October 30, 2008

Supply Strategies for Inactivated Polio Vaccine in the Post-Eradication Era

Presentation to OPV / IPV Manufacturers Group
**Project Objective:** Develop IPV supply strategies for developing world populations

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<tr>
<th>Sponsors</th>
<th>Key Questions to be Answered</th>
<th>Audience</th>
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<tbody>
<tr>
<td>Commissioned by The Bill &amp; Melinda Gates foundation (BMGF)</td>
<td>What range of demand could exist for IPV post-eradication?</td>
<td>Intent was to help inform policy and aid country decision making</td>
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<td>WHO/GPEI was a close collaborator</td>
<td>What are the current and potential sources of supply, including new technologies?</td>
<td>Insights and conclusions to be shared with:</td>
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<td>What are key tradeoffs across these supply sources?</td>
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<td>What are the supply strategy implications?</td>
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Audience:
- SAGE [Working Group]
- ACPE
- WHO regions (e.g., AFRO)
- GPEI/WHO
- UNICEF
- Manufacturers
- Gates foundation
**Approach: Project conducted over the last year, following a 5-step approach**

### Diagnostic

1. Assess current IPV supply situation
2. Evaluate tradeoffs / economics of IPV
3. Develop alternative demand scenarios

### Strategy formulation

4. Identify alternative supply strategies
5. Evaluate and solicit input

**Over one hundred individuals and organizations contributed to this effort, including:**

- Current and potential IPV manufacturers
- Global-level supply and demand experts
- Select country government officials
Objectives of this presentation

- Summarize major project findings that are being shared with broad set of constituents
  - Potential post-eradication demand for IPV
  - Sources of supply and tradeoffs across IPV technologies
  - Implications for standalone versus combination vaccines

- Solicit manufacturer feedback and address any questions

- Following this meeting, we will be releasing a public paper summarizing the findings
Demand Findings: Demand is still uncertain with a range of scenarios potentially unfolding beyond the current “as is”

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<th>Scenario</th>
<th>Which countries adopt?</th>
<th>Adopt when?</th>
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<tbody>
<tr>
<td>“As is” / Current</td>
<td>Upper income countries only</td>
<td>Now until cessation</td>
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<tr>
<td>“Sovereign” Capacity With Finite Use</td>
<td>“As is” + India, China, &amp; Indonesia</td>
<td>When local production is ready</td>
</tr>
<tr>
<td>“Finite use” (for 5-10 years)</td>
<td>All Countries</td>
<td>Cessation</td>
</tr>
<tr>
<td>“Universal long-term adoption”</td>
<td>All Countries</td>
<td>Cessation</td>
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Source: Global-level demand expert interviews
Demand Findings: Demand could rise from the “as is” of 80 million to as high as 425 million annual doses

Source: Oliver Wyman Analysis
Classification data collected from WHO, UNDP, GAVI, and World Bank; birth cohort collected from UNDP, assuming medium fertility, and includes over 99.5% population
1. Coverage rate based on 2008 WHO ICE-T country-by-country projections
2. Wastage rates assumed to be 5% for pre-filled syringe in HICs / UMICs and 25% for multi-dose vial in LMICs / LICs (WHO report: Monitoring vaccine wastage at country level)
Demand Findings: A strong policy recommendation will be a key input to resolving the demand uncertainty and solidifying supply

- SAGE and WHO policy recommendations
  - What situations/conditions warrant the use of IPV?
  - If it should be used: When? For how long? How many doses? What presentation?

- Priority relative to other public health objectives or needs

- Programmatic and other factors (e.g., political considerations)

- Affordability (including donor funding)

Potential IPV Demand

Potential IPV Supply

- “[We] will follow the WHO policy…in the absence of a WHO policy, [we] will not do anything”

- “[Our country] will follow whatever IPV policy WHO recommends; [we have] a long history of doing so with other vaccines”

- “An understanding of demand is a critical input in our IPV investment decisions…stronger policy guidance would help countries make decisions and help us better understand potential demand.”

- “We have had a lot of discussions with countries that want to adopt IPV, but first want WHO’s guidance.”
Supply Findings: Current wild-type IPV (wtIPV) capacity is ~110 million doses annually with the potential to expand to ~400 million if demand materializes.

Source: Oliver Wyman Analysis; Expert Interviews
1. Assumes 10% overfill
Supply Findings: Given its potential capacity and successful history, existing wtlIPV capacity will have a significant role in any post-eradication supply strategy

- wtlIPV is an established, proven source of supply
  - Long clinical and commercial history
  - Able to supply a great deal, if not all, of the additional demand if manufacturers expand

- Manufacturer expansion would result in lower manufacturing cost due to scale economics
  - Vaccine price would be expected to decline although not necessarily proportionately

- However, even if demand increases and manufacturers scale-up, IPV will never be as cheap as OPV
  - IPV manufacturing cost can be in the €0.50 - €1.50 range, which is 5x - 15x OPV price
  - Manufacturing scale will be a key driver of the position within this range
  - Note: This considers vaccine cost only, not broader programmatic & health impact
Supply Findings: Sabin IPV may still have a role to play in the future, but has risks

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<th>Potential Role</th>
<th>Key Risks</th>
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| ▪ Several countries likely to require/prefer local production – China; Indonesia; India; Brazil  
  – Unclear whether they will require local bulk or be open to importing bulk and finishing locally  
| ▪ If these countries require local bulk production, only sIPV production is feasible under GAP-III  
  – sIPV may enable IPV adoption (and OPV cessation) by this large demand segment  
| ▪ Also, sIPV may increase robustness of supply base  | ▪ R&D Risks:  
  – Still in early stage development  
  – Type 1 higher immunogenicity than wtIPV, type 3 moderately lower, type 2 considerably lower  
  – Alternative methods (e.g., adjuvants) offer promise, but are still unproven  
| ▪ Timing Risks:  
  – Uncertainty around R&D timing, tech transfers, and facility construction  
  – May impact cessation timeframe  | ▪ Economic Risks:  
  – Potential for similar economics as wtIPV (with alternative approaches)  
  – However, need to carefully manage scale / # of suppliers or may cost considerably more |
Standalone vs. Combo Findings: To frame the decision around stand-alone versus combination vaccines, we can analyze the break-even combo price

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<th>Breakeven framework</th>
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<td>Breakeven combo pricing (DTP + Hep B + Hib + IPV) = Pricing that would be economically neutral to Penta + IPV standalone</td>
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<td>Breakeven has to consider:</td>
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<tr>
<td>– Penta and IPV standalone price</td>
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<td>– Administration benefits of combo (~€0.60 savings for combo)</td>
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<td>– Shipping and wastage costs</td>
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<td>Analyzed 2 scenarios of Penta and IPV standalone pricing</td>
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<td>– Current¹: Penta at €2.69; IPV stand-alone at €2.30</td>
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<td>– Low Scenario: Penta pricing at long-term target² of €1.20; IPV pricing at €1.00 (as an assumption?)</td>
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Source: Oliver Wyman Analysis

1. UNICEF tenders (2-dose penta: $3.50 converted at 1.30 USD/EUR [avg. 2006], 1-dose IPV: $3.00 converted at 1.30 USD/EUR [avg. 2006])
2. GAVI long-term target of $1.85, using projected exchange rate of 1.54 USD/EUR [1 year currency forward as of July 2007]
Standalone vs. Combo Findings: The current breakeven price for combination vaccines is €5.19, but will decline considerably as Penta and IPV pricing declines.

**Breakeven declines further if stand-alone IPV is used in a 2-dose course**

Sources: Oliver Wyman analysis, WHO GIVS cost model, WHO expert interviews
1. Calculations based on 2-dose presentation; 15% wastage; exchange rate 1.30 USD/EUR; analysis accounts for price, shipping, wastage, and administration/programmatic costs
Note: Administration cost savings amount to ~€0.60
Standalone vs. Combo Findings: The standalone vs. combo decision will be impacted by considerations around the pertussis antigen

- Current wtIPV suppliers likely not to offer wP combos with IPV (only aP)
  - Existing wP processes not compatible with IPV
  - Changing would require considerable development and regulatory investments

- Therefore, the combo vs. standalone decision from existing wtIPV suppliers would be:
  - aP-based combo vs. standalone IPV + Penta

- Decision would need to be informed by several key inputs:
  - Policy recommendation around pertussis antigen?
  - Whether aP-based combo pricing can be achieved within the breakeven range?
  - Whether additional non-economic value may be placed on aP, raising the breakeven?
Next steps

- We are in the process of finalizing a public paper for broad release that will summarize the findings presented to you today

- We welcome any questions and feedback going forward
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  – Graegar Smith (graegar.smith@oliverwyman.com)