Cost-effectiveness and budget impact analysis of quadrivalent (QIV) versus trivalent influenza vaccines (TIV) in low and middle income countries

Preliminary Report

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Policy Question

Under which scenario’s will QIVs be cost-effective compared to TIVs in low and middle income countries from a societal perspective?
Study Teams

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  - Pieter de Boer

- WHO Initiative for Vaccine Research (IVR)
  - Raymond Hutubessy
Part I: Community model

- Mimic real communities by individual-based, multi strain influenza simulation models
- No vaccination vs TIV vs QIV

  - Run simulator *without* vaccination and *with* vaccination strategy activated
  - *Difference* determines effectiveness of vaccination as reduction in illness attack rate
  - Infection profile of each infected individual then input into *economic analysis* model to determine cost and cost-effectiveness.
Methods (2/2)

- **Part II: Cost-effectiveness analysis model**
  - **Perspective:**
    - societal public health
  - **Costs:**
    - vaccine procurement and delivery costs;
    - treatment
    - household, including productivity losses due to influenza
  - **Benefits:**
    - influenza-related loss of Quality of Life (QoL)

- **Part III: Budget impact analysis**
Integrated simulation model and economic analysis methodology

- **Census Data**
  - Population Contact Network
  - Influenza Transmission Procedure
  - Vaccination strategies

- **Individual-based simulation models**
  - Simulation outcomes
  - Vaccination Effectiveness

- **Parameters associated with Disease Burdens**
  - Health outcomes decision process
  - GP visits, Hospitalisations, ICU Admissions, Deaths
  - Quantification of resulting Disease Burdens

- **Cost parameters**
  - Overall Costs and Vaccination Cost-effectiveness

**Disease parameters**

**Vaccination parameters**
8 Vaccination Scenario’s Simulated

- Vaccine: TIV or QIV
- Distribution: choice target group
  - Randomized
    - (unrealistic) baseline
  - Transmitters-first
    - first to highest age-specific attack rate
  - Vulnerable-first.
    - first to those aged 65+, followed by those under 5, followed by adults
  - HIV and Vulnerable-first
    - first to HIV positive, and remainder to vulnerable-first option as above
## Communities

<table>
<thead>
<tr>
<th>Community</th>
<th>Australia</th>
<th>South Africa</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community</td>
<td>Albany</td>
<td>Agincourt</td>
<td>Thai Nguyen</td>
</tr>
<tr>
<td>Population</td>
<td>30000</td>
<td>50000</td>
<td>74000</td>
</tr>
<tr>
<td>GDP/capita (2013 US$, WB)</td>
<td>67,458</td>
<td>6,618</td>
<td>1,911</td>
</tr>
<tr>
<td>Type (WB classification)</td>
<td>High-income relatively isolated</td>
<td>Upper-middle-income rural</td>
<td>Lower-middle-income urban</td>
</tr>
<tr>
<td>Seasonal vaccination coverage</td>
<td>20%</td>
<td>2%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Results

● Vaccination scenario:
  – “Transmitters-first” most cost-effective scenario for all 3 locations for both vaccines,
  – QIV gives a health advantage over TIV in all scenarios for all 3 locations

● Cost effectiveness:
  – QIV over TIV: more benefits but at more costs !!
  – Results depend on setting
    • In Australia picture is less clear due to a “better B-strain match” in 2003-2013 and higher hospitalization rates and higher treatment costs compared to SA and Vietnam
Albany, Australia
Cost Effectiveness

Vaccination scenario: Transmitters First. QIV20: Price Premium of QIV over TIV = 20%

No vaccination
Agincourt, South Africa
Cost Effectiveness

QUALY loss

Vaccination scenario: Transmitters First. QIV₂₀: Price Premium of QIV over TIV = 20%

Costs (I$)
Thai-Nguyen, Vietnam
Cost Effectiveness

QALY loss

Costs (I$)

Vaccination scenario: Transmitters First.  QIV$_{20}$: Price Premium of QIV over TIV= 20%
Budget Impact

% of National Health Budget

TIV
QIV

Australia
South Africa
Vietnam
Conclusions

- Preliminary analysis shows that influenza vaccination with TIV compared to no-vaccination is cost effective.

- Cost-effectiveness of QIV vs TIV is setting-dependent:
  - In low-income settings such as SA and Vietnam:
    - Potential benefits but at significant additional costs
    - Major budget impact implications
  - In high-income setting such as Australia:
    - Marginal benefits to gain
    - Minor budget impact implications
CAVEAT!

- This is modelling – the value of the results is dependent on the data put into the model and the assumptions that are made.

- These are very preliminary results – analysis is continuing.

- Three small communities analysed – NOT PREDICTIVE of national, regional or global situation.
Alternative model

- Price increase about 35%
- Efficacy increase – about 5%
- You choose!
Local decision makers need to decide whether the additional investments for QIV are worth the resources required compared to TIV

What are the opportunity costs?
Thank you for your attention