Key Concepts: Economics of Vaccine Production

Understanding vaccine prices.

Why are there so few vaccine manufacturers?
Vaccine production involves high investment costs for research and development, and for production facilities. It also requires significant know-how. Know-how is difficult to acquire and so technology transfer requires a strong cooperative relationship between the partners. All of these factors create barriers of entry into vaccine production. As a result of these high barriers to entry, there are relatively few vaccine producers, compared with producers of other classes of pharmaceuticals. In addition, the world’s vaccine market is very small—less than 2 percent of the pharmaceutical market—attracting few suppliers.

Why have prices for traditional vaccines gone down over time?
Vaccine production costs have a significant fixed cost component, reaching up to 90 percent of total costs. These costs include research and development (R&D), quality control and quality assurance, selling and distribution overhead, and the construction and maintenance of production facilities.

Vaccine production costs per unit can be reduced significantly through gains in productivity (the “learning curve”) and through economies of scale. Because of the high fixed cost element, the cost of production per dose decreases with increasing batch size. The traditional six vaccines of the Expanded Programme on Immunization (EPI), measles, diptheria, pertussis, tetanus, oral polio and BCG, are mature products. Because the fixed costs of production of these vaccines have been covered long ago, and because their production costs have been lowered due to the learning curve and economies of scale, their prices are relatively low.

How did developing countries benefit in the past?
In the past, high- and middle-income countries have paid the initially higher price of vaccines while the fixed costs were paid off. Low income countries have adopted the vaccines once the price came down following this paying off of fixed costs such as R&D, the entrance of competitors into the market, the reduction in cost of production that results from learning, and economies of scale following widespread adoption of the vaccine into national programs.

Historically, there has been excess production capacity of these vaccines as new producers have entered the market, thus sales to developing countries at low prices covered the variable costs of producing extra doses of vaccine, and did not require additional capacity.
What will the future bring for traditional vaccines?
Excess capacity is disappearing as manufacturers reallocate their production capacity to vaccines with higher added value. Therefore, we can expect the price of vaccines from traditional manufacturers to go up. However, manufacturers from developing and emerging economies are entering the vaccine market, offering significant quantities at low prices. Therefore, the net increase in prices is difficult to predict.

What about new vaccines?
High fixed costs and steep learning curve make new vaccines relatively more expensive, as the investments in R&D and production facilities need to be paid off and optimum production techniques need to be perfected to bring down variable production costs.

New vaccines that involve recombinant DNA technology or conjugation of a polysaccharide with a protein may not be as amenable to large-scale production as vaccines produced by more traditional techniques. Therefore, the prices for these vaccines may never reach the same low level as the traditional six EPI vaccines.

Consumers used to purchasing the traditional six EPI vaccines at low prices may be unwilling to pay the high price demanded for innovative new products, especially where financial constraints are tight. The market for new products has been limited to middle- and high-income countries until very recently. There has been little financial incentive for manufacturers to develop and produce new products for the developing country market.

As new vaccines come into the market to address diseases of huge public health importance such as tuberculosis, malaria and HIV/AIDS, there will be tremendous pressure to make these vaccines available immediately to all those who need them. This might be facilitated through tiered pricing with the richer countries paying the full cost and the lower income countries paying the marginal cost of production (mainly variable costs).

An acceptable strategy for a supplier and the most appropriate strategy to increase access is to maximize production volume to meet demand from all potential markets, in combination with tiered pricing. This is a way to ensure equitable access to vaccines for the poor, and a profit incentive for vaccine producers through sales in higher-income countries.

For additional information . . .

Managing the product lifecycle (adapted from Mercer Management Consulting, 1997)
Global supply of new vaccines can be optimized if new strategies are developed to manage the product lifecycle.

<table>
<thead>
<tr>
<th>Factor</th>
<th>New Product Launch</th>
<th>Market Penetration</th>
<th>Product Maturity</th>
<th>Optimal Situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of producers</td>
<td>One or few</td>
<td>Several producers</td>
<td>Several producers in both high income and developing countries</td>
<td>Tiered within and across markets (global): low average price</td>
</tr>
<tr>
<td>Pricing</td>
<td>High, uniform</td>
<td>Tiered within and across markets. High average price mainly for rich countries and the private market in high income countries</td>
<td>Tiered within and across markets (global): low average price</td>
<td>Tiered within and across markets (global): low average price</td>
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<tr>
<td>Cost</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Profitability</td>
<td>Uncertain</td>
<td>High</td>
<td>Low</td>
<td>Uncertain</td>
</tr>
<tr>
<td>Capacity</td>
<td>Low</td>
<td>High</td>
<td>Surplus</td>
<td>High</td>
</tr>
<tr>
<td>Vaccine availability</td>
<td>Poor</td>
<td>Good in high income countries</td>
<td>Good world-wide</td>
<td>Good world-wide</td>
</tr>
<tr>
<td>Market demand</td>
<td>Low</td>
<td>High demand in high income countries and the private sector of lower income countries</td>
<td>High world-wide</td>
<td>High world-wide</td>
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