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Health economic considerations for vaccine program investment in high and low income contexts

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Public Health England

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Overview

• Economic evaluation today – what are the implications for vaccination of older adults?
• What economic analyses are most useful to inform vaccine investment decisions?
• What data are needed to inform economic analyses? (influenza vaccination as a case study)
A (full) economic evaluation compares the incremental costs and health outcomes of an intervention compared to a comparator.
# Measuring health utility using the EQ-5D

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Level</th>
<th>Coefficient (England)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td>1.003</td>
</tr>
<tr>
<td>Mobility</td>
<td>Slight</td>
<td>0.057</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.075</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0.208</td>
</tr>
<tr>
<td></td>
<td>Unable</td>
<td>0.255</td>
</tr>
<tr>
<td>Self-care</td>
<td>Slight</td>
<td>0.058</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.083</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>Unable</td>
<td>0.208</td>
</tr>
<tr>
<td>Usual activities</td>
<td>Slight</td>
<td>0.048</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.067</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0.165</td>
</tr>
<tr>
<td></td>
<td>Unable</td>
<td>0.165</td>
</tr>
<tr>
<td>Pain/discomfort</td>
<td>Slight</td>
<td>0.059</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.080</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0.245</td>
</tr>
<tr>
<td></td>
<td>Unable</td>
<td>0.298</td>
</tr>
<tr>
<td>Anxiety/depression</td>
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<td>0.073</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>0.099</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
<td>0.282</td>
</tr>
<tr>
<td></td>
<td>Unable</td>
<td>0.282</td>
</tr>
</tbody>
</table>

A capabilities approach to measuring well being

**Capability theory** is an alternative view of economic welfare that measures the freedom that people have to do and be what they want.

The **ICECAP-O** (ICEpop CAPability measure for Older people) is a measure of capability in older people for use in health economic evaluation.

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### ABOUT YOUR QUALITY OF LIFE

By placing a tick (✓) in ONE box in EACH group below, please indicate which statement best describes your quality of life at the moment.

1. **Love and Friendship**
   - I can have all of the love and friendship that I want
   - I can have a lot of the love and friendship that I want
   - I can have a little of the love and friendship that I want
   - I cannot have any of the love and friendship that I want

2. **Thinking about the future**
   - I can think about the future without any concern
   - I can think about the future with only a little concern
   - I can only think about the future with some concern
   - I can only think about the future with a lot of concern

3. **Doing things that make you feel valued**
   - I am able to do all of the things that make me feel valued
   - I am able to do many of the things that make me feel valued
   - I am able to do a few of the things that make me feel valued
   - I am unable to do any of the things that make me feel valued

4. **Enjoyment and pleasure**
   - I can have all of the enjoyment and pleasure that I want
   - I can have a lot of the enjoyment and pleasure that I want
   - I can have a little of the enjoyment and pleasure that I want
   - I cannot have any of the enjoyment and pleasure that I want

5. **Independence**
   - I am able to be completely independent
   - I am able to be independent in many things
   - I am able to be independent in a few things
   - I am unable to be at all independent
A broader view of the value of vaccines

Fig. 1 A conceptual framework for pathways to the broader economic impact of vaccines. Boxes are shaded in colours corresponding to different major categories in Table 1

What is needed for investment?

<table>
<thead>
<tr>
<th>Setting</th>
<th>Key considerations</th>
<th>Type of analysis</th>
</tr>
</thead>
</table>
| High income    | • Cost-effectiveness  
• Disease complications, health and wellbeing  
• Economic productivity | • Impact modelling  
• Cost-effectiveness |
Based on reviews by Ott et al. (Human Vaccines & Immunotherapeutics 2013; 9:7) and Peasah et al. (Vaccine 2013; 31:5339). Costs reported in USD based on exchange rates at the time of analysis.
Key influential parameters in sensitivity analyses

- Country/setting$^{1,2}$
- Consultations for ILI$^1$
- Number of work days lost$^1$
- Hospitalisation costs$^3$
- Vaccine effectiveness$^3$

### Static models: data requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Status</th>
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</table>
| Vaccine effectiveness          | • Limited studies in LMICs\(^1\)  
• Affected by co-morbidities (HIV, malnutrition), seasonality, interactions with other pathogens (pneumococcus). |
| Vaccine uptake                 | • Distribution may not correspond to burden (inverse care law).                                                                        |
| Vaccine delivery costs         | • Non-traditional target group (no delivery via either EPI or schools).                                                                 |
| Health burden                 | • Most LMIC studies in children.                                                                                                       |
| Economic burden               | • Limited evidence (see later).                                                                                                         |

\(^1\)Breteler et al. Vaccine 2013; 31:5168
Burden of disease: economic costs

de Francisco et al. Vaccine 2015; 33:6537
Burden of disease: economic costs

Health care system costs
- Case management (hospitals, primary care)
- Drugs
- Health care systems (outbreak response, surveillance)

Societal costs
- Direct household expenses (transport, OTC drugs, out-of-pocket payments, informal care)
- Loss of productivity to patients and their carers

Broader economic costs
- Sectoral impact (agriculture, tourism)
- Foreign direct investment
- Distributional impact
- Antimicrobial resistance

Adapted from de Francisco et al. Vaccine 2015; 33:6537
Further studies needed using standard methods
Conclusions

- Health economic evaluations can capture a narrower or broader view of health and economic value depending on needs of decision makers.
- Economic evaluations of vaccination of older adults are lacking in LMICs.
- Data to inform these evaluations are also lacking, e.g.
  - Vaccine efficacy and effectiveness in LMIC populations
  - Vaccine uptake
  - Delivery costs to non-traditional age groups
  - Health and economic burden