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Lessons Learned: New Procurement Strategies for Vaccines

Final Report to the GAVI Board

MERCER
Management Consulting

Lessons Learned: New Procurement Strategies for Vaccines:

Executive Summary

1. This paper summarizes the findings of a study commissioned by the Vaccine Fund and the GAVI Financing Task Force Procurement Sub-group to examine the first procurement of vaccines by GAVI and the Vaccine Fund.

2. The study had two components: (1) building a fact base around the global vaccine market including the suppliers, market segments and economics, and determining the implications of this market structure for GAVI's procurement strategy; and (2) analyzing the actual implementation of GAVI/The Vaccine Fund's first procurement of vaccine and recommending enhancements going forward.

3. The study process, analyses and findings have been extensively reviewed with representatives of UNICEF, WHO, the Vaccine Fund and the Procurement Sub-group of the GAVI Financing Task Force.

The context for GAVI/Vaccine Fund Procurement

4. Demand profile and trends
   - The global market for vaccines has grown at a 10% annual rate since 1992, from $2.9bn to $6bn. This growth is forecasted to continue.
   - The growth is driven predominantly by high-income country demand for higher priced vaccines, not volume.
   - The market remains characterized by strong value/volume skews. High-income country demand represents 82% of industry revenue, but only 12% of volume.
   - Increasingly, high-income country immunization schedules are diverging from those in low and middle countries. This trend threatens one of the bases for tiered pricing, whereby high-income and low-income countries bought the same products, but high-income countries' pricing covered most of the production costs. Historically, tiered pricing has been critical to affordability and broad access.

5. Vaccine production economics
   - Vaccine production economics are highly volume sensitive, with an average 60% of costs fixed at the plant level and 25% fixed on a per batch basis. Scale is therefore a major cost driver.
   - Whilst there is wide variation in the costs to produce different vaccines, many of the factors explaining these differences are subject to buyer influence. For existing vaccines, multidose presentations and making appropriate use of those lower cost suppliers that are both economically viable and meet quality standards enhances affordability. For newer vaccines, influencing batch size decisions

during plant scale-up (e.g. size or number of fermenters) will also enhance affordability.
- By comparison, differences in vaccine cost attributable to manufacturing processes (e.g. testing regimes and direct labor) are relatively minor. However, reliance on purchased (versus in-house manufactured) components (e.g. CRM protein for conjugates) and the inclusion of high numbers of antigens in combination products have a significant impact.

6. Supplier trends
   - For the multinationals[1], profitability has risen significantly since 1992, driven by proprietary products and technology substitution in high-income markets.
   - As a consequence, R&D investment has also risen significantly, and is now at pharmaceutical industry levels. We estimate the five industry leaders spent over $750m on R&D in 2000.
   - Since 1992, the number and scale of WHO-prequalified producers in low and middle-income countries has increased.
   - These producers, termed in this paper "Emerging Suppliers"[2], have a large cost advantage over OECD-based producers, but typically lack significant R&D or process development capability. In consequence, their production is largely limited to older products.

7. Implications for GAVI/The Vaccine Fund's procurement strategy priorities
   - GAVI's procurement strategy and implementation influences (positively or negatively) the engagement and decisions of vaccine suppliers.
   - GAVI needs the engagement of both multinational and emerging suppliers to meet its conflicting procurement objectives of affordability and access to new/newer vaccines
     → Low-cost emerging suppliers can provide affordable pricing on mature products.
     → Large multinational suppliers, with significant R&D capabilities and process know-how, are better equipped to make available new or recently developed vaccines.
   - GAVI's procurement priorities should therefore comprise the following:
     → Maintaining / enhancing large multinational supplier engagement, to ensure access to new/newer products.
     → Seeking to expand the number of economically viable and high quality emerging suppliers, to increase competition for basic pediatrics and accelerate access to products as they mature.
     → Ensuring multi-dose presentations continue to be produced, as presentation is a key factor in affordability and access regardless of supplier type.
   - Whereas GAVI and its partners are a significant and profitable customer for emerging suppliers, GAVI has little leverage in terms of revenue or profit with the multinationals.

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[1] Aventis Pasteur, Chiron, GlaxoSmithKline, Merck, and Wyeth
[2] Includes Green Cross Biofarma, Serum Institute of India,

- Given GAVI's objectives and lack of leverage over the multinationals, the procurement strategy needs to be designed and managed to increase multinational supplier engagement. These measures will also solidify emerging supplier engagement.
  → Providing for appropriate returns.
  → Creating credible and predictable demand (in part through firm contracting)
  → Working in a collaborative and open fashion with suppliers.
  → For new products, focusing (from a product and supplier perspective) to maximize leverage and minimize costs.

8. Review of 2000-2001 Procurement Activity

- During the first procurement, the Alliance successfully allowed for appropriate returns, creating "pull" incentives that have accelerated competition in DTP-based combinations. This competition will result in reduced prices for these products in due course.
- However, opportunities were missed to demonstrate credible and predictable demand and to work in a collaborative and open fashion with suppliers
  → The mismatch between 2001 supplier awards (98 million doses) and actual offtake (18 million doses) was especially problematic in this regard.
- Shortcomings of the first GAVI effort, relative to a procurement strategy which would fully support GAVI's objectives, are attributable to:
  → Extreme pressure of time: fourteen months from conception to award.
  → An excessive focus on financing as the key constraint, with inadequate and late attention to program and supply issues.
  → The ineffectiveness of a loose alliance in implementing (vs. developing) policy, with unclear and overlapping roles and a lack of accountability.
  → Significant discomfort with suppliers as partners in the effort

9.Lessons Learned and Recommendations

- Our recommendations to address these shortcomings going forward are:

- <u>Pressure of time</u>. In any context, preparing for the introduction and introducing a new vaccine is a multi-year effort. This is especially true for low-income country immunization, given that decision-making is complex with multiple actors, programmatic strength varies, and change places an additional burden on constrained resources at country, donor, agency and supplier levels.
- Reflecting these facts, GAVI must start planning now for the next wave of vaccine introduction several years hence.
- GAVI and the Vaccine Fund should therefore engage with partners to define the next wave of initiatives, consistent with the likely resource levels available and other calls on those resources.
- GAVI and the Vaccine Fund have a key role to play in ensuring that consistent messages on priorities are sent to suppliers, potential donors and countries and that constrained resources are aligned against these priorities.

- Excessive focus on financing. Preparing for and introducing a new vaccine is a multidisciplinary effort. Success depends on contributions from program (advocacy and delivery), supply and financing. Further, there are inter-dependencies between these disciplines, requiring strong coordination and communication.
- Each required discipline is represented in the Alliance: Program (UNICEF PD, WHO, low-income countries), Supply (UNICEF Supply Division, industry) and Financing (the Vaccine Fund, World Bank, donors). The Alliance is therefore well positioned to facilitate multi-disciplinary and coordinated planning and implementation.
- Therefore, we recommend that GAVI implement a multi-disciplinary approach to planning and managing the introduction of vaccines and ensure that a strong coordinating mechanism is in place.

- The ineffectiveness of a loose alliance in implementing. Multi-disciplinary implementation and coordination is a challenge even within one organization with a single objective. A loose alliance with complex objectives faces an even greater challenge.
- The challenge of ensuring effective implementation, coordination and decision-making in such circumstances is most often addressed in our experience by using a project management model, the key components of which are:
  - → Responsibility for integrated decision making and outcome is vested in a single entity and individual within that entity (the project manager).
  - → Each required discipline is represented on the project team and relevant experts are accountable for a component of the overall project. Individual representatives draw on the resources of their institution to achieve the goals of the project.
  - → Team members are accountable to the project manager, and the project manager is accountable to a project oversight body.
  - → A properly constituted project oversight body should be small and should include a mix of senior staff from engaged partners and representatives of partners not directly involved in the project team to ensure objectivity.
  - → Project management tools, such as workplans, timelines, milestones and measurement of deliverables to ensure progress and accountability are essential.

- The composition of each team, the choice of project manager and the membership of the oversight body are functions of the specific goals and critical issues of each project. The selection of the appropriate institution(s) to fulfill all of these roles should depend on both relevant expertise and a willingness to be accountable to the GAVI Board for performance.
  - We recommend that GAVI should institute a project management model for the planning and implementation phases of key initiatives such as vaccine procurement and introduction.

  - We further recommend that GAVI and the Vaccine Fund pilot the project management approach with the upcoming 2004-6 procurement round.

- The key objective is to produce an accurate, product-specific, forecast that enhances the credibility of demand and commands sufficient confidence amongst partners to allow the majority of GAVI's vaccine to be procured on a firm contract basis.
- Given that programmatic issues ultimately determine forecast accuracy, we suggest the Project Manager function reside in an agency with a strong program focus: either UNICEF PD or WHO.
  - → Either UNICEF PD or WHO should have lead responsibility for program issues within the project team.
  - → UNICEF SD should have lead responsibility for supply.
  - → The Vaccine Fund should have lead responsibility for finance. Firm contracting for vaccine transfers offtake risk from suppliers to purchasers. Therefore the Vaccine Fund will also have a particular responsibility, given its fiduciary responsibility to donors and fundraising, for satisfying itself that the planned firm commitments are prudent.
  - → It is worth emphasizing that no one agency has all the skills and resources to deliver within each of these foundations. It is therefore the responsibility of each lead agency to draw upon and team with other agencies to meet the project's and GAVI's objective.
- GAVI should create or instruct an oversight body to monitor progress and hold the project manager and the relevant individuals and institutions accountable for performance. This oversight body should include representatives from the engaged institutions as well as representatives from institutions outside the core project team.
- Each member of the project team should have indicators and milestones to measure performance and progress. These indicators and milestones should be defined in advance with the oversight body and team members. As examples:
  - → For the project manager, forecast accuracy, proportion of firm contracting, meeting project deadlines, meeting supply needs to achieve coverage targets.
  - → For the program function, country by country and overall forecast accuracy, both as to product and timing.
  - → For the finance function, proportion of firm contracting, financing return, uptake of firm offtake.
  - → For the supply function, realized accuracy of availability and pricing assessments, delivery reliability, timeliness, frequency and content of information shared with industry, and pricing trends over time.
- There is an urgent need to move forward with this initiative as soon as possible.
  - → A tender/RFP is due to be issued in Q3 of this year for 2004-2006, and we understand that little preparatory work has been done to date.
  - → Even with prompt action by GAVI partners, we are concerned that this Q3 target date may not allow sufficient time for the partners to ensure accurate, transparent forecasting, implement new strategies like firm contracts and establish indicators to measure performance across the 3 disciplines.
  - → We therefore recommend that GAVI consult with industry to determine if a later deadline for RFP/tender issuance can be set without jeopardizing supply.

We believe industry will, in general, be supportive of efforts to improve the robustness of forecasts and the predictability of demand.

→ Given timelines, there is an urgent need to move forward with this promptly.

- Significant discomfort with suppliers. We believe it is in GAVI's interest that suppliers have as good insight, as early as possible, into the Alliance's plans and preferences. Lead times in the vaccine industry, whether for product development, capacity investment or production, are relatively long. Further, capacity at some major suppliers is increasingly constrained and so early indications of demand are essential.
- We therefore recommend that GAVI ensure that information on demand, product preference and future needs is shared with industry, unless there is a well-defined reason not to do so. Further, GAVI should ensure that bilateral meetings are held with industry when key decisions need to be made or there is a major development.

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Project Context

The Procurement Sub-Group of the Financing Task Force of the Global Alliance for Vaccines and Immunization ("GAVI") and the Vaccine Fund engaged Mercer Management Consulting to evaluate GAVI's vaccine procurement strategy and the implementation of that strategy in GAVI's first two years of existence. Further, Mercer was asked to recommend changes, where applicable, in GAVI's procurement strategy and implementation approaches that would better support GAVI's strategic objectives. The project began in mid-February 2002 and ran until mid-May.

The study was led by the authors of this paper and culminated in a series of presentations in May and June of 2002 to the GAVI Financing Task Force, the Procurement Sub-group, and concluding with the GAVI Board at its June 2002 meeting. The audience across these presentations included a broad cross-section of GAVI partners, including the World Health Organization, UNICEF Supply Division, UNICEF Program Division, the World Bank, the Vaccine Fund and the Gates Foundation. We have solicited the input of these and other partners in the development and communication of these findings and recommendations.

Project Objectives

The terms of reference for this study laid out the following two major objectives and deliverables:

- A description and fact base of the global vaccine market (size, segmentation, trends, supplier economics and key dynamics); the implications of the current state of the market for GAVI's procurement strategy priorities and the ability of that strategy to achieve public sector goals; and resulting procurement options for GAVI and the Vaccine Fund.

- An evaluation of GAVI's first set of procurement activities, recognising that actual deliveries to countries only commenced in the last twelve months, and therefore a full cycle of procurement and use has yet to be completed. This included a mapping of key processes and roles and responsibilities; identification of procurement strategy, organizational or process-related shortcomings that detracted from the effectiveness and desired outcome of the effort; and recommendations for changes going forward.

Methodology

In arriving at our findings, we have drawn on three sets of sources:

- A comprehensive review of publicly available data, including immunisation coverage and schedules, company annual reports and websites, the general and specialist press and GAVI Board Meeting and Task Force minutes. It is noteworthy that, given the

open nature of the Alliance, we did not have access to any proprietary information from GAVI partners from either public or private sectors.

- A wide-ranging interview program, covering GAVI stakeholders and participants in the procurement process; major suppliers and customers; experts and regulators. We are grateful to all those who found time to contribute their thoughts and insight to our efforts.
- Mercer's own proprietary vaccine expertise and models, including the 1993 study for UNICEF Supply Division and subsequent work for a variety of public and private sector clients. No client-confidential material has been included in our findings.

The context for GAVI/Vaccine Fund Procurement

Demand profile and trends

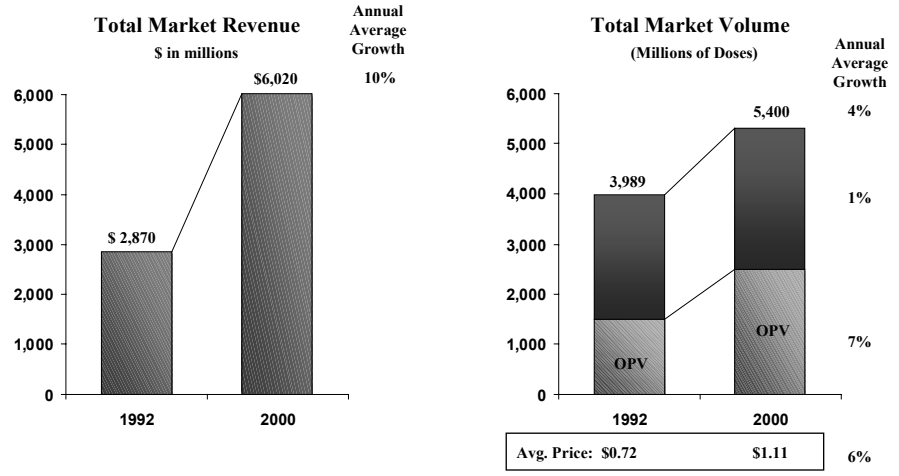
We estimate the global vaccine market was approximately $6 billion in revenues in 2000, as compared with $2.9 billion in 1992, when Mercer conducted its study for UNICEF Supply; this represents an average annual growth rate of 10% in nominal terms (i.e. before adjusting for inflation) over the eight year period. This growth can be expected to continue, and likely accelerate, given both the recent focus on bioterrorism risks and the early stage of introduction in 2000 of some of the antigens driving revenue growth, such as Meningitis C and Pneumococcus.

We estimate total worldwide volume to be 5.3 billion doses, as compared with 4.0 billion doses in 1992. The majority of volume growth is attributable to the worldwide polio eradication effort, with volume of all vaccines excluding oral polio vaccine increasing at only a 1% rate during the 1992-2000 period. Note that our definition of doses is filled vaccine. A multivalent vaccine represents one dose, regardless of the number of antigens it contains.

Most of the revenue growth, therefore, has been driven by an increase in average vaccine pricing rather than by increased volumes. We estimate that the average price per dose across all vaccines increased 6% annually to $1.11 in 2000 from $0.72 in 1992. Significant volume/value skews continue to characterize the global vaccine market from a buyer perspective; high-income countries represent $4.9 billion, or 82%, of the total market in terms of revenues, but only 12% of the total market in terms of volume.

Vaccine market: Growth

Revenue growth has been driven by modest volume gains and higher average prices.



Source: Mercer analysis, 1992 Vaccine Report.
Note: 2000 OPV volume includes UNICEF (1200MM), UNICEF estimated local procurement in China and India (600MM), PAHO (340), and other

Understanding volume and revenue growth requires that one consider the distinct product segments within the global vaccine market. The first distinction is between vaccines intended primarily for adults and those for primarily pediatric use. Within pediatrics, our segmentation criteria is product lifecycle – in general, products earlier in their lifecycle are proprietary and are characterized by a less competitive supply base; as in most markets, such conditions result in restricted availability and relatively high pricing. Relatively mature or basic products have more competitive supply bases, and in many cases are produced not only by companies in the OECD but also by emerging suppliers based in low/middle income countries. Notably, the earlier the product is in its lifecycle, the more likely that product is to be purchased exclusively by high-income countries[3]. Adult/travel and proprietary pediatrics are primarily or exclusively purchased by high-income countries, whereas several enhanced pediatric vaccines are purchased by all buyer segments and basic pediatrics are purchased primarily by low/middle income countries.

[3] An exception to this general rule is the DTP-Hep B and DTP-Hep B-Hib combination vaccines, which represent relatively "new" products and are purchased almost entirely by developing countries through intermediaries such as GAVI and PAHO

Product Segments and Example Vaccines

Basic Pediatrics	Enhanced Pediatrics	Proprietary Pediatrics	Adult/Travel
• OPV • BCG • TT • DTP • Measles *2000 Revenue: $680MM*	• IPV • DTaP • Hepatitis B • Hib • MMR *2000 Revenue: $2.0 billion*	• Pneumococcal and Meningococcal conjugates • Varicella *2000 Revenue: $1.7 billion*	• Hepatitis A • Yellow Fever • Typhoid • Influenza *2000 Revenue: $1.7 billion*

Illustrative of the lifecycle-based differentiation in supply bases and pricing, proprietary products, all of which have been brought to market in the last seven years, and two of which (pneumococcal conjugate and varicella) are each currently produced by a single supplier, had an average price per dose in 2000 of $35. These levels contrast with an average price per dose of $12 and $0.15 for enhanced pediatrics and basic pediatrics, respectively.

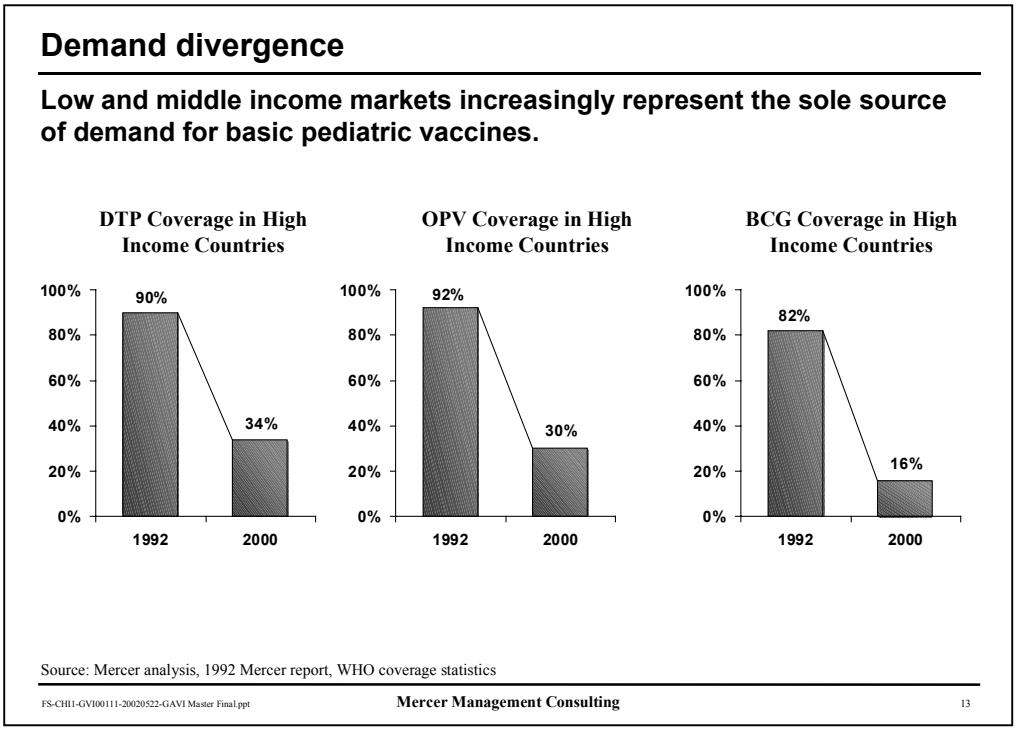
Due to their relatively high pricing, three proprietary products – pneumococcal conjugate, meningococcal conjugate and varicella represented $1.7 billion, or nearly 30%, of the total vaccine market spend in 2000, on only 1% of the total market volume. Since they did not exist in 1992, these three products represent over 50% of the absolute revenue growth in the vaccine market since 1992. Consistent with historical experience, these products have been developed for, and are exclusively purchased by, high-income countries.

The success of these products has served as a strong "signal" to suppliers: significant increases in revenue and profits[4] can be achieved through the development of new products for high-income countries targeting previously unserved needs. This strategy is analogous to the predominant "blockbuster drug" strategy which has underpinned much of the commercial success of the large pharmaceutical companies in the recent past.

The second factor driving the growth in revenue terms of the vaccine market is two technology substitutions in high-income country markets – acellular pertussis for whole cell pertussis in diphtheria-tetanus combinations, and injectable polio vaccine for oral polio vaccine. For example, DTaP is now specified in the majority of high-income immunization schedules, covering 66% of high-income birth cohorts, which were covered by whole cell pertussis combinations in 1992. While these substitutions are volume-neutral, they typically result in significantly higher pricing compared to the products they replace. As a result, the market for enhanced pediatrics has doubled, increasing to $2.0 billion in 2000 from $1.0 billion in 1992.

[4] We estimate that gross margins are in the 90% range for these products

By contrast, the size of the market in revenue terms for basic pediatrics has decreased by 40% during the last 8 years to $680 million in 2000, in spite of the significant volume increases driven by polio eradication. This reflects the decline of high-priced, high-income country demand for these products. This decline is attributable to multiple factors: technology substitution with enhanced pediatrics, the increasing prevalence of combinations (e.g., MMR versus measles monovalent) and the more targeted use of BCG (i.e., during tuberculosis outbreaks) in high-income countries. Thus, the schedules of high-income countries and low/middle income countries are increasingly divergent.

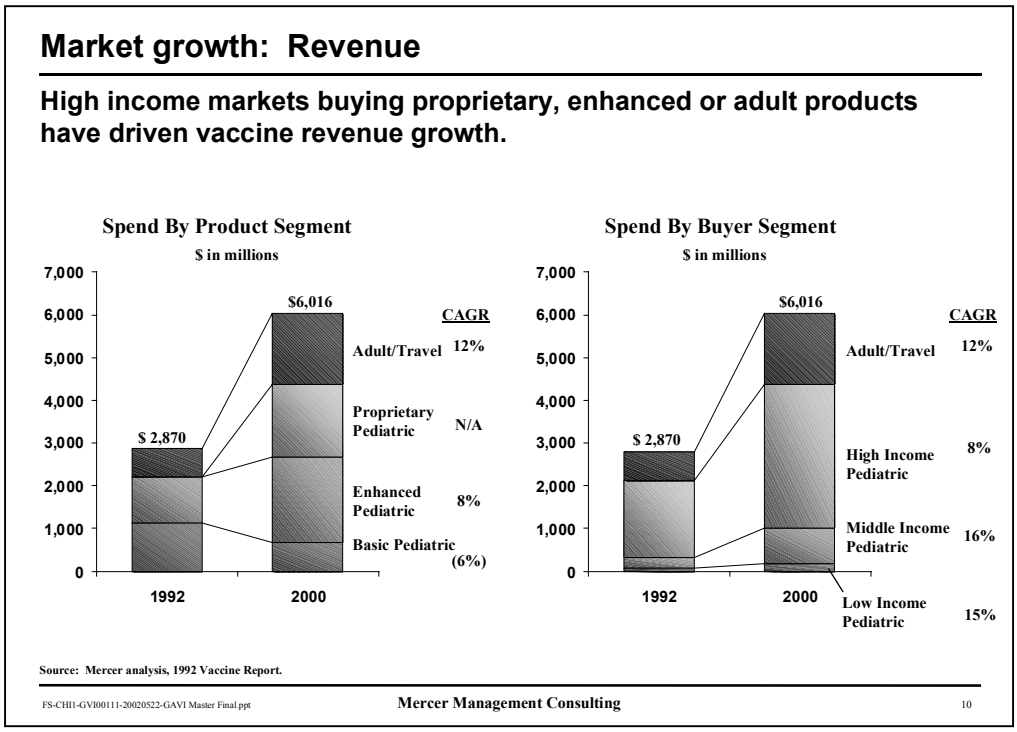


Schedule divergence has significant implications for the cost and availability of vaccines for low/middle income country demand. Historically, low/middle income country demand has benefited from tiered pricing for a given product; in the 1993 study, we found that high-income country pricing for a given product could be 250 times higher than low income country pricing (as achieved by UNICEF Supply). This degree of price tiering has historically been enabled by three conditions:

- The existence of both high-income country and poor/middle income country demand for a common vaccine. As a result, relatively high prices paid by high-income countries cover suppliers' fully-loaded costs and profit requirements, enabling low/middle income countries to achieve marginal pricing, defined as prices which cover direct costs but do not fully cover fixed costs.
- The existence of significant excess capacity relative to high-income country demand.
- The willingness of certain suppliers and government customers to accept radically different pricing for different segments of demand.

Schedule divergence means that the first enabler of price tiering is increasingly threatened. Divergence requires low/middle income pricing to increasingly justify (and therefore cover) the fully loaded costs and required profit of the capacity dedicated to this product; otherwise, availability of the vaccine becomes jeopardized and potentially compromised. Therefore, while price tiering continues *across products* based on lifecycle, price tiering is less prevalent *for a given product*. As we will discuss in the next section, capacity constraints amongst the multinational suppliers threaten the second enabler of the traditional tiered pricing / marginal capacity paradigm.

Given the product segment trends discussed above, it is unsurprising that most of the market revenue growth is attributable to high-income demand, both for pediatric and adult/travel vaccines. Whilst low and middle income demand is in fact growing faster in percentage terms, the absolute impact of this growth is modest, given that it represents only 18% of the market by value.



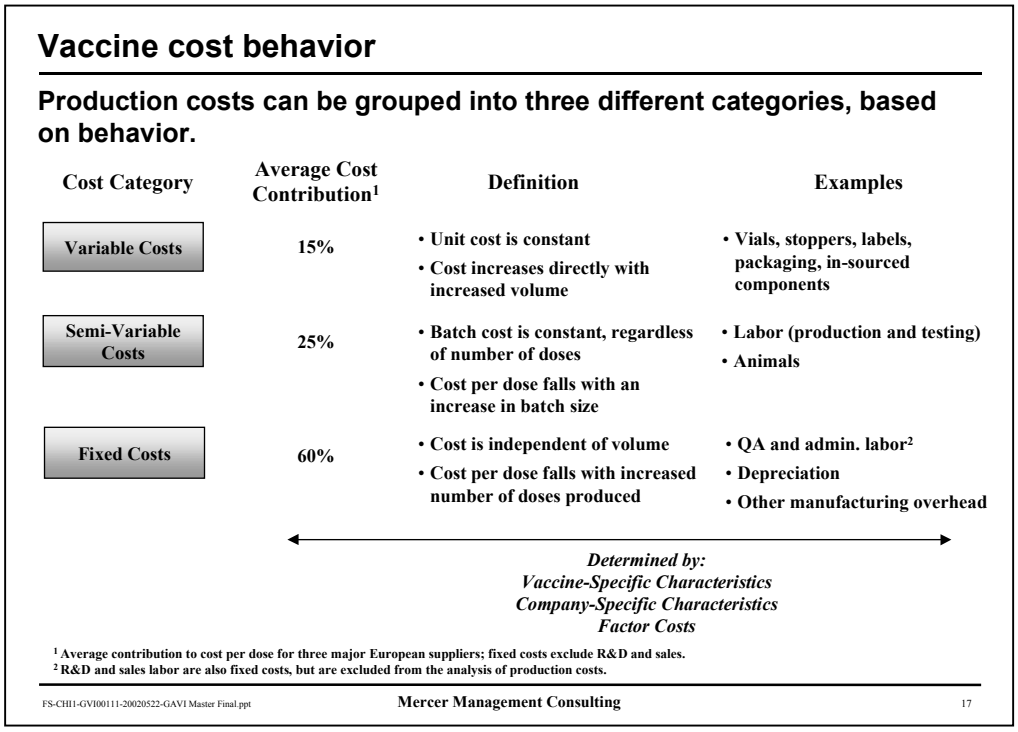
Vaccine Production Economics

Production Process & Economics Overview

At a high level, vaccine production represents two sets of sequential activities: bulk production (growing cell lines/fermenting and harvesting) and filling (blending, formulating, filling and lyophilizing, where applicable). To conduct these activities, vaccine manufacturers incur certain expenses, such as labor, animals for testing, and depreciation on equipment and facilities, utilities, vials and packaging materials, among

others. Throughout this document, we exclude research and development and selling/marketing expenses from the definition of production costs.

Vaccine production economics are characterized by high operating leverage. The majority of costs are either fixed regardless of volume (on average, 60% of total costs) or "semi-variable" (25% of total costs) – that is, fixed at the batch level or filling lot level, regardless of batch size or filling lot size. Only 15% of costs are truly variable, meaning that they fluctuate in direct proportion to the volume of individual doses produced.



Vaccine cost behavior

Production costs can be grouped into three different categories, based on behavior.

Cost Category	Average Cost Contribution[1]	Definition	Examples
Variable Costs	15%	• Unit cost is constant • Cost increases directly with increased volume	• Vials, stoppers, labels, packaging, in-sourced components
Semi-Variable Costs	25%	• Batch cost is constant, regardless of number of doses • Cost per dose falls with an increase in batch size	• Labor (production and testing) • Animals
Fixed Costs	60%	• Cost is independent of volume • Cost per dose falls with increased number of doses produced	• QA and admin. labor[2] • Depreciation • Other manufacturing overhead

Determined by:
Vaccine-Specific Characteristics
Company-Specific Characteristics
Factor Costs

[1] Average contribution to cost per dose for three major European suppliers; fixed costs exclude R&D and sales.
[2] R&D and sales labor are also fixed costs, but are excluded from the analysis of production costs.

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We do not believe there has been a significant increase in the costs of vaccine production since 1992, after making allowance for the effects of inflation. Companies have significantly increased their spending on R&D, which we do not consider a production cost. In addition, there has been an increase in the effort and thus expense associated with regulatory compliance. However, our research and analysis does not suggest that this is significant overall, and may have been offset by productivity gains elsewhere.

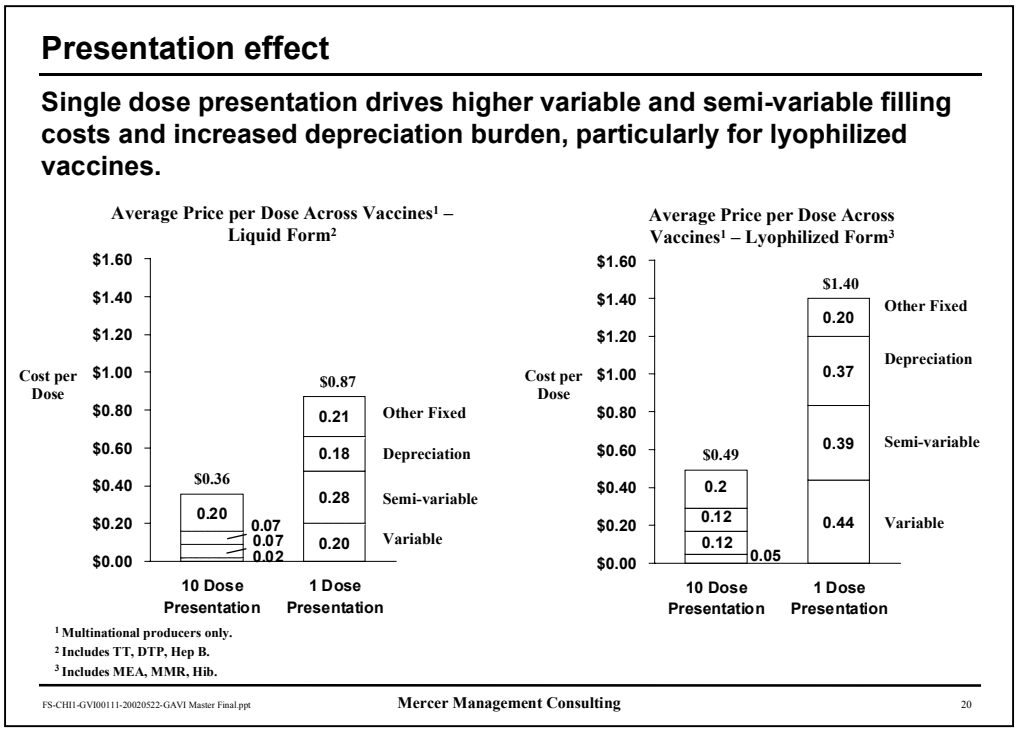
Vaccine Cost Drivers

The cost to produce a vaccine varies significantly, ranging from $0.05 per dose up to $3-$4 per dose. There are six factors that drive the variation in these production costs. These factors are:

1. *Presentation*: the number of doses per vial
2. *Scale of Operations*: the total volume of production over which fixed costs are amortized

3. *Supply Policy for Vaccine Inputs*: whether antigens and carrier proteins are produced in house by the supplier or purchased from another supplier
4. *Supply Base Location:* whether the production (and required labor) is located in a country with relatively high or relatively low wage rates
5. *Vaccine Batch Size:* The number of doses in a bulk production batch for a given vaccine
6. *Vaccine Production Characteristics:* The amount of time, labor intensity and testing regimen required to produce a given vaccine

1. *Presentation* Presentation is customer-defined; that is, the buyer specifies the presentation, not the supplier. Single dose presentations are significantly more costly to produce than multi-dose presentations because presentation is the key determinant of filling lot size. This is attributable to increased filling labor requirements, higher vial costs per dose and a greater depreciation burden due to higher filling capacity requirements (6-7x versus 10 dose presentations). In an OECD supplier context, single dose presentations add approximately $0.50 per dose to the cost of a liquid vaccine, and $0.90 to the cost of a lyophilized vaccine.



Scale of operations, supply policy for vaccine inputs and supply base location are all supplier-specific factors. The influence of these factors on the price paid by a buyer for a vaccine is therefore within the control of the customer to the extent that the customer can choose among suppliers to satisfy its product needs.

2. *Scale of operations* The impact of manufacturer scale can be illustrated by comparing the US multinationals with the European multinationals. U.S. multinationals are higher-cost producers relative to European multinationals because of the former's overall lower volume levels (fewer than 100 million doses annually versus over 1 billion doses for certain European multinationals). We estimate the impact of this scale differential at $0.82 per dose. Much of this scale differential is attributable to European supply of OPV for polio eradication.

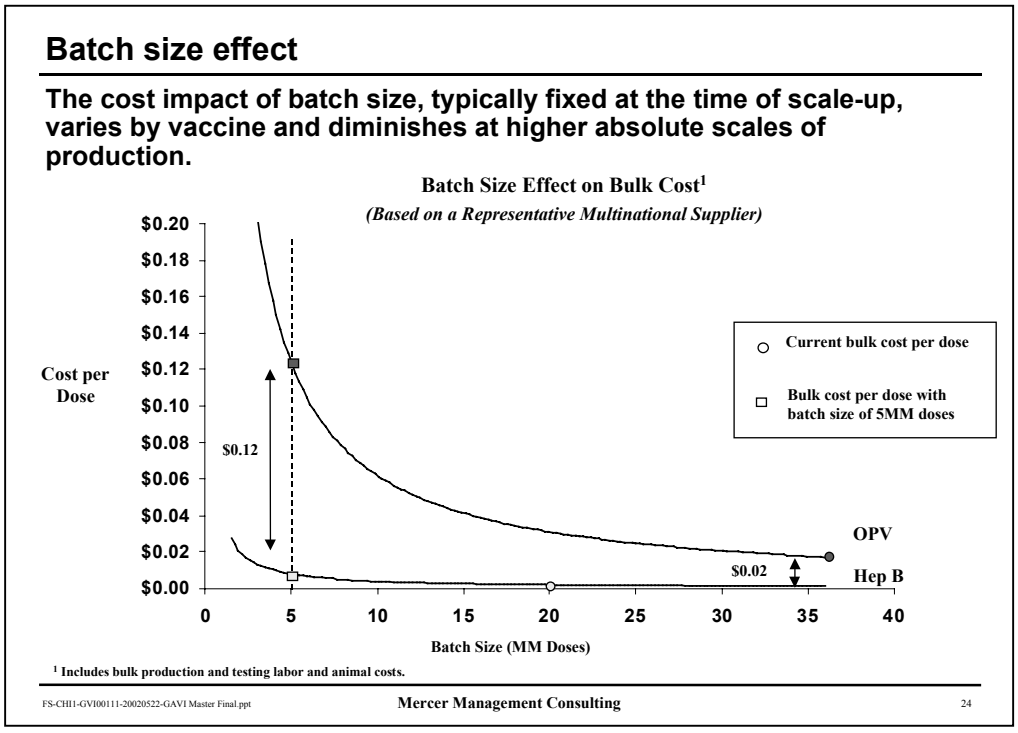
3. *Supply policy for vaccine inputs* The importance of supply policy for vaccine inputs reflects two trends. Since 1992, these trends have reduced the extent to which any major vaccine producer is self-sufficient in terms of all the components it requires to manufacture its products. These trends are the growth of combinations and the growth of conjugate vaccines, which require a carrier protein. As a consequence, vaccine manufacturers have entered into contractual arrangements with other suppliers to gain access to the antigens and carrier proteins required for their suite of products; for example, GSK sources diphtheria toxoid and tetanus toxoid bulk requirements from Chiron.

While we are not privy to the terms of these supply arrangements, two factors, supported by anecdotal evidence, suggest that these supply arrangements have a significant impact on economics. First, outsourcing a component reduces operating leverage, since it converts what is primarily a fixed cost activity (in-house production) into a variable cost. The marginal cost of vaccines with significant outsourced components will likely therefore be higher than those produced entirely in-house. Second, we believe the likely impact of these arrangements is generally to increase the absolute cost of the vaccine in question. There is no law of economics that dictates that this should be true: if the outsourced supplier is a more efficient producer than the customer, the decision to outsource might actually reduce cost. Finally, each arrangement will be unique and reflect the negotiating positions and strategies of the parties involved. However, an outsourcing arrangement introduces a second party requiring a commercial return and a second set of plant fixed costs and overhead to cover. Anecdotally, it is clear that these deals have had the effect in the short term of limiting both availability and competition in the DTwP-based combination market.

4. *Supply base location* All OECD suppliers are significantly higher cost producers than large emerging suppliers, as wage rates for pharmaceutical labor in lower income countries such as India and Indonesia are less than 10% of comparable wage rates in high-income countries. Location translates into a $0.12 per dose advantage (for multidose vials) on average in labor costs alone for such emerging suppliers. This differential will be much higher for single dose presentations.

5. *Vaccine batch size* The bulk batch size is a significant driver of variation in cost between vaccines. Since the cost to manufacture and test a bulk batch is largely fixed, an increase in batch size results in lower per dose costs. Batch size is largely determined at the time of manufacturing scale-up. Once a plant is in place, there are two ways in which bulk batch size can be increased. One is by adding capacity, a process that requires

incremental capital, may disrupt production and certainly requires regulatory approval and GMP certification. The second is to wait and allow the experience effect to drive yield improvements and consequent increases in effective batch size. Although recombinant hepatitis B appears to have experienced very rapid and dramatic improvements in yield, the available data suggests that for most other vaccines, this process takes many years to reach the kind of batch sizes desirable for the international public sector, given the scale of demand and affordability requirements. Given the difficulties of increasing batch size once a plant is built, the most desirable route to both capacity and relative affordability is to influence batch size at the time of scale-up, either through being considered part of the "core" market, or perhaps through early commitment to purchase.



6.*Vaccine production characteristics* These are entirely beyond the control of the buyer and do vary across vaccines. These differences result from differing testing and labor requirements, antigen combinations and production process cycle times, which in turn drive cost differences. However, after normalizing for the five customer and supplier-specific drivers of cost, differences in cost attributable solely to varying production methods are relatively small. As an illustration, the most expensive vaccine to produce at the bulk stage is OPV. However, the large batch sizes and the fact that it is manufactured by high scale producers in predominantly multi-dose presentations results in a fully loaded production cost we believe to be the lowest of any vaccine manufactured by OECD producers.

In summary, buyers can significantly impact the cost of production and resulting pricing they receive based on the choices they make with respect to suppliers, presentations and, for new vaccines, the timing of commitment to purchase. Therefore, a buyer seeking to enhance affordability can do so by buying in multi-dose presentations, purchasing in significant quantities from a limited set of suppliers (to reduce overhead per dose) and doing business where appropriate with lower-cost emerging suppliers.

Supply Base and Trends

There are five segments of vaccine producers in the market today.

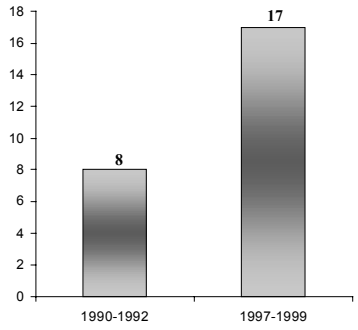
	U.S. Multinationals	**European Multinationals**	**OECD Locals**	**Emerging Suppliers**	**Developing Country Locals**
Product Range	Narrow	Broad	Narrow	Narrow - Moderate	Narrow
Scale	Low	High	Low	Moderate-High	Low-High
Customer Focus	Mostly high-income	All buyer segments	Mostly in-country	In-country and other low-moderate income buyers	All in-country
R&D Activity	High	High	Low	Low-Moderate	Low
Example Suppliers	Merck, Wyeth	Aventis, GSK, Chiron	SSI, CSL, Powderject	Serum Institute of India, Biofarma, Green Cross	State-owned producers in China, Egypt, Vietnam

U.S. and European multinationals experienced near double-digit revenue growth during the 1992-2000 period, resulting primarily from the sale of adult/travel, proprietary and enhanced pediatric products to high-income buyers. The success of this strategy has driven significant investments in research and development; we estimate that the vaccine businesses of Merck, Wyeth, GSK, Aventis and Chiron spent in excess of $750 million in 2000 on research and development. We believe that this represents a significant increase, both in absolute terms and as a percentage of sales, over the level of R&D investment in 1992. Spending as a percentage of sales is now at a level consistent with the broader pharmaceutical industry, and the fruits of this investment are feeding through, both in terms of new product introductions and development pipeline.

Significant increases in R&D

Enhanced profitability and the application of pharmaceutical and biotech business models have greatly expanded investment in R&D.

Number of New U.S. Vaccine Licenses Granted



Current Development Pipeline

- **Nearly 350 vaccines in various stages of development[1]**
  - **188 in pre-clinical phase, 158 in clinical trials**
- **Pipeline contains increasingly complex vaccines**
  - **Genetically engineered recombinants (e.g., HIV, herpes simplex virus, diabetes, fertility)**
  - **Conjugates (e.g., group B streptococcal)**
  - **Combinations (e.g., DTaP/Hib/IPV/HB, 9- and 11- valent pneumococcal conjugate)**

R&D spending on vaccines among multinationals likely exceeds $750m annually: pharmaceutical levels[2]

[1] As of 2000. 2. 16% of sales
Sources: NIH 2000 Jordan Report, "Vaccines", CDC.

These increased research and development expenditures notwithstanding, we believe that as a group, the profitability of the multinational producers is now higher than it was in 1992. As an illustration from public data, GSK's Belgian subsidiary (which represents the majority of its vaccine operations) reported an operating margin of 33% for 2000, as compared with 26% in 1992. This increase occurred despite a nearly five-fold expansion in R&D on a revenue base that grew by a much lower 50% over the period.

However, the observed strategies being pursued by U.S. and European multinationals differ significantly. U.S. multinationals appear focused on point innovation, concentrating their business and R&D efforts on a small number of proprietary products with high profit margins. These companies have demonstrated (e.g., tetanus) that they are willing to drop mature products from their portfolio, as competition increases and profitability drops to unacceptably low levels. Conversely, European multinationals have built and are continuing to develop comprehensive "suites" of product, enabling them to serve a wide range of buyers with both monovalent and combination products; for example, Aventis and GSK are currently the only providers of pentavalent and hexavalent products in the world.

Emerging suppliers have significantly enhanced their scale and product breadth since 1992. Given their cost advantages,, they represent an attractive low price supply source for basic pediatrics, and have benefited as a result. However, these suppliers do not currently have experience in developing new products, and generally lack the R&D infrastructure and process know-how (e.g., conjugation) possessed by multinationals. Therefore, the key challenge for emerging suppliers is accessing / developing technologies that are of interest to low and middle-income countries, either as direct buyers or through agencies such as PAHO, UNICEF and GAVI.

Implications for GAVI/The Vaccine Fund's Procurement Strategy Priorities

GAVI and the Vaccine Fund seek to balance three objectives in procurement: affordability, supplier investment in capacity and relevant R&D. The tension between these objectives is obvious: investment, whether in capacity or R&D, tends to follow profitability, whereas affordability translates to lower prices and lower profitability.

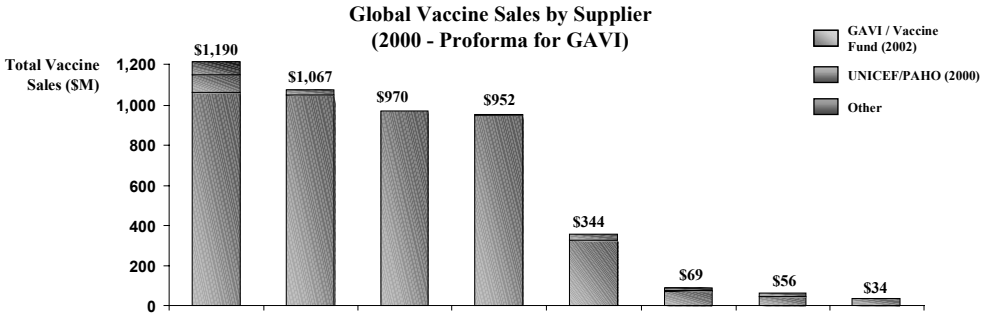
Given this mix of objectives, both large multinational and emerging suppliers are potentially important to meeting GAVI's overall objectives. Emerging suppliers provide GAVI with a low-cost and potentially high-volume sourcing option, and one over which GAVI can exert significant influence, given the importance of the GAVI market for these suppliers. Large multinationals, on the other hand, possess the R&D capabilities, product pipeline and range, and process know-how which are critical to providing product options that, while not lowest-cost, may afford significant programmatic and public health benefits.

Not only do these different types of suppliers have very different things to offer GAVI, but they are also likely to see GAVI/Vaccine Fund demand – and low and middle income demand generally – as very different commercial opportunities for them. Even with the Vaccine Fund, low-income country demand represents a relatively small and marginally profitable opportunity for multinational suppliers. We should note, however, that whereas procurement of mature vaccines from the multinationals is at marginal prices (i.e. prices which do not cover fully-loaded production costs), we believe that the newer (combination) vaccines purchased by the Vaccine Fund are at prices that allow OECD suppliers a significant profit margin.

By contrast, for emerging suppliers, international public sector procurement, even of mature vaccines, is both a major part of the business (up to a third of revenues) and is profitable on a fully loaded cost basis. This difference in economic importance and value for mature vaccines is reflected in UNICEF's sourcing of these products. In 1992, UNICEF bought no vaccine from emerging suppliers. In 2000, such suppliers fulfilled over 50% of UNICEF's non-OPV needs. Emerging suppliers have responded by significantly expanding capacity to meet the needs of this source of demand.

Supplier perspective: Revenue

Developing country demand is modest for the multinational players, but can be significant for emerging suppliers.



	GSK	Aventis Pasteur	Wyeth	Merck	Chiron	Green Cross	Serum, India	BioFarma
UNICEF/PAHO Share	8%	2%	0.2%	0.01%	9%	6%	32%	2%
+2002 GAVI	14%	2%	0.2%	0.4%	9%	29%	32%	3%

Source: Analyst reports, Company 10K, Lit search, CDC, UNICEF.
Note: UNICEF purchase data is for 2002

Given the relatively low economic importance of developing country markets to multi-national suppliers, it is legitimate to ask whether these manufacturers are engaged and committed to low-income country immunisation. We believe there is evidence that they are, but also that it is important for procurement policy to recognise the pressures on this commitment. As evidence, it is worth acknowledging that the multinationals were critical historically to broad access to mature vaccines, and continue to be critical to the polio eradication effort. Further, all five (Merck, Wyeth, GSK, Aventis and Chiron) have contributed time and resources to GAVI and responded to its RFP. European multinationals are making investment decisions in capacity that can only be explained by a strategy to serve markets outside the core high-income countries. (E.g., GSK's acquisition of Human and Aventis' investment in building Hepatitis B capacity). Finally, in interviews, all of these suppliers expressed a commitment to serving developing country demand.

We see three pressures on this commitment. The first is absolute capacity constraints. As discussed above, excess capacity was a key enabler of broad access via tiered pricing for the basic pediatric vaccines. We do not recollect having a single conversation with a manufacturer in 1992 around capacity limits. This situation has changed. Since 1992, multinational suppliers such as Aventis and Chiron have specialized and rationalized their bulk and filling operations to increase overall utilization rates, which reduces capacity relative to overall demand. In addition, the shift to a single-dose presentation preference among high-income country buyers has significantly increased the demands on filling and lyophilizing capacity. As an example, we estimate that the U.S. Centers for Disease Control's shift to single-dose presentations has doubled the filling capacity required to serve this customer. The removal of thimerosal from vaccine production, as

strongly encouraged by the FDA and other regulatory bodies, will further increase demand for single dose presentations and thus will exacerbate filling capacity constraints.

The second is opportunity cost. International public sector demand is increasingly competing for bulk quantities of antigens that can be used in many different products. For example, the diphtheria toxoid component of GSK's DTP-Hep B combinations for GAVI is also used in its DTaP and DTaP combinations sold to high income country buyers; the tetanus toxoid component is used not only for these other products but also as a carrier protein for its Hib products. Faced with capacity constraints , suppliers are likely to allocate antigens based on the absolute and relative profitability of buyers and products.

The third is regulatory pressures and regulatory divergence. Schedule divergence has increased the production of vaccines not marketed in the country of manufacture, which in turn raises a number of regulatory oversight issues. More pressing, perhaps, is the fact that the needs, and priorities, of high-income countries are different from those of low-income countries. The requirements and concerns of OECD regulators reflect (as they should) the needs of the populations they serve. As an example, regulatory action on thimerosal will both add to capacity constraints (as above) and threaten the ability of the multinationals to supply multi-dose vials, a key enabler of affordability.

To summarise, the different types of suppliers have different roles to play in support of GAVI's objectives. The GAVI market also represents very different levels of commercial importance and priority for the different suppliers. Given these factors, procurement policy should seek to:

- Ensure access to capacity of existing vaccines and encourage R&D in other desired products from the multinationals
- Broaden the number of viable emerging suppliers to facilitate competition

To achieve these procurement priorities vis-à-vis multinational suppliers for existing vaccines, GAVI and the Vaccine Fund need to demonstrate and provide:

- Appropriate returns for suppliers
- Open, collaborative relationships
- Credible and predictable demand

These components will also enhance emerging supplier engagement, albeit that it is less fragile, and consequently there is less of an imperative to provide them.

Providing *appropriate returns* better positions GAVI to access capacity in an environment where all buyers are competing for constrained resources but other buyers are highly profitable. The purpose of *open and collaborative relationships* with suppliers is to facilitate production planning and minimize costs to serve GAVI, as well as to enhance the credibility of end demand by demonstrating a robust planning process.

Perhaps most important, *demonstrating credible and predictable demand* creates confidence for suppliers that procurement awards will translate into actual purchases and that production to meet these awards will be consumed. Predictable demand is essential, given the long lead-times of vaccine production often taking upward of a year before product is ready to ship. Demand credibility can be achieved through a number of means: past record (previous credibility), information sharing, demonstrating a well-thought out execution plan and rigorous forecasting process (current credibility) and contractual commitments (guarantees).

However, to encourage research and development in products valued by, and potentially dedicated to, developing countries, GAVI and the Vaccine Fund need to provide in addition:

- A credible, profitable market today
- Focus, both in terms of priority and suppliers, to maximize the potential commercial opportunity (and therefore leverage) of a new product

Review of 2000-2001 Procurement Activity

In assessing the activities associated with the Alliance's first procurement of vaccine, we have sought to answer three questions:

- What worked well / what was achieved?
- Was the procurement process aligned with the required procurement priorities as defined in the section above?
- Did the alliance function effectively from a process and executional perspective?

There were significant positive outcomes resulting from this first procurement. GAVI partners, in a new alliance, executed against the first major GAVI initiative. Second, GAVI achieved access to a relatively new product dedicated to developing country demand in large quantities (2003 supply of 41 million doses of DTP-Hep B and DTP-Hep B-Hib per year). In the context of low-income country demand, this is a unique accomplishment, at least on this scale. Third, GAVI achieved low pricing for these combination products when compared to other relatively early lifecycle products: for example, the price achieved for the pentavalent combination is close to half the average OECD price for monovalent HIB, and less than 20% of OECD prices for new products.

Perhaps most important, the signals the procurement sent, both in terms of desired product and a willingness to depart from marginal pricing seem to be acting as a "pull mechanism" for additional future capacity for desired products. We are aware of seven initiatives being undertaken by both multinational and emerging suppliers to build capacity for DTP (whole-cell pertussis) combination products with Hepatitis B and/or Hib. In effect, GAVI has accelerated the product lifecycle for DTwP-based combinations, which will result in increased capacity and competitiveness in the future for these products and thereby enhance affordability.

Review of 2000/2001 procurement activity

As a result of GAVI activities, there are significant efforts to expand DTwP-based combination capacity.

Supplier Plans for DTwP-Based Combinations with Hep B and/or Hib

Supplier	Product	Timing/Status
• GSK	• DTP capacity in Hungary for combinations	• Additional capacity available in 2004
• Aventis-Pasteur	• Hep B and combinations	• 2006 for monovalent, 2008 for combinations
• Chiron	• DTP-Hib	• In production, availability from August, 2002
• Chiron/Green Cross	• DTP-Hep B-Hib	• Available by 2005
• Serum Institute of India	• DTP-Hep B, DTP-Hep B-Hib	• In clinical trials on quadrivalent, pentavalent 3-5 years away
• Biofarma	• DTP-Hep B, DTP-Hep B-Hib	• 2-3 years away on quadrivalent, 5 years away on pentavalent
• Chendu	• DTP-Hep B	• In clinical trials

Source: Company interviews, WHO

Finally, GAVI was able to complete this process very quickly – fourteen months from start to finish – which served to accelerate the introduction of Hepatitis B and Hib in the poorest countries and accordingly save lives.

Measured against the criteria defined above (appropriate returns, open relationships and credible demand), the performance of the Alliance was more mixed. On the one hand, we believe that the pricing achieved for the combination products does allow the supplier a return, and this represents a clear break with the historic marginal pricing paradigm. Whilst this may be controversial to some, it is important to evaluate this investment by the Alliance against three factors:

- The impact on supplier behavior and thus the product lifecycle, discussed above, and its ramifications for future capacity and affordability.
- The impact on the achievement of program goals which would have been harder or more expensive (including country delivery costs) to achieve by other means.
- The recognition that, given schedule divergence, the marginal pricing paradigm (which has set expectations of what vaccines "cost" for low income countries) is increasing irrelevant.

Against the other two criteria, open relationships and credible, predictable demand, the 2000/2001 procurement activity must be considered a missed opportunity.

At the outset, there was a wide expectation and desire that GAVI/Vaccine Fund procurement would break with past practice and make contractual commitments to purchase (as opposed to "gentlemen's agreements"). This did not happen, and given the accuracy of actual offtake versus forecast to date, this is on balance a good thing. We believe that committed contracting is a potentially valuable tool to enhance demand credibility and predictability. However, to avoid wasting financial resources, it must be supported by a forecast of offtake in which partners have a high degree of confidence and which ultimately accurately reflects demand.

Second, the forecast and the RFP outputs and process were not as helpful to suppliers in supporting capacity and production planning as they could have been. Data shared with suppliers was exclusively at the antigen, rather than product, level ("number of children to be immunized") even after significant information on country product preference was available. Further, country-level demand data was not shared with suppliers as it became available. Although country applications are public documents, significant research was done as part of the forecast effort into country demand and product preference and not shared.

As we see it, the rationale for not sharing this information fully was twofold. As regards product preference, it was decided to procure using a RFP process. The reasons for this decision were understandable in the context, given that procurement and demand creation were running in parallel. Therefore, product preference information was not shared to avoid biasing responses to the RFP. However for both practical and philosophical reasons, the Alliance gave primacy to meeting country preferences wherever possible. The position that countries should drive product selection is inconsistent with a RFP process that is product-agnostic with a view to seeking innovative manufacturer responses.

The second rationale was concern over how suppliers would use the information, and in our view reflects residual discomfort with suppliers as GAVI partners. Country by country product preference and demand was not shared, at least in part, to avoid triggering supplier competitive marketing activities in countries.

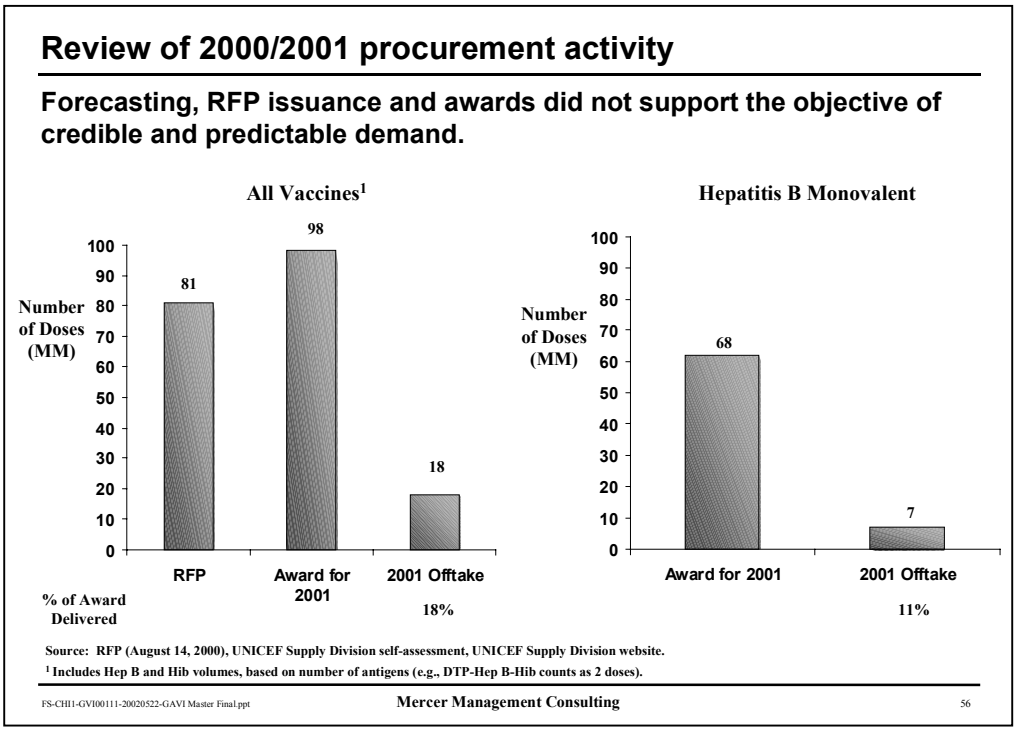
Going forward, it seems to us that more should, be done to ensure that suppliers are aware earlier of both evolving product preference and likely demand, even if only in the aggregate. Whilst it is clear that procurement itself (supplier selection, competitive offers, decision-making) needs to be confidential, we believe that transparency of process and data leading up to procurement significantly enhances both demand credibility and likely capacity availability. Further, the multi-disciplinary and transparent nature of the country application process ought to act as a brake on inappropriate marketing activity.

Third, and perhaps most important, to date actual offtake has fallen well short of awards to suppliers. In 2001, the Alliance purchased 18% of the doses (counting pentavalent as two doses) it awarded. The difference is even more marked for monovalent Hepatitis B, where 2001 offtake was only 11% of award. A number of factors explain much of this shortfall. Some countries delayed introduction, so the gap will narrow as they come

online, although from a supplier perspective, this delayed volume should probably be considered permanently lost. Two large countries determined that, given the lack of availability of combinations, they would prefer to delay introduction rather than utilize monovalent product. Obviously, given the pressure of time and the new ground being broken, some inaccuracy was unavoidable. In our view, however, one should not lose sight of the fact that there was no uptake scenario in which offtake would not fall well short of award, given that:

- The volume forecast incorporated in the RFP was based on the "high" case, and

- The awards in aggregate exceeded the volumes in the RFP by 17 million doses, because of the need to accept or reject manufacturer offers, including volumes, in their entirety.



One possible explanation for this mismatch might be that, under the circumstances prevailing at the time, the RFP/Award process was required to serve two somewhat contradictory objectives. On the one hand, it was intended to ensure supply of vaccines to countries approved by the GAVI Board and funded by the Vaccine Fund: a classical definition of procurement. On the other, it may also have had the intent of establishing product and capacity availability and willingness to supply. Regardless of explanation, the gap between award and offtake does not support the objective of credible and predictable demand. Although we believe that direct financial losses by suppliers have been minimal (e.g. inventory carrying cost), we would suggest the Alliance should consider buying all the vaccine awarded in 2000, even if delivery takes place after 2003. Bearing in mind the economics of vaccine production, prices offered are inextricably

linked to volumes, and the Alliance should try and recognize this fact in its purchasing behavior.

Whilst far less serious in its impact, we would also suggest that the credibility of the procurement process suffered somewhat from the communication of requirements or product preferences which were not reflective of the supply reality and the Alliance's negotiating position. This is not necessarily to question the validity of these requirements or preferences. Rather it is to observe that having mandatory requirements which then have to be ignored because of the supply situation, or preferences (e.g. single dose, pre-filled syringes) which do not take account of capacity and perhaps affordability considerations, does not enhance the credibility of the procurement process. Again, it seems to us that there is some telescoping of intent here, mixing strategic aspiration into a more tactical process.

We have already cited some issues around the depth of openness and collaboration that was achieved with suppliers. In general, we believe these issues are significantly less important than those which relate to creating credible demand. It is also worth noting that many of the suppliers to whom we spoke felt that the relationship that now exists between the international public sector and the supply base is much improved since 1992. Some suppliers expressed frustration with the quality or timeliness of communication, whether around product preference or changes in direction, for example, around the decision not to use the supplier selection criteria. Perhaps most important, GAVI partners and The Vaccine Fund do not speak with a single voice to the suppliers: this can lead to mixed messages, a lack of clarity around authority to take decisions, and the impression of disagreement or competition amongst partners.

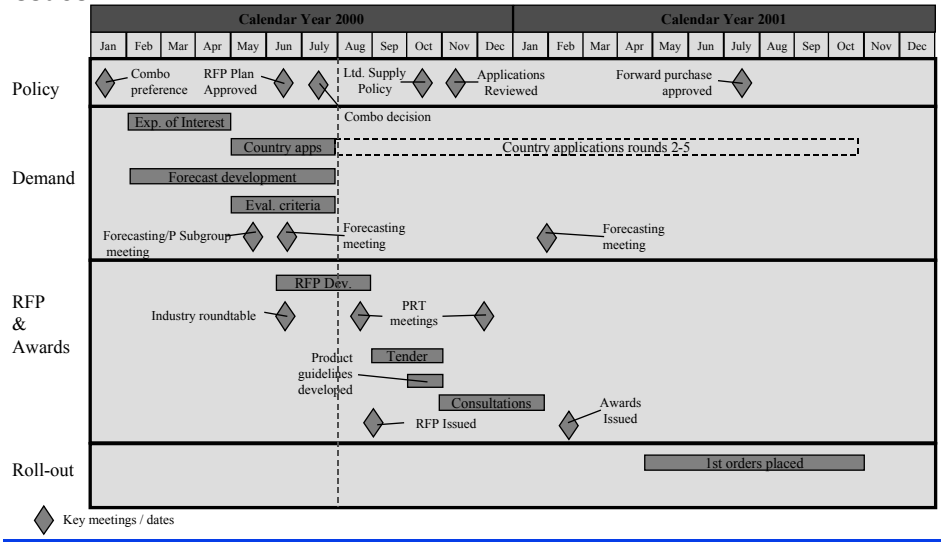
Turning to the internal functioning and execution capability of the Alliance in support of procurement, it is important to reiterate that an incredible amount of work was done in a very short period of time and in an entirely new context. That said, there were significant process shortfalls, which both affected the quality of the outcome and created some frustrations amongst partners. The process followed in support of procurement had significant sequencing, redundancy and hand-off issues. Further, as at the end of 2001, Hepatitis B coverage is significantly below the goal, largely for reasons outside the control of procurement, but nonetheless with significant implications for purchasing as discussed above.

On examining the process which was followed, our first observation is that the timeline required that vaccine order awards be made before demand (as defined by the country application process) was fully, or even largely, complete. The need to run procurement in parallel with demand creation drove a requirement for a separate and additional forecasting process, drawing on the country applications but also supplementing that data with direct country research. The incomplete status of the country application process also required that UNICEF SD conduct a separate country consultation in late 2000 and early 2001, both to establish product preferences for those countries which had not completed the application process and to advise of supply constraints for certain combination products.

In addition to the parallel processing requiring duplicative activity, the supplier evaluation criteria developed by the procurement sub-group were simply never used, on the advice of UNICEF SD's Procurement Reference Team.

Review of 2000/2001 procurement activity

The timeline of activity shows significant sequencing and redundancy issues.



Overall, there were significant changes, both additions and deletions, to the process followed once the RFP process proper started in late July 2000. The RFP was significantly redrafted, the country consultations executed and the evaluation criteria dropped. Whilst the necessity for these steps is largely clear to us, it seems that with the benefit of hindsight, more attention should have paid earlier in the process to:

- Establishing the country product and volume requirements
- Understanding the supply situation for the products likely to be required

In the event, three semi-independent processes established country product and volume requirements: country applications, the forecast and the consultation. In aggregate, from a procurement and forecasting perspective, these yielded the disappointing outcome for 2001 described above. On the supply side, although UNICEF SD advised in early 2000 that combinations might be in short supply, the product availability picture was not quantified until responses to the RFP were received, and the RFP ended up serving two purposes: information collection and a statement of intent to purchase.

In order to understand, and learn from, the shortcomings of the Alliance's first procurement, it is important to identify the root causes of issues. We see four:

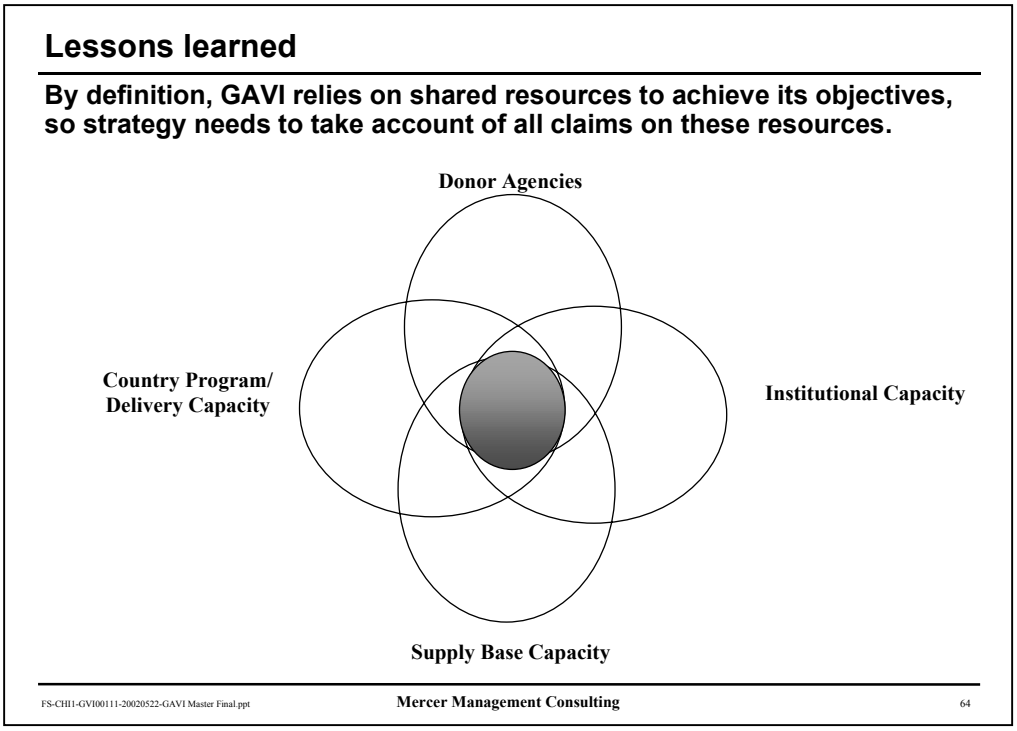
1. Pressure of time played a key role, as discussed above.
2. We believe that financing, as opposed to program or supply issues, was perceived to be the key constraint to introduction of new vaccines in low-income countries.
3. Loose alliances face effectiveness issues when called upon to implement, as opposed to develop, policy.
4. Finally, we perceive there to be significant residual discomfort with suppliers as partners in the effort.

In the section which follows we expand on these four themes, and recommend steps we believe the Alliance should take to ensure that the lessons of the first procurement are learned.

Lessons Learned and Recommendations

A significant proportion of the issues raised by GAVI and the Vaccine Fund's first procurement can be attributable to the very short period of time allowed to define and create demand, ensure delivery capability and procure vaccine. By way of comparison, the UK, a rich country with a strong, centralized, immunization system took five years to introduce Meningococcal C Conjugate, albeit this time period included the need for industry to develop a vaccine. From a supply perspective, up to five years is required to create capacity, if additional or new capacity is required.

Now that the Alliance has "won its spurs", and is in the implementation phase of its first major initiative, we would recommend that it define as soon as possible the next wave initiative, and start planning for its implementation. Without a strong lead from the Alliance in this area, there is a risk that each individual agency pursues its own priorities, an outcome that has three major risks. First, it will not allow cross-functional planning, which we believe to be essential to successful introduction. Second, any low-income country immunization effort draws on the same finite agency, supply, country and funding resources. A set of priorities inconsistent with the resource available will overload these resources and will not result in effective implementation. Finally, conflicting messages around priorities to the supply base is unlikely to result in timely capacity or R&D investments. This is an area where the Alliance clearly has an additive role over individual agencies.

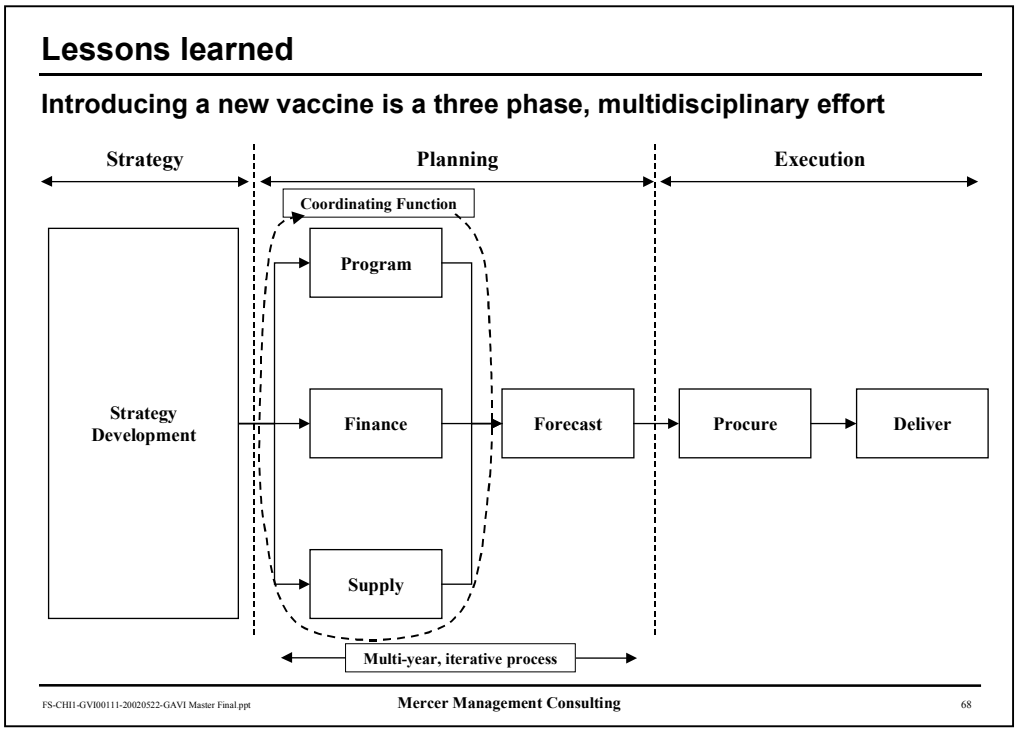


We therefore recommend that GAVI and the Vaccine Fund engage with partners as soon as possible to define the next wave initiative, consistent with the likely resource levels available and other calls on those resources.

In terms of the constraints on introducing new antigens in developing countries, it is important to preface our observations with the caveat that the scope of our work was limited to procurement. In this regard, whilst there were elements of the procurement activity which resulted in less than ideal results, as noted above, the outcomes in terms of vaccine supply and pricing were satisfactory. Given the timeline, no amount of creative procurement activity could resolve the combination capacity constraint. The main flaw in the process which was followed from a pure procurement perspective (as opposed to forecasting) was how late in the process the capacity constraint was identified, which may have had an undesirable knock-on effect on country uptake of monovalent product. Indeed, looking at the process which was followed, it is striking how late supply issues were considered, and how limited the resources devoted to understanding country and program issues were.

Based on these considerations, and again taking the UK introduction of Meningococcal C as a template, the key lesson from this is that successful introduction of a new antigen is fundamentally a multi-disciplinary task. The three disciplines involved are program (including advocacy and the creation of in-country demand), finance and supply. Once a strategy is set to introduce a given antigen, these three disciplines need to work together closely and in a coordinated fashion to plan the introduction. The forecast that is used to support procurement is a composite of all three disciplines: what real demand exists, what can be paid for and what can be supplied. Given that these questions are inter-dependent, and decision-making based on any one is unlikely to produce an overall optimum

outcome, there is a need for a strong coordinating and integrated decision-making entity to sit above the three individual disciplines in this process.



Again, since no one agency or GAVI partner encompasses all the disciplines required to assure the successful introduction of new antigens, there is clear value-add to the role GAVI should play, including ensuring that the coordinating function is in place.

We therefore recommend that, going forward, GAVI implement a multi-disciplinary approach to planning the introduction of antigens and ensure that a strong coordinating mechanism is in place across these disciplines.

Implementing policy across disciplines and ensuring cross-functional decision making is a significant challenge in most organizational contexts. Private sector companies invest significant effort in structures and processes to try and ensure that these challenges are met. This challenge is even greater in the context of a predominantly public sector alliance, which may host a range of legitimate, but competing, objectives and where there is not a single chain of command, indeed where the structure is consciously a loose one.

Nonetheless, we believe that such coordination is essential if GAVI is to be an effective implementer, as opposed to developer, of policy. In policy development, broad thinking, informal participation and redundancies are all desirable so long as they do not threaten the desired outcome of a clear and shared strategic direction. Once the focus shifts to implementation, however, clarity of roles, coordination and accountability become important.

Based on our analysis of the procurement activity, the Alliance needs a different operating model for planning and implementation (as opposed to policy-setting) activities. We would make the following observations. First, there are three bodies within the Alliance (the Board, the Secretariat, and the Working Group) which have, in theory, a mandate to coordinate partner activity and hold partners accountable. In practice, however, none of these bodies currently has either the resources or authority to be fully effective.

Second, partner involvement in planning activity, at least as it relates to procurement, showed a lack of clarity around roles and responsibilities. For example, on a self-reported basis, no partner claims lead responsibility for forecast development, or advising countries on vaccine choice. Two partners claim lead responsibility for procurement strategy development. As well as the loose nature of the Alliance, some of this lack of clarity and overlap is embedded in the Board mandates to partners and Task Forces. For example, UNICEF Supply is responsible for "procurement implementation", without the scope of this responsibility being spelt out. The Financing Task Force has a broad set of responsibilities, including procurement-related responsibilities, without it being clear how the FTF work links to others with procurement mandates.

We further believe that the absence of clear responsibilities and accountabilities means that the Alliance risks making operational decisions which are not fully fact-based. Not only does this increase the risk of making mistakes, it also means that decisions, even if right, can be hard to defend. In the procurement context, we would cite two examples. The first is the Alliance's preference for combination vaccines. This preference was determined before the supply constraints were fully appreciated. Further, it emerged, so far as we are aware, without any cost/benefit analysis, trading off the additional procurement spend against rapidity of introduction, capacity to deliver and in-country program savings. Similarly, the decision to communicate to suppliers a preference for a doses per vial reduction seems not to have been taken with any supporting analysis of cost/benefit.

One of the ways in which the private sector addresses the challenge of cross-functional execution and decision making is to appoint an individual or entity whose responsibility it is to ensure these things happen. Each function is accountable to this individual or entity for meeting their individual goals in a timely fashion, and also for contributing their expertise to integrated decision making. We call this the project management approach.

The key components of a project management approach are:

- Responsibility for integrated decision making and outcome is vested in a single entity and individual within that entity (the project manager).
- Each required discipline is represented on the project team and relevant experts are accountable for a component of the overall project. Individual representatives draw on the resources of their institution to achieve the goals of the project.

- Team members are accountable to the project manager, and the project manager is accountable to a project oversight body.
- A properly constituted project oversight body should be small and should include a mix of senior staff from engaged partners and representatives of partners not directly involved in the project team to ensure objectivity.
- Project management tools, such as workplans, timelines, milestones and measurement of deliverables to ensure progress and accountability are essential.
- Team composition, and project manager selection are a function of the specific situation and key constraints.

We believe such an approach will significantly enhance GAVI's effectiveness as an implementer of policy, as well as improving the quality of operational decision-making.

We therefore recommend that GAVI institute a project management model for the planning and implementation phases of key initiatives.

Turning to relationships with industry, we have already discussed our view that more information could and should have been shared earlier with suppliers. We see three separate issues relating to engagement with industry: the engagement "model", confidentiality and conflict of interest, and partner responsibilities. Taking each in turn:

We believe that GAVI risks overemphasizing multilateral engagement with industry at the expense of bilateral engagement. Whilst both types of engagement have value, industry often has competitive and competition law concerns with the multilateral model. It is also clearly important to maintain a level playing field for suppliers. In this context, we would observe that it is not safe to assume that industry representation at a meeting (one company) means that all companies will be made aware of the contents of the meeting.

On conflict of interest and confidentiality, we believe that in the 2000/2001 activity, these areas of concern were defined too broadly. Specifically, demand and product preference information should be shared and updated, and there is a cost to not doing so. On the other hand, procurement decision-making is clearly not a place where industry can participate, and individual companies have a right to expect that their commercial discussions and negotiations with customers will remain largely confidential.

In terms of partner responsibilities, we would suggest the following. It is potentially damaging for the Alliance to send mixed messages or to give the impression of internal competition to suppliers. Therefore, within a specific initiative, the partner with lead supply responsibility, and by extension, the project manager have responsibility for supplier liaison. On broader strategy priorities, it is less important that there be a single point of contact, so long as the Alliance has clearly defined and communicated the strategy and the role and timing of individual antigens within it.

We therefore recommend that GAVI ensure that information on demand, product preference and future needs is shared with industry, unless there is a well-defined reason

not to do so. We further recommend that GAVI require that project teams schedule bilateral meetings with industry when key decisions need to be made or there is a major development.

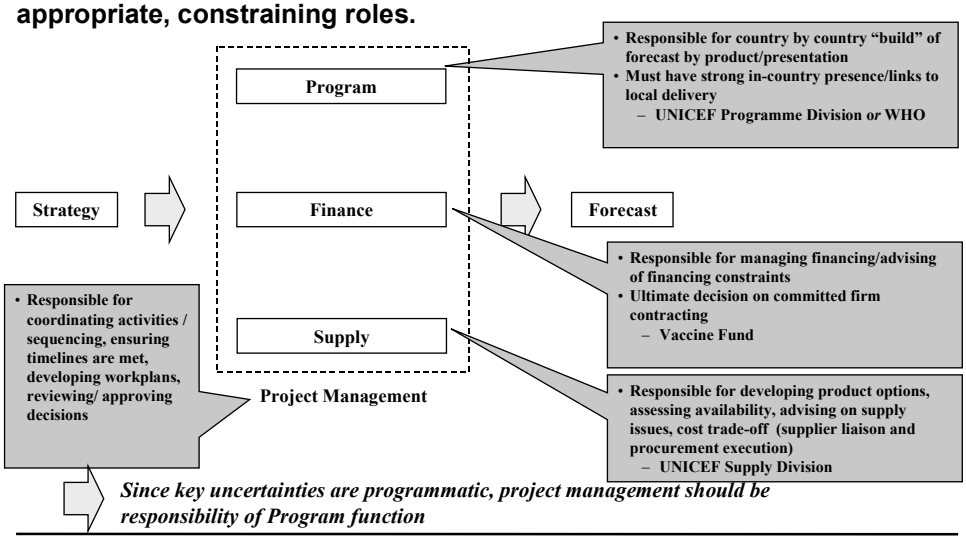
The most immediate challenge facing the Alliance on the supply/procurement side is the upcoming procurement round for 2004-2006, for which an RFP is due in the third quarter of 2002. We believe that this round represents both an opportunity and a need for GAVI partners to utilize the project management approach we described above. Specifically, there is a need to create a forecast to support this procurement. The most visible issue with the 2000/2001 procurement activity was the weakness of the forecast. This weakness damages credibility of demand, damages the credibility of the Alliance as a paradigm shift and does not support the goal of firm contracting. However, we understand that little has been done to date to improve on the forecast that already exists.

We therefore believe there is an urgent need to move forward with this effort, the first issue being the selection of the project manager. Whilst all three functions (supply, finance and program) need to be involved as described above, project management lead should reside in an institution which has insight and resources to address the key constraints. This will vary from situation to situation, but in this circumstance, we perceive the key issue to be developing a more robust understanding of the status and likely evolution of country uptake. Hence the project management lead should reside in an institution which has strong country presence and links to government, and therefore either UNICEF PD or WHO.

Within the project management structure each function should have a lead partner: WHO or UNICEF PD for program, the Vaccine Fund for finance and UNICEF SD for supply. These partners are at liberty (and, indeed, will need) to recruit other partners to assist as appropriate, but are accountable for the performance of their function to the project manager. The project manager should be accountable to an entity designated by the GAVI Board. This oversight body should be small, but should include representatives of Agencies not directly involved in the project team to ensure objectivity.

Lessons learned

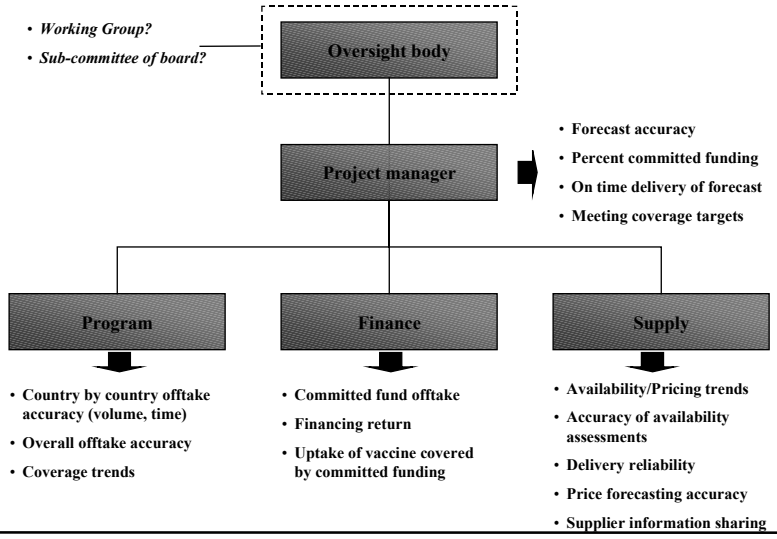
Forecasting needs to be driven from the country level, with supply and financing functioning in supporting, communication, and, where appropriate, constraining roles.



Accountability and measurement are critical to the success of a project management approach. A suggested structure and potential performance measures are shown below.

Lessons learned

Lines of accountability and metrics need to be established for all involved parties and endorsed by the GAVI board.



Accountability and measurement are critical to the success of a project management approach. A suggested structure and potential performance measures are shown below. Overall success for this effort is defined as a product-level forecast which commands high confidence amongst partners, enabling firm contracting for 75-80% of volume. Further, the process should be transparent to potential suppliers, both as to assumptions and results in the aggregate. Finally, actual offtake should demonstrate the accuracy of the forecast.

Given the current status, we are concerned that it may not be possible to meet a Q3 deadline and deliver a high quality outcome. We suspect however that, given supplier lead times, and if appropriate levels of information are shared early and often, this deadline could be pushed later in the year without threatening supply. We would recommend confirming this with suppliers; our view is that a high quality outcome to this effort is sufficiently important to make a modest delay in awards a price worth paying.

We therefore recommend that GAVI and the Vaccine Fund trial the project management approach with the upcoming 2004-6 procurement round; appoint a project manager from either UNICEF PD or WHO; and create or instruct an oversight body to hold the project manager accountable for performance.