How to evaluate the economic impact of interventions I: introduction and costing analyses

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Outline

- Background
- Narrow traditional economic evaluations
  - Direct and indirect costs
- Broader economic impact
  - Macroeconomic and sectoral gains
- Conclusions
Assessing an intervention:
Some criteria to consider when introducing a new health technology:

- Safety
- Efficacy
- Quality

- Affordability
- Sustainability
- Value for money

- Equity
Background

- High influenza disease burden in LMICs
  - mortality and morbidity impact
  - But also economic impact

- Economic arguments needed to convince different stakeholders to invest in influenza vaccines for both seasonal and pandemic use

- Potential stakeholders – national governments, international donors and national and international vaccine manufacturers
Traditional economic analysis

- Traditional economic evaluation techniques (cost per DALY, cost per QALY etc) to determine value for money are well established tools for decision making
- Traditional evaluations well understood by decision makers in health sector and used for priority setting
- What about other decision makers/stakeholders such as
  - Decision makers outside health sector e.g. Finance, Commerce, Trade?
  - Donor agencies?
  - Private sector e.g. vaccine manufacturers?
### Types of economic evaluations

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost effectiveness</td>
<td>“Vaccination costs $500 per clinical influenza episode prevented.”</td>
</tr>
<tr>
<td>Cost utility</td>
<td>“Vaccination costs $500 per DALY gained.”</td>
</tr>
<tr>
<td>Cost consequences</td>
<td>“Vaccination costs $2 million but prevents 30 deaths and 10,000 clinical influenza episodes.”</td>
</tr>
<tr>
<td>Cost benefit</td>
<td>&quot;The cost-benefit ratio of vaccination is 3:1.”</td>
</tr>
<tr>
<td>Budget impact</td>
<td>“Vaccination costs $2 million a year, but will save the health service $500,000 a year and increase tax revenues by $300,000 a year.”</td>
</tr>
<tr>
<td>Threshold price</td>
<td>“The break even price of the vaccine is $5 a dose.”</td>
</tr>
</tbody>
</table>
Counting the costs of influenza: perspective which to consider?

<table>
<thead>
<tr>
<th>Direct costs</th>
<th>Health care provider or purchaser perspective</th>
<th>Societal perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccination (dose and administration cost)</td>
<td>• Over the counter medicines</td>
<td></td>
</tr>
<tr>
<td>Health care use (drugs, staff, accommodation etc.)</td>
<td>• Transport to seek health care</td>
<td></td>
</tr>
<tr>
<td>Indirect costs</td>
<td>• Lifetime health care costs from prevented deaths (\text{note: controversial!})</td>
<td>• Informal care</td>
</tr>
<tr>
<td>• Productivity loss due to morbidity (due to own or others’ sickness), mortality and vaccination</td>
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</table>
Indirect costs of influenza

Estimated economic burden of influenza in 281 German patients (1995-6)

- Medication (6.4%): DM 9.3 million
- Out-patient services (9%): DM 13.1 million
- In-patient costs (2.4%): DM 3.4 million
- Indirect costs (82.2%): DM 119.7 million
How to estimate indirect costs

Friction costs
Cost of replacing the lost production of a worker (e.g. filling the vacancy with a new hire)

Present Value of Lost Earning (PVLE)
Value of the lost production (or earnings) of a worker over the remaining lifetime

Value of statistical life (VSL)
Value of the lost production (or earnings) of a worker over the remaining lifetime + Social value of human life (e.g. from wage-risk tradeoffs)
How to estimate indirect costs

Estimated economic burden of influenza in the United States (2003)

Adapted from Molinari et al. Vaccine 2007; 25:5086.
Cost from middle income countries - little evidence available

- Company perspective (chemical and bank)

- Net Value=Benefits – Costs
  \[(\text{ILI costs}_{\text{NV}} - \text{ILI costs}_{\text{V}}) \] – cost vaccination program

<table>
<thead>
<tr>
<th>Country</th>
<th>Argentina</th>
<th>Colombia</th>
<th>Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost-saving per vaccinated employee (US$)</td>
<td>73-240</td>
<td>6.45 – 89.3</td>
<td>39.9 - 734</td>
</tr>
</tbody>
</table>

- Potential biases
  - Methodological: PVLE vs coping strategies
  - Industry studies/funding


11 | Workshop on Health and Economic Impact of Influenza Bali June 2012
## Practical use of economic evidence

<table>
<thead>
<tr>
<th>Target audience</th>
<th>Potential use</th>
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<tbody>
<tr>
<td>Society as Whole</td>
<td>Advocacy for vaccine use</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Vaccine effects compared to interventions</td>
</tr>
<tr>
<td></td>
<td>Vaccination policy development</td>
</tr>
<tr>
<td>Ministry of Finance</td>
<td>Return on investment (RoI) to the economy as a whole</td>
</tr>
<tr>
<td>Donor Community</td>
<td>“Success story” using RoI and other externality arguments</td>
</tr>
<tr>
<td>Vaccine Manufacturers</td>
<td>Justify entry into pipeline vaccine markets</td>
</tr>
</tbody>
</table>
Broader economic impact of vaccines

- Traditional cost-effectiveness analysis (CEA) is often seen as less useful (or ignored) for decision-making by stakeholders in low/middle income countries.

- Typical question policy makers consider
  - What is the effect of vaccines on earnings?
  - What is the return of investments of vaccination?
  - What is the public sector budget impact of introducing new vaccines at country level?
  - Impact on other sectors or economy as a whole?

- Broader economic approach and analysis is needed to include wider impact of vaccine programs
Potential externalities of vaccine programs

- Demand
- Labour productivity
- Cognitive development
- Educational attainment
- Foreign investment
- Savings
- Fertility
- Household security
- Equity

Broader economic benefits
Example 1: Macro economic impact following pandemic influenza vaccination

- Applying GCE model (previously applied to UK) to Uganda, Thailand and South Africa to quantify vaccination impact on multiple sector results in estimated GDP loss <1.5%.

- Grain and crops sector exhibits a large impact for Thailand and Uganda

- At household level non essential/luxury items decline

Smith & Keogh-Brown, WHO report 2010
Example 2: Sectoral impact  SARS in China

[Graph showing sectoral impact of SARS in China across different sectors and months, with Beutels et al. Trop Med Int Health 2009; 14 Suppl 1:85. cited at the bottom.]
From a Narrow to a Broad Perspective

Typically, economic evaluations of vaccines take a narrow perspective of benefits. This misses valuable contributions of vaccination:

**Narrow**

- Health benefits
- Health costs averted
- Averted costs from lost productivity when caretakers miss work to care for children

- Outcome-related productivity gains
- Behavior-related productivity gains
- Ecological externalities
- Community externalities
- Macroeconomic/changed GDP

Based on Bärnighausen, et al Vaccine 2011; WHO consultation 2011
Important Implications

- **Direct economic benefits – some evidence available**
  - Measuring economic benefits of immunization beyond treatment savings is important
  - Epidemiological and geographical differences are important for decision making
  - Results are the product of the underlying disease burden and the timing, rates of immunization, and effectiveness of vaccination programs

- **Indirect economic benefits – less evidence available**
  - *Outcome-related productivity gains*: cognitive development and better school attainment of children should be considered
  - *Behavioural-related productivity gains*: improvements in survival rate and thereby changes in household choices e.g. Fertility and consumption choices
  - *Ecological externalities*: impact on unvaccinated community members (herd immunity)
  - *Community externalities*: improvements in equite and financial sustainability
  - *Macroeconomic and sectoral effects*: impact on the economy as whole
<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Data and model requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional economic evaluations</td>
<td></td>
</tr>
<tr>
<td>Cost-effectiveness</td>
<td>Disease epidemiology</td>
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<tr>
<td></td>
<td>Vaccine effectiveness</td>
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<tr>
<td>Cost-utility</td>
<td>Health utilities</td>
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<tr>
<td>Cost-benefit</td>
<td>Societal costs in monetary values</td>
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<tr>
<td>Threshold price / willingness to pay</td>
<td>Societal valuations of WTP</td>
</tr>
<tr>
<td>League table ranking</td>
<td>Results of other economic evaluations</td>
</tr>
<tr>
<td>Budget impact/return on investment</td>
<td></td>
</tr>
<tr>
<td>Health care budget</td>
<td>Long-term costs</td>
</tr>
<tr>
<td>Public sector</td>
<td>Impact on productivity, other economic sectors</td>
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<tr>
<td>Societal</td>
<td>Labour market participation</td>
</tr>
<tr>
<td>Macro-economic impact</td>
<td></td>
</tr>
<tr>
<td>Short term</td>
<td>Labour market effects</td>
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<tr>
<td>Long term</td>
<td>Demographic effects</td>
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<td></td>
<td>Drivers of behaviour (eg. fertility, savings, human capital investment)</td>
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</tbody>
</table>
WHO Guides on economic evaluations

- **WHO-CHOICE**
  - Sector-wide priority setting

- **WHO IVB Guides**
  - Guidelines for estimating costs of introducing new vaccines into the national immunization system (2002)
  - WHO guide for standardization of economic evaluations of immunization programmes (2008)

- **Health Systems Financing**
  - Broader economic impact
Conclusions

- To inform investment decisions on influenza vaccines, economic tools and techniques are available.

- Both traditional and broader economic tools are needed to demonstrate the full value for money of vaccines.

- Most examples on economics of influenza vaccines are from high income countries e.g. US, Europe etc.

- LMIC evidence is lacking; hence country-specific case studies using different economic techniques are needed.