Cost-effectiveness analysis and budget impact assessment: a graphical way to combine the two for the aid of decision makers

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Introduction

• Many health care decision makers consider both cost-effectiveness analysis (CEA) and budget impact assessment (BIA)
• However, these are usually considered separately and it is the job of the decision making committee to implicitly make the necessary trade-offs between the two
• By combining these we make the trade-offs explicit in order to aid decision makers
Example

- **Oncotype DX** is a gene expression profiling assay for early-stage breast cancer
- We conducted a **CEA** and **BIA** for the Ontario Health Technology Advisory Committee
- CEA and BIA were presented separately
- CEA results: $\Delta C=3505, \Delta E=0.22$ QALYs
  ICER=$15,932$ per QALY
- BIA estimate: $N=3825$ per year
  Budget impact $\$4m$ per year
What actually is budget impact?

- Defined by a recent ISPOR task force as:
  - “… the financial consequences of adoption and diffusion of a new health-care intervention within a specific health-care setting or system context given inevitable resource constraints.”
- But what are “financial consequences”?
- To understand the “consequences” of adoption we must consider opportunity cost
- Critical question: is the budget fixed?
**Fixed vs flexible health budgets**

- If the budget is **perfectly fixed**, adoption displaces other technologies, resulting in *forgone health* elsewhere in the system.
- “Health” rather than *financial* consequence.
- By definition there is **no budget impact**.
- If the budget is **perfectly flexible**, adoption results in a budget impact of $\Delta C \times N$.
- If the budget is **partially fixed**, adoption results in budget impact *and* forgone health.
How much *health* is forgone?

- When the budget is perfectly or partially *fixed*, any costs falling within the budget will *displace* other technologies, resulting in *forgone health* elsewhere in the system.
- To estimate this we need an estimate of the *shadow price of the budget*, denoted by $k$.
- Efforts underway in the UK to estimate $k$.
- Dividing the costs that fall within the budget by $k$ gives us the *health forgone*.
Is the budget impact worth it?

• When the budget is perfectly or partially flexible, any costs resulting in an expansion of the budget will ultimately fall on other sectors and/or taxpayers.

• We need an estimate of the amount of cost the decision maker is willing to impose on other sectors and/or taxpayers in order to gain a QALY within the health system.

• We denote this as $m$ (distinct from $k$).
Example: *perfectly fixed* budget

- $\Delta C = $3505, $\Delta E = 0.22$ QALYs, $N = 3825$
- If the budget is *perfectly fixed*, adopting Oncotype DX has *no impact on the budget*.
- There is a *direct health benefit* of $0.22 \times 3835 = 842$ QALYs but an *indirect health loss* since $3505 \times 3825 = 13.4$m will fall on the budget and displace other health.
- Critical question: does the direct health benefit exceed the indirect health loss?
Example: *perfectly flexible* budget

- $\Delta C = $3505, $\Delta E = 0.22$ QALYs, $N = 3825$
- If the budget is *perfectly flexible*, adopting Oncotype DX results in a budget impact of $3505 \times 3825 = $13.4m
- Again there is a *direct health benefit* of 842 QALYs but *no indirect health loss* since no other technologies need to be displaced
- Critical question: is the gain of 842 QALYs worth increasing the budget by $13.4m?
Example: *partially fixed* budget

- $\Delta C = 3505, \Delta E = 0.22$ QALYs, $N = 3825$
- If the budget is *partially fixed*, adopting Oncotype DX results in a budget impact of somewhere between $0$ and $13.4m$
- There is a *direct health gain* of 842 QALYs but an *indirect health loss* since the remaining costs will fall within the budget
- Critical question: is the *net* health gain worth the increase in the budget?
Net budget impact (millions) vs. Net health benefit (QALYs)

Fixed Budget

Flexible Budget

m=$100k, m=$50k

k=$20k, k=$100k
Summary

• A single graph can simultaneously display net health gain and budget impact across a range of plausible values of $k$ and $m$ and for all possible degrees of budget fixity

• Only $\Delta C$, $\Delta E$ and $N$ need to be known

• Interpreted in exactly the same way as the familiar cost-effectiveness (CE) plane

• Can instantaneously show whether or not an adoption decision justifies its budget impact
Thank you!

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