Panel Session 1
Background: QALYs and Thresholds

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Outline

• What is a threshold?
• What is a QALY?
• How does it relate to WTP?
  – Must relate to preferences
• How does it relate to Opportunity cost of health care?
  – Must relate to health benefit derived
• How are either related to thresholds?
Incremental cost-effectiveness ratio (ICER)

\[ \text{ICER} = \frac{\Delta \text{costs}}{\Delta \text{effectiveness}} = \frac{\text{Cost}_{\text{int}} - \text{Cost}_{\text{comp}}}{\text{Eff}_{\text{int}} - \text{Eff}_{\text{comp}}} \]

- Higher ICERs indicate lower cost-effectiveness
- But what does this ICER tell the decision makers?
- A new intervention is found to be more effective and more expensive but.....
- It is necessary to have further information to determine whether society considers this additional benefit to be worth the additional cost involved

- To do this, an external value system is needed - something to compare the ICER to:
  - ‘Cut-off point’, ‘ceiling value’, threshold (λ) for the ICER
  - λ represents the maximum amount society is willing to pay for a unit increase in health benefits (maximum price (WTP) or shadow price of a unit increase in the health benefits)

\[ \text{ICER} = \frac{\text{Cost}_{\text{int}} - \text{Cost}_{\text{comp}}}{\text{Eff}_{\text{int}} - \text{Eff}_{\text{comp}}} < \lambda \]

QALYs & WTP (Broome, 1993)

- Fairly well known that QALYs find it difficult to meet the axioms of expected utility
- Broome (1993) picks up on a number of issues
- Discounting implies separability
  - Where \( v \) are value functions measuring good/benefit of each \( q \)
  - Separability can hold if individual risk-neutral
- Then we get the EU function

\[ E[u(V(q_1, q_2, \ldots, q_n))] = E[u(r(q_1)] + r(q_2) + \ldots + r(q_n)] \]

- Note that the EUs \([u(.\ldots)]\) are attached to the \( v(.)s \) and it is the \( v(.)s \) that are additively separable
  - And therefore linearly transformable and therefore *cardinal* measures
  - It is NOT the “q”s (the quality of life measures) that are cardinal measures
- He reconciles by introducing goodness or benefit measures of “q”

\[ D(q_1, q_2, \ldots, q_y) = g(q_1) + \rho_1 g(q_1) + \ldots + \rho_y g(q_y) \]

\( p = \) discount rate
QALYs & WTP (Broome, 1993)

- So the $g(.)$ & $v(.)$ functions are related through some transformation
- The QALY [$v(.)$] is some transform of the good/benefit [$g(.)$] function
- QALYs assign values to these “states of health” but are determined by how people feel in these states of health, their preferences or by some objective principle
- We simply do not know how QALYs relate to preferences
- Moreover in adjudicating across individuals we need additional weights
- Difficult to come by if we do not know the $v(.)$ to $g(.)$ transform
- Basically QALYs cannot easily be related to WTP and require additional information to represent “societal” values
- Could relate to value of a statistical life – but really?

The Cost Effectiveness (WTP) Threshold and how NICE works it out

Source: Cookson, 2007

Plus end of life threshold?
£50,000 per QALY

Cost utility (cost per QALY)
QALYs and opportunity cost

- QALYs can be taken as value to individual of state of health as it relates to health benefit
- Easier jump to make that any “valuation” can be made on a revealed preference basis
- Value of the opportunity cost of resources currently devoted to producing a health state
- Assumes “rationality” in decision making
QALYs and opportunity cost

• In England approach to take QALYs = f(health expenditure)
• Martin et al (2008), Klaxton (2013)
• Essentially QALYs related to 23 programme budget areas within the NHS
• Econometrically derived
• Say essentially
  \[ H_{ij} = \alpha + \beta x_{ij} + \phi n_{ij} + \epsilon_{ij} \] (with a related expenditure equation)
• H=QALY; x=expenditure; n=population health needs
• Still being worked on
  – Data (needs, QALY conversions, assigning “overheads”, etc etc)
  – Endogeneity issues
  – IV estimates
  – Essential equations based on mortality changes converted into LYG, then QALYs
• But first systematic attempt to produce opportunity cost based QALY thresholds
• Lots of estimates based on various assumptions

QALYs and opportunity cost

• Estimated for 23 programme budget areas
  – Give different values
  – Inefficient or Inconsistent?
  – Or diseases weighted differently?
• Could pick any number of estimates
• Let’s take the median after a number of adjustments to be £10,378 per QALY
• Tested for model & parameter uncertainty
• Relatively stable
  – Well below current threshold
  – Correct?

Source: Claxton et al, 2013
Conclusions

• QALY difficult to define formally as a preference
• Therefore difficult to define as WTP
• Could be under a number of assumptions
• QALY must have an opportunity cost
• Difficulties in measuring this
• In both case societal weights required

**Conclusion**

\[
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