Economic Evaluation of Healthcare Innovations

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Centre of Expertise Healthwise
Health (Care) Economics, Business, and Management
Jochen Mierau (j.o.mierau@rug.nl)
What is economic evaluation?

“the comparative analysis of alternative courses of action in terms of both their costs and consequences” Drummond (2005)

> The objective of economic evaluation is to compare the costs and effects between an existing and a new healthcare intervention:
  - The existing intervention can also be a policy of doing nothing – a common approach in (societal) cost benefit analysis.
Use of economic evaluation

To be reimbursed through the *Health Insurance Act (Zvw)*, new – evidence based – healthcare interventions or pharmaceutical products need to be shown to be cost effective using the guideline (*Richtlijn*) of the Dutch *National Health Care Institute (ZIN)*:

- Guideline stipulates state-of-art approaches to the measurement of costs and effects and provides guidance on the appropriate perspective and time frame of the evaluation.
- Guideline is updated frequently in consultation with leading health economists in the Netherlands.
Use of economic evaluation

> In deciding on healthcare purchasing, municipalities and other responsible authorities rely partially on (societal) cost-benefit analysis of available interventions.

  - The *Netherlands Bureau for Economic Policy Analysis (CPB)* provides a guideline (*Leidraad*) for performing (societal) cost-benefit analysis in general.
  - Currently domain-specific manuals (*Werkwijzers*) are being developed:
    - Social Domain was released recently.
## Types of economic evaluation

<table>
<thead>
<tr>
<th>Type of analysis</th>
<th>Measurement &amp; valuation of costs</th>
<th>Identification of consequences</th>
<th>Measurement &amp; valuation of consequences</th>
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<tbody>
<tr>
<td>Cost analysis (CA)</td>
<td>Monetary units</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Cost-effectiveness analysis (CEA)</td>
<td>Monetary units</td>
<td>Single effect of interest</td>
<td>Health outcomes</td>
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<td>Cost-utility analysis (CUA)</td>
<td>Monetary units</td>
<td>Single or multiple effects</td>
<td>Quality-adjusted life-years</td>
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<td>Cost-benefit analysis (CBA)</td>
<td>Monetary units</td>
<td>Single or multiple effects</td>
<td>Monetary units</td>
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</table>

- The choice of analysis depends on objectives, data availability and policy guidelines.
- Cost-utility analysis is the preferred method in the Netherlands.
- (Societal) Cost-benefit analysis is gaining ground but additional research is required.
Steps in economic evaluation: Determine perspective

› Patient perspective: Takes into account all costs and benefits accruing to the patient – including non-monetary costs such as suffering.

› Payer perspective: Takes the vantage point of the insurance company or whoever pays the bill – disregards non-priced services such as informal care.

› Societal perspective: Includes all society-wide monetary and non-monetary costs and benefits regardless of where and by whom they are received or paid – *preferred perspective*. 
Steps in economic evaluation: Costs

› Guidelines are generally accompanied by costing manuals, which indicate tariff prices for medical services.

› Costs arising due to decrease in labor force participation can be valued through foregone wages or the time it takes to replace a worker.

› Non-priced services such as informal care can be assessed through validated questionnaires such as the Care-related Quality of Life Instrument (CareQol).
Steps in economic evaluation: Costs

> Challenges:

- Costs outside the healthcare sector (e.g., education or criminal justice) are generally hard to assess.

- Prices used to assess costs can be sensitive to the intervention itself – if a disease is reduced due to the intervention, the cost of treatment may change.

- Future costs need to be discounted to today to make them comparable – the choice of discount rate matters crucially for this.
Steps in economic evaluation: Effects

- Cost Analysis: Outcomes are ignored.

- Cost-Effectiveness Analysis: Outcomes are measured in terms of health outcomes such as changes in blood pressure or improvement in self-sufficiency.

- Cost-Utility Analysis: Outcomes are measured with a common, non-disease specific, metric such as a Quality Adjusted Life Year (QALY).

- Cost-Benefit Analysis: A monetary value is attached to QALYs and added to other benefits.
Steps in economic evaluation: Effects

- QALYs are assessed using validated questionnaires such:
  - EuroQol EQ-5D-5L is the preferred Dutch option.
  - Administered using a survey.
  - Survey responses are combined to provide a score between 1 (perfect health) and 0 (death.)
Steps in economic evaluation: Effects

> Challenges:

  - The preferred EQ-5D-5L tool is mainly aimed at adults:
    - Questionnaires for children, especially very young ones, currently don’t exist.
    - Questionnaires for individuals in care facilities are currently being developed and tested (e.g., ICECAP-O and ASCOT).
  - Conversion of QALYs into monetary units is controversial:
    - There is no official Dutch conversion rate – values between € 20,000 and 200,000 have been suggested.
Steps in economic evaluation: Compare costs and effects

Let costs be $C_O$ be the costs of the existing intervention and $C_A$ that of the new one.

1. The change in costs is then given by:
   
   $C_A - C_O$

2. Similarly the change in the effectiveness is given by:
   
   $E_A - E_O$

3. Combining the two gives the Incremental Cost Effectiveness Ratio:
   
   \[
   ICER = \frac{C_A - C_O}{E_A - E_O}
   \]

   ...indicates the costs required to achieve an additional unit of the desired effect.
Steps in economic evaluation: Compare costs and effects

Figure 1: Comparing an existing intervention (O) to its alternative (A) in terms of cost and effect allows us to draw a cost-effectiveness plane.
Steps in economic evaluation: Compare costs and effects

› In a societal cost benefit analysis effects are monetarized:
  - ...allows us to determine the cost-benefit balance,
    - ...positive indicates a gain, negative a loss.

› Often not all benefits can be measured or monetarized properly:
  - ...in that case a reciprocal cost-benefit analysis can help,
  - ...it indicates how much value we would have to attach to a non-measured concept for the balance to be positive.
Evaluating system innovations

› The economic evaluation toolbox is optimized for single interventions in clinical settings:
  • ...many current healthcare innovations are outside the clinical setting and involve multiple interventions at once.

› How to determine the “clinical effect”?  
  • ...use observational data in combination with econometric techniques.

› How to determine the economic effect?  
  • ...feed the clinical effect into a simulation model.
Summary

“the comparative analysis of alternative courses of action in terms of both their costs and consequences” Drummond (2005)

› Used for reimbursement and procurement decisions.
› Different options: Cost Analysis, Cost Effectiveness Analysis, Cost Utility Analysis, Cost Benefit Analysis.
› Requires explicit choice of perspective.
› Identify costs and benefits in line with perspective using validated methods to determine the Incremental Cost Effectiveness Ratio.
› Be aware of the challenges!
Further reading


› CPB (2013) *Algemene leidraad voor maatschappelijke kosten-batenanalyse*.