNICEF, on behalf of the Immunisation Supply Chain Taskforce
Agenda item:	05
Category:	For Decision
Strategic goal:	Affects all strategic goals

Section A: Overview

1 Purpose of the report

- 1.1 To seek the GAVI Alliance Board's approval of the GAVI Alliance's immunisation supply chain strategy. This paper reflects the PPC discussion of the strategy: amendments are marked in tracked changes.

2 Recommendations

- 2.1 The PPC, and where appropriate, the AFC and the EC recommended to the GAVI Alliance Board that it:
- a) **Approve** the GAVI Alliance immunisation supply chain strategy as attached as Annex A to Doc 05.
 - b) **Approve** US\$ 3 million to be added to the 2014 Business Plan for implementation activities of the immunisation supply chain strategy.
- 2.2 As explained in section 5.1 of this report, in early 2014 the Government of Canada provided funding for the implementation of the immunisation supply chain strategy and therefore the amount of US\$ 3 million to be added to the 2014 Business Plan does not affect GAVI's resources for other purposes.

3 Executive summary

- 3.1 Over the next few years, the Alliance has the opportunity to help countries to immunise hundreds of millions of additional children, saving millions of lives. This impact depends upon effective immunisation supply chains that move vaccines and other supplies from the point of manufacture to the point of administration. Although one of the challenges of managing

immunisation supply chains is a lack of quality data, it is clear that the supply chains are already under strain. Despite great efforts by those involved in immunisation supply chains to cope with the challenges, too many vaccines risk reaching their expiry dates, or having their potency compromised due to excessive heat or cold before they are administered;¹ stockouts occur too often in health centres;² and supply chain resources are too often inefficiently used. Country demand for new vaccines is projected to grow dramatically: in 2020 GAVI-eligible countries are projected to be required to manage four times the volume of vaccines³ and six times the number of doses.⁴ This will place significant additional pressure on under-performing and under-funded immunisation supply chains.

- 3.2 Fundamental changes in the way immunisation supply chains are designed and managed are needed so that vaccines can be rolled out more successfully, and equitable access, especially for the hardest-to-reach, can be achieved.
- 3.3 Faced with growing evidence of these challenges, a task force was established of WHO, UNICEF, the Bill & Melinda Gates Foundation, and the Secretariat to lead the development of an Alliance immunisation supply chain strategy, drawing on input from experts and practitioners. The strategy (see Annex A) builds on existing evidence and previous initiatives, and is aligned with the Alliance's emerging 2016-2020 strategy. In support of GAVI's mission and with a vision to provide potent vaccines to all who need them, the objectives of the immunisation supply chain strategy are to achieve continuous improvement in vaccine potency, availability and supply chain efficiency. The strategy leverages the Alliance's global capabilities – advocacy, policy-making, standard-setting, influencing, and funding – and in-country resources, to establish a powerful enabling environment for end-to-end supply chain improvement.
- 3.4 The first priority is to ensure that all GAVI-eligible countries have the fundamentals in place – a manager with expertise, with a plan and the capacity to monitor and manage the supply chain. Implementation will be different in every country but for each involves:

¹ ARISE study, "A Study of the Drivers of Routine Immunization System Performance in Ethiopia", August 2012 (http://arise.jsi.com/files/2012/09/Arise_EthiopiaReport_final508-Web-Version.pdf); Matthias Dipika et al. Freezing temperatures in the vaccine cold chain: A systematic literature review. Vaccine 25 2007: 3980-3986; Manoj V Murhekar et al. Frequent exposure to suboptimal temperatures in vaccine cold-chain system in India: results of temperature monitoring in 10 states Bull World Health Organ 2013;91:906–913.

² Immunization Summary database country profiles provide detail of stockouts (<http://www.childinfo.org/bluebook/profiles.html>), for example: DRC: http://www.childinfo.org/files/Congo_Dem_Rep_2000_2012.pdf; Nigeria: http://www.who.int/immunization/monitoring_surveillance/data/nga.pdf, Haiti: http://www.childinfo.org/files/Haiti_2000_2012.pdf.

³ UNICEF Supply Division Annual Report 2012, page 16.

⁴ 2010: UNICEF Supply Division shipment data; 2020: GAVI SDFv8 forecast. Includes volume for countries which graduate during this period.

- (a) Establishing, or reinforcing, the post of supply chain manager, within a strengthened management system for supply chains, with the training, experience, authority and resources to manage the supply chain. Countries are recommended to have plans in place to establish posts by mid-2015, with managers in post by the end of 2016. Under UNICEF's leadership, the Alliance will support establishing and developing these positions, in particular by providing focussed technical assistance to ten countries during 2015.
 - (b) Developing a comprehensive national supply chain management plan, building upon Effective Vaccine Management (EVM) assessments and improvement plans while integrating and linking with other assessments and plans. Countries are recommended to have comprehensive plans in place by the end of 2015. Under the joint leadership of WHO and UNICEF, the Alliance will provide guidance and technical assistance as required by mid-2015 to develop and implement these plans.
 - (c) Developing a country-level dashboard of key supply chain indicators and targets to monitor and manage supply chain performance and implementation of improvements in line with the comprehensive plans. Countries are recommended to have a first iteration of a dashboard in place by end-2015, with full dashboards by mid-2016. Under WHO's leadership, the Alliance will establish by the end of 2014 definitions and data standards for indicators and targets, providing a menu from which countries can select indicators that are most relevant. This will be developed jointly with countries, particularly those which already have dashboards in place. In 2015 the Alliance will support the development or improvement of dashboards with specific technical assistance in 10-15 countries.
- 3.5 To achieve these priorities, new vaccine and HSS guidelines will be adapted so that as countries apply for new GAVI support the more comprehensive national supply chain management plans will be requested in place of the current EVM improvement plans. Action will also be taken to shape the cold chain equipment market by helping countries to improve their inventories and maintenance; providing better information to countries and manufacturers; requiring that cold chain equipment purchased through HSS be pre-qualified by WHO, publishing the prices of cold chain equipment⁵ and advocating for similar requirements to be adopted by other donors (more detail is provided in Annex A).
- 3.6 Some countries have already been working over several years on redesign of their supply chains. Evidence from these indicates that vaccine availability can be increased and costs reduced,⁶ with modelling indicating

⁵ At present UNICEF Supply Division publishes vaccine price ranges, as prices can be volume dependent. It is proposed that Supply Division also publish price ranges for cold chain equipment. Where Supply Division procures equipment, it will have direct access to prices. Where a country procures equipment using HSS funds, HSS guidelines will require countries to provide prices to Supply Division, which will publish them.

⁶ Reports of the Vaccine Supply Chain Optimization Workshops in Benin (25 July and 20-21 September 2012)

that redesign can reduce operational costs by 10-25%.⁷ In a first phase, 4-6 countries will be identified which are a priority either because they have already started a supply chain change process, because they are planning to introduce significant numbers of new vaccines, or because there are particular issues with the current design. With these countries, a more intensive process to redesign supply chains, including monitoring and evaluation of the process, will be supported starting by early 2015. In a second phase, which will start by the end of 2015, another 5-10 countries will be invited to consider the design of their supply chains, with each phase building upon evidence from previous stages.

- 3.7 In all countries, but particularly in countries embarking on redesign, there will need to be a focus on change management. Where they do not already exist, it is recommended that countries establish supply chain sub-committees of their Interagency Coordination Committees (ICC), with links also to health system coordination bodies and supply chain functions for the health sector. It is proposed that these sub-committees will oversee country-led teams that will coordinate change management. Depending upon country circumstances there may be a case for exploring synergies and promoting convergence between health commodity supply chains, and the Alliance should take account of the Supply Chain interagency group recommendations as these develop. The role of the private sector and other third parties in managing parts of the supply chain also needs to be considered.
- 3.8 By 2020 implementation of this strategy will significantly improve the capacity of supply chains to efficiently support sustainable high coverage for existing and additional vaccines with low levels of vaccine wastage.
- 3.9 The taskforce's recommendation is that urgent action is needed to strengthen immunisation supply chains if the Alliance is to achieve its goals. Even with supply chain redesigns in several countries, supply chain costs will increase significantly as volumes increase. Given the scale of the challenge, GAVI on its own will not be able to fund the required increase in resources. This strategy represents a call to action to the Alliance to recognise the importance of immunisation supply chains and resource them accordingly.
- 3.10 The PPC discussed the GAVI Alliance immunisation supply chain strategy at its meeting on 5 May 2014, and recommended that the Board approve the strategy, as amended by the discussions of the PPC. The PPC also recommended the addition of \$3m to the 2014 Business Plan for implementation activities of the immunisation supply chain strategy. The PPC discussed the supply chain strategy as follows:

⁷ Bruce Y. Lee et al, University of Pittsburgh ("The World's Vaccine Supply Chains: Is Radical Redesign Needed?". To be published).

- PPC members commended the work carried out on the proposed strategy since the October 2013 PPC meeting and agreed that the project is a great demonstration of the power of the Alliance.
- PPC members noted that countries have very different needs in terms of improving their immunisation supply chains and asked how the related work will be prioritised. The Secretariat clarified that in addition to the prioritisation of specific initiatives proposed in the strategy, further prioritisation will be part of the implementation phase once the strategy has been approved.
- It was agreed that country ownership is critical. PPC members noted that in 2014 alone up to 40 Effective Vaccine Management (EVM) assessments will be implemented, each of which should include an improvement plan. For some countries this will be their second EVM assessment and will therefore be the first time a comparison can be done. The importance of ensuring accountability and funding for the implementation of the improvement plan was highlighted.
- PPC members noted that the scope of the immunisation supply chain strategy includes issues such as vaccine presentation and thermal stability. It was agreed that there will be a need to focus on the global elements of the supply chain, and also on factors that are beyond the scope of the strategy, but nonetheless have an impact on supply chains, such as electricity and the condition of roads but that this will obviously require discussions with the entities responsible for these other elements both at the global and country levels.
- PPC members asked for more analysis and guidance around the opportunities for integration referred to in the paper. In this context it was agreed that there should be guiding principles in the strategy about integration. Establishing synergies with other health commodity supply chains should be encouraged where appropriate. It was suggested that putting in place some incentive mechanisms to support integration, for both governments and partners, could be considered.
- One PPC member suggested that there is a need to differentiate between integration and convergence, where integration would be putting immunisation in the context of primary health care delivery systems while convergence would be bringing two or more systems together where specific synergies can be found by countries. It was acknowledged that convergence would depend on the state of systems in individual countries. It was agreed that it will be important to ensure that work on improving immunisation supply chain management in countries leads to better coordination across programmes with the county health systems and budgeted for within the existing financial management structures.
- It was suggested that supply chain specialists are needed not only at the national level but also at the subnational level to ensure sustainability. PPC members noted that WHO has put together information on the competency framework and profile of a supply chain manager should be and the training requirements. Further work needs to be done on this. PPC members also noted that the way in which the supply chain is managed will differ from country to country but that there is a need to clearly identify who will be in charge for progress to be made.

- One member of the PPC advised against any measures which might lead to the further creation of silos or which might lead to competing projects in supply and cold chain in countries.
- One PPC member noted that it would be good to have greater emphasis on maintenance in the paper and suggested that this should be looked at, not only in terms of spare parts and training of logisticians but also in terms of fostering a maintenance culture in countries.
- One PPC member noted that references in the paper to data for management appeared to be focused on data at the central level and highlighted the importance of ensuring through the strategy the ability to use cold chain and vaccine management data throughout the appropriate points in the system. The importance of ensuring that there is no requirement to increase the data that is already being collected was highlighted.
- PPC members agreed on the need to better define the roles and responsibilities and expertise needed to implement the strategy. It will be important to ensure that UNICEF, WHO and other Alliance partners have the right expertise and influence in-country to help deliver and foster change with governments. Should this not be the case it will be necessary to consider how this expertise is brought in. It will also be important to consider the potential role of the private sector, perhaps looking at lessons that can be drawn from PPPs that have done similar work in the past.
- A PPC member noted that the Board has indicated that it does not favour earmarked funding and therefore asked for further information on the funding received from Canada for the implementation of supply chain activities. The CEO referred to the earmarking policy and confirmed that earmarking is indeed discouraged. This particular funding from Canada was one-off end of year funding and could only be given for an activity which was not already funded – and was therefore in line with the Board's policy on earmarking - and was accepted in this spirit. It would also enable the implementation of supply chain strategy activities to start in 2014.
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- In terms of long term funding of the implementation of the supply chain strategy PPC members noted that it is not proposed that GAVI should fund major supply chain costs through the business plan going forward. There is an opportunity for countries to fund some supply chain activities through health systems strengthening grants. There are no plans to propose the opening of a new funding window, although it may be necessary to adapt existing windows. There will also be requests for funding for global interventions which will go through the normal business planning process.
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- PPC members agreed that the wording of the vision which is been developed by the Supply Chain Inter-agency group should be incorporated into GAVI's immunisation supply chain strategy.
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- PPC members noted that the figures presented in the presentation on immunisation supply chain costs to 2020 were projections. PPC members also noted that potential innovations have been being factored in. Such innovations include better designed supply chains as well as better technology. In this context

it was suggested that it might be useful to look at the work being carried out by the UN Commission on Life-Saving Commodities.

- 3.11 At their meetings on 17 April and 12 May, the AFC and the EC respectively also recommended the addition of US\$ 3 million to the 2014 Business Plan for implementation activities of the immunisation supply chain strategy.

4 Risk implication and mitigation

- 4.1 The immunisation supply chain strategy is itself a risk mitigation initiative, as it is designed to protect the Alliance's US\$ 1 billion plus annual investment in vaccines and the associated health impact, and mitigate the reputational risk if vaccines are wasted and the public health risk if they are administered with reduced potency. However, there are several issues that could limit the impact of the strategy:

- (a) Efforts to improve **coordination** could be derailed by entrenched institutional interests, competition for limited resources, or funding streams not aligned with the strategy. The challenge of communicating and making decisions with so many partners could result in a process more complex and cumbersome than a decentralised and uncoordinated approach. *Mitigation:* a re-shaped immunisation supply chain taskforce will remain in place with responsibility for overseeing implementation of the strategy and managing Alliance business plan supply chain funding.
- (b) The scale and complexity of the action required will exceed available **resources**; other priorities will compete for attention, and not all initiatives can be immediately pursued. *Mitigation:* the strategy identifies the highest priority initiatives and a process for identifying priority countries. It also makes a call to action, and proposes better engagement with donors to increase and make better use of resources.
- (c) Enthusiasm at the global level and a need for supply chain improvements does not mean countries will have the **political will** to embark on significant change such as redesign or outsourcing. *Mitigation:* country representatives have been involved and consulted in the strategy development process to ensure that it responds to countries' needs. Redesign efforts will be focussed on 4-6 countries initially (see also paragraph 3.6). Just as the Alliance has generated political will to introduce new vaccines, so it must now generate political will to strengthen supply chains.

5 Financial implications: Business plan and budgets

Under the GAVI business plan approved by the Board in 2012, funding in 2014 for WHO of US\$ 2.2 million and UNICEF of US\$ 4.9 million is provided for supply chain activities. These primarily involve supporting countries to conduct EVM assessments, implement temperature

monitoring systems, and cold chain equipment inventories. In November 2013 the GAVI Board approved US\$ 3.9 million to be added to the 2014 Business Plan to be managed by the Secretariat for supply chain activities. Of this: US\$ 1.6 million was for supply chain strategy development, 50% of which has been spent with the remaining funds used to support implementation of the strategy; US\$ 2.3 million was for the GAVI Supply Chain Fund, of which US\$ 2 million has been approved for two country grants and about US\$ 85,000 has been spent as budgeted for Secretariat activities. The remaining Supply Chain funds will support additional grants and related expenses.

- 5.1 The Government of Canada and the Secretariat have signed a grant agreement to provide CAN\$ 20 million (US\$ 18.3 million) to support implementation of the immunisation supply chain strategy in 2014 and 2015. A recommendation is provided in paragraph 2.1 to the Board with respect to business plan spending in the second half of 2014, for US\$ 3 million, which is in addition to US\$0.8m which remains from funds for supply chain spending in 2014 already approved by the Board. US\$3.8m is proposed to start implementation, in line with the priority initiatives which are scheduled to start in 2014 (see Annex A, Section 9). Business plan funding for 2015 will be requested through the business planning approval process later this year. Additional business plan or country funding for catalytic investments to support implementation of the strategy of around US\$ 20 million - US\$ 30 million will be required per year up to 2020.

Section B: Content

- 6 See Annex A.

Section C: Implications

7 Impact on countries

- 7.1 Countries can expect the following benefits:

- (a) Ability to reach more people with vaccines using more resources more efficiently without compromising potency.
- (b) Capital expenditure in supply chain operations can significantly reduce operating expenses for a net gain.
- (c) Leadership of change by better recognised, resourced and trained staff.
- (d) Access to financial and technical resources to upgrade systems, re-think processes, test new approaches, and improve broader health supply chains.

- 7.2 To realise these benefits, countries will need to:

- (a) Commit higher levels of human and financial resources
- (b) Be open to adopting new approaches, technologies, and systems.
- (c) Be willing to be held accountable for making improvements in supply chain performance, including in data management.

8 Impact on GAVI stakeholders

- 8.1 Roles and responsibilities are outlined in Annex A section 10.

9 Impact on Secretariat

- 9.1 Roles and responsibilities are outlined in Annex A section 10.

10 Legal and governance implications

- 10.1 The Alliance will implement any market shaping of cold chain and other immunisation supply chain related equipment in a manner that manages conflicts of interest and is consistent with regulatory and legal requirements, including anti-trust and competition laws.

11 Consultation

- 11.1 In July 2013 a survey on the objectives, analysis and indicators drew 150 responses, about half from within countries, and a baseline analysis drew upon interviews with 75 experts and practitioners. Subgroups made up of 67 experts reviewed the information, collected additional input through online forums ([TechNet](#) and [IAPHL](#)) from countries, and developed the initiatives identified in the strategy. These initiatives have been discussed with EPI managers at regional meetings in AFRO (February 2014), and in individual interviews. The draft strategy has been presented and discussed in several forums, such as the Global Health Supply Chain Summit,⁸ and the World Vaccine Congress. On 11 April, private sector and other partners reviewed key elements of the supply chain strategy, identified best practices to consider, and provided input on their potential contribution in the implementation phase.

12 Gender implications

- 12.1 To be kept under review as the strategy is implemented but there is no evidence so far that immunisation supply chains have gender implications.

Section D: Annexes

Annex A: GAVI Alliance Immunisation Supply Chain Strategy

Annex B: Strategy Performance indicators

⁸ http://www.ghsc-2013.com/ghsc2013/Presentation_Part.php

Annex A: GAVI Alliance Immunisation Supply Chain Strategy

1 Introduction

- 1.1 Supporting and creating immunisation supply chains⁹ for low income countries was a vital part of WHO's Expanded Programme on Immunization (EPI), launched in 1974, and UNICEF's Universal Child Immunization initiative in the early 1980s. For the last 35 years, these supply chains have made it possible for EPI programmes to deliver low-cost vaccines to the remotest regions of the world and, as a result, contributed to the extraordinary gains in immunisation coverage that have prevented countless cases of disease and saved millions of lives. But today they are straining to keep up with existing volumes of vaccines – many of which are more expensive than older vaccines – and face further challenges with significant growth in volumes up to 2020.
- 1.2 Immunisation supply chains typically have four levels, following countries' administrative levels:¹⁰ a central store with cold rooms, two levels of intermediate stores with cold rooms or refrigerators, and health facilities which may have refrigerators. Transport between levels is carried out with coolers and ice packs; outreach is usually carried out with small vaccine carriers and ice packs. Supplying the service delivery level usually involves a nurse or doctor travelling by bus or personal vehicle from the health facility to the district level to collect immunisation supplies when they are running low. Data on vaccine stock inventory and immunisation administration is usually collected on paper and aggregated at each level in monthly reporting cycles.
- 1.3 National governments are responsible for their immunisation supply chains – in practice this responsibility often falls to EPI managers. This does not mean they manage every function of their supply chains: third parties are often involved in some geographical or functional area, and in most countries WHO and UNICEF provide advice and support. Immunisation supply chains usually have “vertical” components, in that some staff, data, and equipment is specific to immunisation. This is starting to change, however, as more health products are requiring refrigeration and integration with other health commodity supply chains is taking place in some countries.¹¹ The role of the private sector in immunisation supply chains is also evolving. Private sector freight forwarders have a long

⁹ For the purposes of this strategy, the immunisation supply chain is defined as: a system of organisations, people, activities, information, and resources involved in moving products (vaccines and other immunisation supplies) from supplier (manufacturers) to customer (children or other target populations). Because vaccines are temperature-sensitive products that must be refrigerated, the immunisation supply chain is sometimes referred to as the “cold chain” or “cold chain and logistics.” The term “immunisation supply chain” is preferred in this strategy because it explicitly captures flows of data and funding as well as the movement of vaccines and other immunisation supplies, which other terms do not.

¹⁰ A study conducted by Bruce Y. Lee et al, University of Pittsburgh (The World's Vaccine Supply Chains: Is Radical Redesign Needed? To be published.) showed that among GAVI eligible countries for which there was data, 35 have four levels, while 6 countries have five, and 4 countries have three levels.

¹¹ USAID | DELIVER PROJECT: "Supply Chain Integration: Case Studies from Nicaragua, Ethiopia, and Tanzania", June 2011 and Project OPTIMIZE Evidence Brief, "Integrating the supply chains of vaccines and other health commodities", August 2013.

standing role in transporting vaccines from manufacturers to countries' port of entry. Within countries, the role of the private sector in immunisation supply chains is currently less prominent. When immunisation supply chains were established, there was limited scope for outsourcing, as few reliable service providers existed. Today in many countries, service providers are available to support immunisation programmes in managing customs clearance, warehousing, distribution, fleet and cold chain equipment management and maintenance – with the higher levels of the supply chains, particularly in urban areas, more likely to be candidates for outsourcing.

2 Why do immunisation supply chains matter?

2.1 Immunisation supply chains have always mattered to the Alliance, but particularly now because:

- (a) There is already evidence that immunisation supply chains are under strain, and the opportunity presented by new vaccine introductions increases the risks that immunisation supply chains carry, and the challenges of managing them (see section 3).
- (b) The investment required for measurable supply chain improvement represents a fraction of the cost of new vaccines, and will add value through improved coverage, increased capacity for vaccine introductions, and lower vaccine wastage and operating costs.¹²
- (c) The Alliance is well placed to help countries improve supply chains by catalysing the introduction of new approaches, tools and technologies, funding capital investments, supporting countries with technical assistance, and creating an enabling environment for change. Because supply chains are interconnected systems, coordinated action is needed across the Alliance.

3 Immunisation supply chain opportunities and risks

3.1 The Effective Vaccine Management (EVM) process involves an assessment of countries' immunisation supply chains, amongst other things, at all levels every three years. To date, 65 GAVI-eligible countries have completed assessments, and none meet the recommended standard for all criteria at all levels. The lowest average scores are in maintenance, stock management and distribution, where fewer than one-fifth of countries meet the standard.¹³ Of the 113 new vaccine support applications reviewed from 2011-2013 by GAVI's Independent Review Committee and

¹² A number of supply chain modelling exercises using real data from GAVI eligible countries (e.g., Benin, Niger, Chad), as well as, multiple demonstration projects, some at fairly large scale (e.g., Mozambique, Senegal, Nigeria), have established the benefits of improved vaccine supply chains. These examples have guided and formed the evidence base for the strategy.

¹³ EVM average score of principal, sub-national, district, local and service point levels; EVM assessment for 57 countries, WHO, February 2014.

requiring clarifications or conditions, 50 were related to one or more supply chain issues.¹⁴

3.2 From a country perspective, the task of moving vaccines and related immunisation products to the end user involves many challenges. Evidence¹⁵ points to issues in six areas:

- (a) **Limitations in system design.**¹⁶ Most GAVI-eligible countries' supply chain networks have not substantially changed since they were established. While the response to supply chain bottlenecks is often to expand infrastructure and introduce new technologies, impact is limited if they are deployed in systems that are not well designed. In addition, supply chain networks that reach every child are necessary for sustainable and equitable increases in immunisation coverage.
- (b) **Insufficient and misallocated human resources.** The profession of "supply chain manager" often does not exist, and there are insufficient managers and workers to effectively manage supply chain operations. Those operating supply chains (usually pharmacists and health workers) have often not received training in supply chain management, and there is a lack of structure and systems in place to share good practices.
- (c) **Ineffective use of data for management.** Effective supply chain management depends upon rapid flows of quality data which is acted upon, for example to manage stocks by having visibility of higher and lower supply chain levels. Good quality, fit for purpose supply chain data may not always be available, or if it is, may not be used. In this environment, capturing data also becomes a chore because it flows one way up the chain, has little immediate value to the person collecting the data, and is not acted upon (i.e. there is no feedback mechanism).
- (d) **Weak distribution systems:** EVM assessments indicate that distribution is one of the weakest links in immunisation supply chains of most countries, and performance is often declining. Vaccines are being exposed to risks of excessive heating or freezing during transport. Distribution systems often have inefficient planning, and insufficient staff or resources to deliver immunisation supplies, meaning that supply is ad hoc.

¹⁴ IRC Reports 2011, 2012, 2013; BCG Analysis.

¹⁵ Including effective vaccine management assessments (see notes 14 and 25), Post Introduction Evaluations, Full Country Evaluations, articles (see supra notes 7, 8 and 11), and surveys of immunisation professionals (see supra paragraph 11).

¹⁶ System Design refers to the underlying structure and processes of a supply chain. Redesigning a system could involve changing the location, function or capacity of storage and immunisation sites, and/or transport routes between them, and/or outsourcing services such as cold chain equipment maintenance or vehicle management to third party providers.

- (e) **Budget and disbursement processes** that support supply chains (funding cold chain equipment management, vehicles and fuel, monitoring systems) do not function properly so funds are often not available at the right point at the right time. One of the reasons for this is that budget lines for operational expenditure often do not exist.
 - (f) **Deficient cold chain equipment.** Of the approximately 134,000 immunisation points in 57 of GAVI-eligible countries, around one fifth have no cold chain equipment, one fifth have equipment that does not work, and more than two-fifths have equipment with significant limitations, such as high freezing risk, and/or the need for expensive gas or kerosene.¹⁷ Issues with cold chain equipment put vaccines at risk of exposure to excessive heat or cold, leading to high wastage (when the exposure is detected) or administration of reduced-potency vaccines (when the exposure is not detected).¹⁸
- 3.3 Over the next few years, the Alliance has the opportunity to help countries to immunise hundreds of millions of additional children, saving millions of lives. The new vaccine introductions that will underpin this opportunity also increase the risks that immunisation supply chains carry and the challenges of managing them. In 2020 GAVI-eligible countries are projected to be required to manage twice as many vaccine products as in 2010;¹⁹ the volume of vaccines will increase four times (from 70 to 280 cubic cm per child),²⁰ and the number of doses will increase six times.²¹ This growth will increase the annual cost of supply chains by two-and-a-half times (see Section 4), and the new vaccines that are being introduced are five times more expensive per dose than existing vaccines.²² The fifteen countries with highest value vaccine introductions from 2014-2016 will see their GAVI-funded immunisation programmes increase cumulatively by \$1bn over the period, and all of them are substantially below the recommended supply chain standards.²³
- 3.4 Despite these challenges, supply chain workers achieve immunisation objectives as best as they can in often very challenging environments. This strategy aims to support countries to address these issues and to optimise²⁴ supply chains.

¹⁷ Estimate by McKinsey and Company of facilities in 57 GAVI-eligible countries. The estimate includes sites that are designated by governments as those which should have cold chain equipment, and does not include campaign delivery sites.

¹⁸ Op. cit. 1.

¹⁹ Or "stock keeping units". GAVI Procurement / SDF v8; 2010: estimates based on 2009 product lineup; 2020: estimates based on 2013 forecasted product lineup. The figures in this paragraph relate to GAVI funded vaccines. Countries which are GAVI-eligible in 2014 are compared against the same countries in 2020.

²⁰ UNICEF Supply Division Annual Report 2012, page 16.

²¹ 2010: UNICEF Supply Division shipment data; 2020: GAVI SDFv8 forecast. Includes volume for countries which graduate during this period.

²² Comparison based on 2013 price; 2020 vaccines include: Rota, Pneumo; HPV; 2010 vaccines include: YF, Measles, DPT, OPV. UNICEF SD.

²³ EVM Score based on supply chain related indicators: E2 (temperature monitoring), E3 (Cold storage and dry storage capacity), E5 (maintenance) aggregated at national and district level, WHO.

²⁴ System Optimisation refers to the process of improving performance of an immunisation supply chain. A system can be optimised within an existing structure on a continuous basis or, in a more profound and episodic way, through system redesign.

4 Immunisation supply chain costs and funding

- 4.1 Scant information exists on supply chain costs, however data from annual progress reports and comprehensive multi-year plans indicates that GAVI-eligible countries spent between \$300-340m in 2013 on their immunisation supply chains, representing approximately 15% of total spending on immunisation programmes.²⁵ With the introduction of new vaccines and the growing volume of vaccines to store, distribute and handle, and without actions to improve efficiency, the annual spending on countries' supply chains is projected to grow from \$300-340m in 2013 to \$750m-1.2bn by 2020.²⁶
- 4.2 Up to 2011, while new vaccine introductions were increasing, GAVI's Immunisation System Strengthening programme was winding down, and the Health Systems Strengthening (HSS) programme was not focussed on vaccine outcomes. Since then, the supply chain component²⁷ of HSS programme approvals has increased from \$29m (5% of total HSS approved amounts) from 2006-2011 to \$43m (22%) in 2012, and \$76.6m (30%) in 2013, and programme approvals are expected to reach \$126.5m in the first half of 2014. These are multi-year programmes: the expected expenditure on supply chains this year through HSS is \$25m. The performance based funding element of HSS is also relevant and provides incentives to improve supply chains as an important contributor to increasing coverage.
- 4.3 The increased focus on supply chains through HSS is encouraging in the light of challenges immunisation supply chains face – however, 2013 and 2014 can be seen as exceptional because of India, Nigeria and DRC's programmes.²⁸ In any event it is clear that HSS cannot provide all of the funding necessary to improve supply chains – see section 11.
- 4.4 Based on the limited data and studies that are available,²⁹ donors are estimated to fund 25-45% of countries' immunisation supply chain costs. Countries, Alliance partners and other donors each contribute around a third of cold chain equipment costs, which are a subset of overall supply chain costs.³⁰ The funding is not coordinated either at the global or country level and is often provided on an ad hoc basis at critical moments.

²⁵ Estimate based on 53 GAVI-eligible countries. Source: Annual Progress Reports (APRs), country comprehensive multi-year plans (cMYPs), SDF, B&MGF/WHO – historical analysis of cMYPs in GAVI-eligible countries (2012), B&MGF – Total System Cost analysis (2012), WHO/P. Lydon "Supply Chain and Logistic costs in LLMICs: Estimates based on the Decade of Vaccines Costing (DoVC)" (To be published).

²⁶ Modelling by BCG based on existing estimates including op.cit.

²⁷ Defined as: cold chain equipment, facilities spare parts, supply chain related training/supervision/capacity building and staff salaries (cold chain technicians, drivers, others), vehicles and transport related expenses (e.g. fuel, spare parts), supply chain logistics and information systems, supply chain related procurement and optimisation.

²⁸ India's was approved in 2013, Nigeria's has been approved in February 2014, and DRC's is expected but not yet received.

²⁹ WHO/UNICEF/Project optimize, "Costing study and gap analysis of Cold chain and Logistics Financing in GAVI countries" by P Lydon and J Grevendonk, Secretariat analysis of Annual Progress Reports submitted by 71 countries to GAVI 2010-2012, B&MGF study (2012).

³⁰ Secretariat analysis of Annual Progress Reports submitted by 71 countries to GAVI 2010-2012.

5 The strategy development process

- 5.1 As the need emerged for a stronger focus on supply chains, at the beginning of 2013 a taskforce made up of staff from WHO, UNICEF, the Bill & Melinda Gates Foundation (B&MGF) and the Secretariat³¹ was formed to lead the development of a global strategy, overseen by a steering committee.³² Working groups involving 67 experts and practitioners made proposals in relation to human resources, data, distribution, cold chain equipment, and system design.
- 5.2 This work built upon the 2020 Vision for Vaccine Supply and Logistics Systems,³³ the work of the Cold Chain and Logistics Taskforce, the WHO and UNICEF immunisation supply chain and logistics Hub, and the supply chain strategy of the B&MGF.³⁴ The Special Advisory Group of Experts (SAGE) reviewed broad supply chain issues and challenges in October 2013 and in early April 2014, and endorsed a call to action which is aligned with this strategy. The development of this strategy has also been aligned with the development of the Alliance's 2016-2020 strategy, and will support that strategy by contributing to sustainable increases in coverage and equity and facilitating new vaccine introductions.

6 Strategy scope and focus

- 6.1 The analysis of the immunisation supply chain considered functions at the global level, including demand forecasting, purchase and shipment of vaccines, syringes, diluents, and other immunisation supplies from international manufacturers to a country's port of entry. Evidence indicates that challenges are most significant from the national level to the point of administration, and therefore this strategy primarily seeks to have an impact at the country level.
- 6.2 Effective immunisation supply chains are necessary but not sufficient for GAVI to achieve its mission; areas such as improving demand generation and service delivery are also clearly important. Some of the conditions that affect supply chains, such as roads and electricity supply, and national public sector pay, are beyond the scope of this strategy.
- 6.3 There is further work underway within the Alliance that has implications for the immunisation supply chain, but they have not been addressed by the taskforce because they have separate momentum:

³¹ Co-chairs: Daniel Thornton (GAVI Secretariat), Benjamin Schreiber (UNICEF). Members: Patrick Lydon (WHO, also lead of distribution working group), Raja Rao (B&MGF), Olof Molander (UNICEF), Gemma Orta-Martinez (UNICEF), Joanie Robertson (GAVI Secretariat, also lead of cold chain equipment working group). Other working group leads: Jan Grevendonk (WHO, data for management), Musonda Kasonde (UNICEF, people and practice).

³² Seth Berkley (GAVI Secretariat), Shanelle Hall (UNICEF), Orin Levine (B&MGF), Jos Vandelaer (UNICEF), Michel Zaffran (WHO).

³³ 2020 Vision for Vaccine Supply and Logistics Systems: World Health Organization, PATH. Achieving the Global Vision for Future Immunization Supply and Logistics Systems: Action Plans. Seattle: PATH; 2012.

³⁴ Bill and Melinda Gates Foundation Vaccine Delivery Strategy. Retrieved from <http://www.gatesfoundation.org/What-We-Do/Global-Development/Vaccine-Delivery> (March 2014).

- (a) Efforts are underway to improve vaccine product characteristics, dosing and handling. These innovations have the potential to help increase coverage and efficacy, and reduce supply chain costs by reducing storage and transport requirements and opportunities for mishandling, although some will require tradeoffs or result in higher procurement costs. They include relabeling vaccines to reflect their real thermostability and enable use in a Controlled Temperature Chain (CTC)^{35 36 37} and reformulating vaccines to protect against freezing. Those assessed as priorities will be included in the vaccine roadmaps under the Alliance's Supply and Procurement Strategy so that partners can collectively work towards their inclusion in guidance and GAVI programmes. In the case of CTC for MenA vaccine, which has already been relabelled and successfully piloted in one country, the immunisation supply chain strategy will support the introduction of CTC in other countries.
- (b) The multidisciplinary Vaccine Packaging and Presentation Advisory Group (VPPAG) brings together various constituencies and advises WHO on policies related to vaccine packaging and labelling as well as formats. Current issues include the agreement of a standard for bar codes on vaccine packaging, and testing this standard in Tanzania.
- (c) UNICEF Supply Division and the Secretariat are following up on the Procurement Benchmarking Study which was considered by the Board at the end of 2013. Clearer roles and responsibilities and a process of continuous improvement have been established which has led to:
 - (a) Strengthening the country programme approval process building on the Grant Application Monitoring and Renewal redesign, with a focus on timely issuance of decision letters which are key supply chain documents.
 - (b) Improving operational forecasts by building on and enhancing existing tools in order to align the multiple forecasts used across the agencies for the near-to-medium term, with the aim of allowing operational planning with countries and manufacturers and financial planning within the Alliance.

³⁵ WHO Immunization, Vaccines and Biologicals. Use of MenAfriVac™ (meningitis A vaccine) in a controlled temperature chain (CTC) during campaigns: Guidance for immunization programme decision-makers and managers. WHO/IVB/13.04. July 2013. Geneva.

³⁶ Zipursky S, et al. Benefits of using vaccines out of the cold chain: Delivering Meningitis A vaccine in a controlled temperature chain during the mass immunization campaign in Benin. Vaccine. 2014 Mar 14;32(13):1431-5.

³⁷ Lydon P, et al. Economic benefits of keeping vaccines at ambient temperature during mass vaccination: the case of meningitis A vaccine in Chad. Bull World Health Organ. 2014 Feb 1;92(2):86-92.

- (d) Improving transparency between supply chain levels is important for all levels, including transparency of the global supply chain for countries. One example is Visual Vaccines, which is a UNICEF/WHO initiative to develop a vaccine stock and stock projection visualisation tool and enable increased collaboration and sharing of data between UNICEF/WHO and governments whilst maintaining confidentiality. This project is being piloted with Nigeria, DRC, Senegal and Niger (May to July 2014).

7 Objectives

- 7.1 In support of the GAVI mission and a vision to provide potent vaccines to all who need them, the objectives of the strategy are to:
 - (a) ensure availability of the right vaccines and supplies
 - (b) maintain vaccine potency³⁸
 - (c) use resources efficiently
- 7.2 These objectives should be interpreted to mean that resources should be used as efficiently as possible consistent with achieving full availability and potency. Draft key performance indicators are outlined in Annex B.

8 Approaches to change

- 8.1 Although every supply chain is different, some principles apply to all supply chains. This strategy has drawn upon practices in supply chain management for other health commodities³⁹ and from the private sector. Examples of these include consolidating supply chain networks to achieve economies of scale in transport and warehouses, and improving transparency and data availability for inventories, demand and delivery status across supply chains, which improves forecasting accuracy and on-time deliveries, and reduces inventory.
- 8.2 There are examples where these approaches have already been adopted in immunisation supply chains, and in these cases the strategy will support scale up:

³⁸ As well as affecting potency, there is also evidence that in a smaller number of cases freezing vaccine vials can increase the number of adverse events following immunisation, by cracking vials and allowing contamination. <http://www.who.int/bulletin/volumes/88/8/08-056879/en/>

³⁹ E.g. External review of USAID's PEPFAR SCMS project evaluation, technical assistance and health systems strengthening. December 2011.

- (a) An “informed push” model has been used in immunisation supply chains⁴⁰ and other health commodities. A distribution loop is established with vehicles visiting health facilities, and supply chain workers topping up stocks and collecting data, rather than a hub and spoke system involving health workers travelling to a store to collect vaccines. As an example, Benin has redesigned its supply chain in one province to introduce distribution loops and is evaluating the results.⁴¹
- (b) Consolidating a supply chain through redesign – potentially reducing the number of levels, and/or the number of storage points – reduces inventory and vaccine handling, allows economies of scale for warehouse operations and makes it more likely that demand information and vaccines will flow rapidly through the system.⁴²

9 Priority initiatives

- 9.1 The first priority is to ensure that all GAVI-eligible countries have the fundamentals in place – a manager with expertise, with a plan and the capacity to monitor and manage the supply chain. Implementation will be different in every country but for each involves:
 - (a) Establishing, or reinforcing, the post of supply chain manager, with expertise, authority and resources to manage the supply chain, within a strengthened management system for supply chains. Countries are recommended to have plans in place to establish posts by mid-2015, with managers in post by the end of 2016. Under UNICEF’s leadership, the Alliance will support establishing and developing these positions, in particular by providing focussed technical assistance to ten countries during 2015.
 - (b) Developing a comprehensive national supply chain management plan, building upon EVM assessments and improvement plans while integrating and linking with other assessments and plans. Countries are recommended to have comprehensive plans in place by the end of 2015. Under the joint leadership of WHO and UNICEF, the Alliance will provide guidance and technical assistance by mid-2015 to develop and implement these plans.

⁴⁰ Op. cit. 7

⁴¹ Op. cit. 6

⁴² A CHAI analysis found that in a five level country, the majority of vaccines were used after 12+ months, while in a four level country, the majority were used after 6+ months, and in a three level country, the majority were used within 4-5 months. Other things being equal, the risk of vaccine expiry is therefore higher in a five level system than in a three level system.

- (c) Developing a country-level dashboard of key supply chain indicators and targets to monitor and manage supply chain performance and implementation of improvements in line with the comprehensive plans. Countries are recommended to have a first iteration of a dashboard in place by end-2015, with full dashboards by mid-2016. Under WHO's leadership, the Alliance will establish by the end of 2014 definitions and data standards for indicators and targets, providing a menu from which countries can select indicators that are most relevant. This will be developed jointly with countries, particularly those which already have dashboards in place. In 2015 the Alliance will support the development or improvement of dashboards with specific technical assistance in 10-15 countries.
- 9.2 To achieve these priorities, new vaccine and HSS guidelines will be adapted so that as countries apply for new GAVI support, the more comprehensive plans will be requested in place of the current EVM improvement plans.
- 9.3 Some countries have already been working over several years on redesigns of their supply chains. Evidence from these indicates that vaccine availability can be increased and costs reduced,^{43 44} with modelling indicating that redesign can reduce operational costs by 10-25%.⁴⁵ In a first phase, 4-6 countries will be identified which are a priority either because they have already started a supply chain change process, because they are planning to introduce significant numbers of new vaccines, or because there are particular issues with the current design. With these countries, a more intensive process to redesign supply chains, including monitoring and evaluation of the process, will be supported starting by early 2015. In a second phase, which will start by the end of 2015, another 5-10 countries will be invited to consider the design of their supply chains, with each phase building upon evidence from previous stages.
- 9.4 In all countries, but particularly in the priority countries, there will need to be a focus on change management. Where they do not already exist, it is recommended that countries establish supply chain sub-committees of their Interagency Coordination Committees, with links also to health system coordination bodies and supply chain functions for the health sector. It is proposed that these sub-committees will oversee country-led teams that will coordinate change management.
- 9.5 In addition to the three fundamentals steps, and the redesign efforts, the Alliance will also take the following steps to implement the strategy:
- (a) **Improve support to countries with supply chain system optimisation and design.** This involves:

⁴³ Op. cit. 6

⁴⁴ Op. cit. 7

⁴⁵ Op. cit. 8

- (a) continuing to improve the comprehensive EVM process described in the WHO-UNICEF joint statement on EVM,⁴⁶ which is already been implemented and piloted in some countries. This involves refinements in the assessment tool, programming additional assessments to supplement the EVM assessment, and the strengthening of improvement planning by linking it with other programmatic priorities and funding opportunities, and strengthening implementation.
- (b) creating a methodology for countries to evaluate options for redesigning their supply chain, defining activities, timelines, and critical paths, and encouraging higher levels of interest and investment in the change process.⁴⁷ Improved tools to support redesign will be available by the end of 2014, and by mid-2015 a more comprehensive methodology will be available and linked to improvements in the EVM process.
- (c) expanding the cadre of personnel and service providers with experience of working with countries and others to review system design and implement change, including by developing regional health supply chain institutes.

(b) **Develop guidance, knowledge, and standards to support country systems:** which aims to establish a comprehensive and regularly updated set of guidance, and accessible sources of knowledge, including operations research and country case studies. These will cover system design, and optimisation and will have modules on:

- (a) data standards and guidance on how to select and implement better and more sustainable information systems. This guidance will be piloted with one country starting in 2014, and a first iteration will be available by mid-2015.
- (b) assessing and improving data and information systems, so that countries can improve and introduce monitoring systems. This will start in 2014.
- (c) immunisation supplies distribution systems. This will start in 2015.
- (d) cold chain equipment commissioning, operation, maintenance, and disposal. These will be available by mid-2015.

⁴⁶ WHO&UNICEF Joint Statement: "Effective Vaccine Management – A Holistic Approach", Geneva/New York, approved by SAGE on 1 April 2014.

⁴⁷ An EVM+ process was implemented in Benin where modelling experts from the University of Pittsburgh worked with the government and implementing partners to evaluate the impact of different system re-design scenarios. Modelling tools will be made more accessible and easy to use for evaluating the cost and impact of various supply chain re-design scenarios.

- (c) **Improve knowledge sharing between and with countries:** which aims to establish new and support existing mechanisms for communicating and sharing knowledge. One example of this involves implementing mechanisms to share and disseminate experiences of data for management (e.g. a software product catalogue). This will be available by the end of 2015.
- (d) **Support evidence-based innovation:** which aims to speed up the pace of innovation in information systems, distribution strategies, cold chain equipment, training and human resource development strategies, and forecasting approaches. This involves investing in the development of promising approaches, through operational research, pilots, design challenges and requirement documentation.
- (e) **Ensure improved quality and choice of cold chain and temperature monitoring equipment.** This involves shaping the market for equipment to better meet country needs by:
 - (a) investing in early-design-stage field-testing of equipment that meets or partially meets target produce profiles, and promoting timely feedback on product performance.
 - (b) developing an improved buyers' guide and equipment field reports (with a first release by the end of 2014).
 - (c) producing a suite of target product profiles (with fridges completed by the end of 2014 and other equipment by the end of 2015)
 - (d) improving forecasts of cold chain equipment requirements (with a first forecast in place by the end of 2014)
 - (e) requiring cold chain equipment purchased through HSS to be pre-qualified by WHO, and the prices of cold chain equipment published⁴⁸ and advocating for similar requirements to be adopted by other donors.
 - (f) Including equipment management plans in the comprehensive supply chain plans,⁴⁹ and linking those plans to GAVI and other donor funding for cold chain equipment purchases and system re-design efforts.

9.6 As noted above, the **private sector and social enterprises** have the potential to play a greater role in immunisation supply chains, and case studies suggest that private sector partnerships can play an effective role in managing or supporting parts of supply chains.⁵⁰ The Alliance will

⁴⁸ Op. Cit. 5.

⁴⁹ Equipment management plans include complete and up-to-date cold chain equipment inventories that can be used to manage maintenance schedules, track performance, schedule repairs, and plan augmentation and replacement as needed over multi-year cycles.

⁵⁰ USAID | DELIVER PROJECT. Emerging Trends in Supply Chain Management: Outsourcing Public Health Logistics in Developing Countries. Task Order 1. 2010. ;Rockefeller Foundation, Dalberg and MIT-Zaragoza"

explore opportunities for increase private sector and social enterprise involvement in immunisation supply chains. For this to be successful:

- (a) EPI, health and supply chain managers need to retain an ability to plan the overall immunisation system, and to oversee immunisation outcomes, including by managing contracts with the private sector directly.
- (b) Contracts need to be actively managed and supplier performance recorded and analysed, and the Alliance can do more to support governments to build capacity to do this.
- (c) Awareness of successful public-private partnerships needs to be raised, documenting and sharing evidence.

9.7 The existence of separate supply chains for vaccines, HIV, malaria, and other essential health commodities and the fact that most health commodities are integrated at health facilities, raises the question as to whether greater **integration** can improve performance. Integration, or at least “convergence”, recognising that health commodities have different supply chain characteristics, may bring benefits through economies of scale, streamlined delivery routes, the establishment of dedicated supply chain professionals, as well as a clarification of roles, responsibilities and processes at all levels. Particularly for smaller countries, supply chain managers may be best established across health commodities, rather than only for immunisation. On the other hand integration is a complex process, and can risk immunisation performance because immunisation supply chains have specific cold chain requirements and delivery schedules, and have benefited from having staff accountable for immunisation.

9.8 Senegal and Tunisia were supported with integration of their supply chains between 2009-2012 through project Optimize.⁵¹ These demonstrated that it is easier to integrate supply chains for vaccines and other health products at lower rather than higher levels of the supply chain. Other examples of supply chain integration (Nicaragua, Ethiopia, Tanzania) have been documented by the DELIVER project and have to greater or lesser extents included immunisation.⁵² In all of the examples a significant strengthening of information systems was a key element of the integration.

Private Sector Role in Health Supply Chains: Review of the Role and Potential for Private Sector Engagement in Developing Country Health Supply Chains”. Technical Partner Paper 13. 2008. ;Michael Copeland. Smarter Medicine: How the US Centers for Disease Control and Prevention Revolutionized the Way Vaccines are Delivered. Strategy & Business, Autumn 2008, Issue 52; PATH, World Health Organization, Health Systems Research Institute, Mahidol University. An Assessment of Vaccine Supply Chain and Logistics Systems in Thailand. Seattle: PATH; 2011; WHO, Collaborating Center for Cold Chain Management. Outsourcing the Vaccine Supply Chain and Logistics System to the Private Sector: The Western Cape Experience in South Africa. Geneva: WHO; 2011.

⁵¹ Project OPTIMIZE Evidence Brief, "Integrating the supply chains of vaccines and other health commodities" (August 2013); Project OPTIMIZE, " Senegal: Integrating and streamlining health supply chains" (August 2012).

⁵² Tanzania's integration covered immunisation supplies but not vaccines. USAID | DELIVER PROJECT: "Supply Chain Integration: Case Studies from Nicaragua, Ethiopia, and Tanzania" (June 2011). Uganda has also decided to fully integrate its health commodity supply chains.

Integration efforts along with other supply chain improvements have helped elevate the role of supply chain managers and the entire supply chain management system. Depending upon country circumstances there may be a case for exploring synergies and promoting convergence between health commodity supply chains, and the Alliance should take account of the Supply Chain interagency group recommendations as these develop.

10 Roles and responsibilities

10.1 A re-shaped immunisation supply chain taskforce will remain in place with responsibility for overseeing implementation of the strategy and managing the GAVI business plan supply chain funding. Partners and stakeholders will also have the following roles and responsibilities for implementation, drawing upon their comparative advantages (see also section A7 on countries, section 9 in relation to UNICEF and WHO and section 11 in relation to donors):

- (a) UNICEF will play a leadership role in advocating for supply chain improvements at country level and working with countries through the change process; work with partners to define and shape key policies around immunisation supply chains, and develop guidance and tools to support countries; lead the forecasting and procurement of immunisation supplies including pre and post procurement activities, and support to countries to do their own procurement; provide technical assistance to countries to implement supply chain improvements; and support the generation and sharing of knowledge, evidence and quality data around immunisation supply chain performance in countries. UNICEF will also strengthen national capacity to manage change processes and to strengthen and establish supply chain managers. Additional business plan resources are needed to support these activities.
- (b) the WHO will play a leadership role in defining and shaping key policies around immunisation supply chains; will develop norms, standards, guidance and tools to support countries improve their in-country systems; will provide technical assistance to countries to implement improvements; and will support the generation of knowledge, evidence and quality data around performance in countries. Additional business plan resources are needed to support these activities.
- (c) the Secretariat will: convene the taskforce to propose and manage business plan funding, and coordinate other donors; ensure coherence between the taskforce and existing governance mechanisms; shape programme guidelines; and support discussions with particular countries to encourage supply chain improvements.
- (d) Civil society: will increase participation in supply chain support and decision-making. Organisations with supply chain expertise will be contracted to support supply chain improvements.

- (e) Private sector and social enterprises: will have increased scope for providing supply chain services, expertise and tools to governments.

11 Funding: a call to action

11.1 As noted above, the scale of new vaccine introductions – which will have a major health impact – will drive an increase in the costs of country immunisation supply chains by two-and-a-half times up to 2020. This can be reduced through:

- (a) System (re)design, which could lead to improved coverage and equity. Modelling also suggests that a 10-25% reduction in supply chain operating costs, and in capital investments could be achieved, as well as one-off savings in inventory levels;⁵³
- (b) Market shaping and introduction of new technologies for cold chain equipment, which could reduce the cold chain equipment funding gap by a cumulative total of \$500m up to 2020.⁵⁴ Part of this will involve advocating with donors to make changes in their support for cold chain equipment, along the lines of proposed changes to HSS.

11.2 These efficiency gains will require business plan spending to catalyse the change, for example by supporting countries better to conduct redesign (see request in paragraph 2.1), and HSS spending to sustain the change. In some cases this spending will require up-front expenditure, which will lead to reduced continuing expenditures, for example through lower operating expenditures for solar cold chain equipment as compared to gas or kerosene models. In other cases, the impact of overall GAVI spending will be increased by reducing vaccine wastage.

11.3 Even with these improvements in efficiency and effectiveness, there will remain a substantial requirement for increased funding on supply chains up to 2020. While an increasing proportion of HSS is being allocated to support supply chains, not all HSS funds can be devoted to such efforts. A holistic funding strategy requires coordinated investment from a number of different sources:

- (a) National governments already cover a large share of supply chain costs. Some governments, particularly those closer to graduation, will need to increase their spending to achieve their immunisation goals of increasing coverage and reaching the hardest to reach, and also improve the efficiency of national spending, for example by budgeting for maintenance.

⁵³ Op. cit. 7; 8.

⁵⁴ McKinsey and Company estimate.

- (b) Donors to country supply chains will need to increase their contributions. These discussions will need to be conducted on a country-by-country basis, led by the government through mechanisms such as the ICC.
- (c) Donors focusing on different health issues can support integrated health commodity supply chains, given the substantial role that some donors play in other health commodities.⁵⁵
- (d) In the future, the Board may wish to consider ways to reinforce funding for supply chains through GAVI.

⁵⁵ e.g. the US government is estimated to have spent \$500m supporting supply chains for other health commodities from 2005-2013. This figure covers SCMS and Deliver, and does not include technical assistance in countries: <http://www.cgdev.org/blog/more-data-needed-usaid-global-health-supply-chain>

Annex B: strategy performance indicators

12 Introduction

- 12.1 Countries face significant challenges in collecting quality data, which limits both the validity and visibility of performance indicators at all levels. Given these challenges, implementation of the supply chain strategy will involve support to countries to improve continuous data monitoring to measure and improve performance (see paragraph 21.5).

13 Process Indicators

- 13.1 To evaluate global progress of the supply chain strategy the following process indicators are proposed:
- Number of countries with a designated supply chain manager who has direct authority over the immunisation supply chain or an integrated supply chain.
 - Number of countries that have in place and are making progress on an active immunisation supply chain management plan.
 - Number of countries that are using a supply chain dashboard to monitor and continuously improv along key performance indicators.
 - Number of countries that each year show performance improvement via their balanced performance scorecard.

14 Performance score card indicators

- 14.1 More than 30 different indicators were evaluated as candidates for inclusion in the score card. Four indicators were chosen—one a headline indicator that is proposed to be included among the indicators reported to the Board on a regular basis under the GAVI 2016-2020 strategy; the others to provide indicators of the three objectives: availability, potency, and efficiency. Aspirational indicators are also designated, which can replace the originals as data systems in countries are strengthened. The following criteria were used to evaluate possible indicators:
- Is it currently feasible for countries to collect and report this data?
 - Is the indicator already reported by countries through an existing WHO/UNICEF process?⁵⁶
 - If the indicator is already reported, what is the known or assessed accuracy of reported values?
 - Does the indicator provide a signal about what is important to the Alliance with regard to the supply chain strategy?
 - What behaviours might the indicator encourage or discourage?

⁵⁶ WHO "A rapid assessment of the burden of indicators and reporting requirements for health monitoring". Prepared for the multi-agency working group on Indicators and Reporting Requirements by the Department of Health Statistics and Information Systems. February 2014.

14.2 The resulting four indicators and aspirational replacements are as follows:

1) Headline strategy indicator - supply chain improvement plan progress

Reported to the GAVI Board under the GAVI 2016-2020 strategic goals. Reported on a yearly basis by each GAVI country per activity.

Pros: helps emphasise the importance of the improvement plan that results from EVM assessment as superior to the result of the EVM itself. Reinforces the importance of countries improving their supply chain performance. Within a country's control.

Cons: does not provide an indication of the quality of the country's performance.

2) Potency indicator - temperature monitoring score card

Uses good management of temperature in the supply chain as a proxy to evaluate the potency of individual vaccine vials at the point of immunisation. The components of this compound indicator are:

- Percentage of cold rooms and freezer rooms in the country having a fully documented temperature mapping study on file
- Percentage of a country's refrigerators equipped with working PQS-qualified 30-day temperature monitors
- Percentage of a country's transport routes including electronic temperature monitoring

Pros: shows the level of sophistication in the monitoring of temperature in vaccine storage and transport, with an increase in sophistication pointing to an ability to deliver vaccines free from temperature damage.

Cons: removed from an actual measurement of vaccine potency or the temperature profile of each vaccine. May be difficult for countries to report accurate information for the 2nd and 3rd components.

Aspirational indicators are temperature excursion during vaccine storage and transport, and cold chain equipment uptime.

3) Availability indicator - national level stock-out

The number of days of stock-out at national stores per vaccine reported by countries.

Pros: already reported through the WHO/UNICEF Joint Reporting Form.

Cons: national level stock-out is not necessarily an indicator that vaccines are unavailable at the point of service. Measuring national stock-outs can create an incentive preventing the sending of vaccine where it is needed.

Aspiration is to have countries report stock-outs and wastage at service delivery level. Another possibility would be to track stock fulfillment rates.

4) Efficiency indicator - Vaccine Utilisation Rate (VUR)

$$\frac{[\text{Opening stock}] + [\text{stock received}] - [\text{closing stock}]}{[\text{doses used for immunization}]}$$

This indicator is defined as the total amount of vaccine moving through the supply chain within a particular timeframe, divided by the total number of vaccines administered, per selected vaccine, on an annual basis. Evaluated over time, the trend would indicate changes in efficiency of the supply chain (reduction of vaccine wastage, reduced buffer stocks). The results are most intended to be evaluated as trends for individual countries across multiple years.

Pros: currently being collected and analysed by the Secretariat. Relates to things that the Alliance cares most about: coverage and vaccines.

Cons: the opening and closing stock must be at a whole-country level in order to be meaningful. Supply chain efficiency is only one of several factors that could contribute to VUR results.

The aspirational indicator for efficiency is supply chain system cost per dose of vaccine delivered in immunisation sessions.