Cost-Effectiveness Thresholds

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Outline

• What is the threshold?
• What should the threshold represent (in principle)?
• How can the NICE threshold be estimated (in practice)?
• Should the NICE threshold change?
System objectives

• Maximise some form of health benefit (e.g. QALY) subject to a budget constraint
• No budget constraint – budget always expand to fund treatments which offer health benefits reaching a particular social value. Does such a system exist?
What is the threshold?

Same concept again

Standard decision rule: $\Delta C / \Delta E < \lambda$
$\Delta C / \Delta E = \text{incremental cost-effectiveness ratio (ICER)}$
$\lambda = \text{cost-effectiveness threshold}$

Rearrange to get:

- Net health benefit (NHB) = $\Delta E - (\Delta C / \lambda)$

e.g.
- Additional treatment costs: £60,000
- Additional QALYs: 4
- ICER = £15,000
- NHB = 1
What should the threshold represent in the NHS (in principle)?

• In principle, it is the ICER of the least cost-effective intervention currently funded
• Such programmes should be forced out by more cost-effective options
• But the threshold will vary:
  – By budget impact
  – Across localities
• What should be displaced is not what is displaced
  – Major information challenge of finding least cost-effective
  – NICE should provide greater input into disinvestment decisions
  – A range of constraints to disinvestment: political and economic
Empirical estimates of the threshold

- Past decisions by NICE
- Social willingness to pay
- Value of health used elsewhere in the public sector
- Data from the NHS on cost-effectiveness of existing services
What NICE says about the threshold value

Below a most plausible ICER of £20,000 per QALY gained, the decision to recommend the use of a technology is normally based on the cost-effectiveness estimate and the acceptability of a technology as an effective use of NHS resources. When the estimated ICERs presented are less than £20,000 per QALY gained and the Committee judges that particular interventions should **not** be provided by the NHS, the recommendations will make specific reference to the Committee’s view on the plausibility of the inputs to the economic modelling and/or the certainty around the estimated ICER. …

Above a most plausible ICER of £20,000 per QALY gained, judgements about the acceptability of the technology as an effective use of NHS resources will specifically take account of the following factors.

- The degree of certainty around the ICER
- …. the change in HRQL has been inadequately captured
- The innovative nature of the technology

Basing the threshold on past decisions

![Graph showing probabilistic cost-effectiveness thresholds for NICE decisions](image)

*Figure 5. Probabilistic cost-effectiveness thresholds for NICE decisions*

A societal willingness to pay

- A number of empirical studies on ‘social valuation’ of health against consumption
  - Revealed preference
  - Stated preference: contingent valuation, conjoint methods
- Some studies estimating social value of the QALY
- Could be used to compare with an ICER when no budget constraint
- If budget constraint, then these values do not replace the threshold
  - Health gained and health displaced valued in same way
  - Still need a threshold reflecting the value of what is displaced
Value of health from other sectors

• The value of a statistical life is used in the UK to inform transport investment decisions
• Also considered by other sectors (e.g. environment)
• These values are based on contingent valuation exercises
• In principle could be generalised to QALYs
• Tend to imply a higher valuation of health than NICE
• Suggestion that government should strive to fund sectors to achieve this value
  – Other sectors have objectives other than health gain
  – Budgets reflect government valuation of other objectives
Using data on existing NHS services

What is actually displaced?

<table>
<thead>
<tr>
<th>Service area</th>
<th>Nature of decision</th>
<th>CQG</th>
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<tbody>
<tr>
<td>1. Hysterectomy for heavy menstrual bleeding</td>
<td>Discontinued</td>
<td>No relevant CQG as surgical option dominated by alternative pharmaceutical interventions</td>
</tr>
<tr>
<td>2. Surgery for mild/moderate Varicose veins</td>
<td>Discontinued</td>
<td>No relevant CQG as implication that ‘mild/moderate’ dominated by alternatives of conservative management and sclerotherapy. However, decision implies continuation for ‘severe’ varicose veins, at a reported CQG of £1,996</td>
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<tr>
<td>3. Cochlear implants</td>
<td>Introduced</td>
<td>Reported CQG: £10,341</td>
</tr>
<tr>
<td>4. ‘Routine’ inguinal hernia repair</td>
<td>Discontinued/‘managed access’</td>
<td>Detailed nature of restriction unclear. Unable to estimate CPQG.</td>
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<tr>
<td>5. Cataract surgery for patients with good visual acuity</td>
<td>Discontinued</td>
<td>This intervention for 'good visual acuity' (presumed to be 6/12) dominated, therefore no CQG can be calculated</td>
</tr>
<tr>
<td>6. Cholecystectomy for non-symptomatic gallstones</td>
<td>Discontinued</td>
<td>Clinical consensus that intervention confers no clinical benefit. Intervention dominated and hence no CQG can be calculated</td>
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<tr>
<td>7. Chlamydia screening</td>
<td>Deferred</td>
<td>No clear evidence on CQG, 'widely believed to be very cost effective'</td>
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<tr>
<td>8. Carotid endarterectomy for asymptomatic carotid stenosis</td>
<td>Possible discontinuation/’managed access’</td>
<td>Weak evidence, but CQG could be in the range: £5,000 to £30,000</td>
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<tr>
<td>9. Cognitive therapy for management of chronic pain</td>
<td>Possible discontinuation/’managed access’</td>
<td>UK evidence lacking; no reasonable estimate of CQG could be made</td>
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</table>

Using data on existing NHS services

Difficulties of Appleby et al study

• Local decision makers mainly consider technical efficiency rather than cost-effectiveness
• Budget impact (irrespective of cost-effectiveness) used
• Some decisions involve trade-off between added costs and benefits, but quite rare
• Not clear whether the sample of decisions was complete
Estimating the threshold from aggregate data

Cost per life year saved

- Based on NHS programme budgets and mortality rates
- Econometric modelling to control for medical need
- Modelling variation between PCTs
- £ 15,387 for cancer (£19,070 per QALY)
- £ 9,974 for circulation problems (£11,690 per QALY)
- £ 5,425 for respiratory problems
- £ 21,538 for gastro-intestinal problems
- £ 26,428 for diabetes

Should the threshold be changed?

• Pressure to increase because of increased NHS budget and inflation
• Considerable uncertainty regarding whether existing threshold correct
• But change will depend on budget, uses of budget and NHS productivity
  – Much additional budget spent on things not easily displaced (e.g. GP salaries)
  – Gains in productivity (e.g. generic drugs, new innovation) bring threshold down if greater than budget increase
  – NICE can drive threshold down (if services displaces less cost-effective)
  – Prices of potentially displaced services may not increase (e.g. use of generics)
Conclusions

• Any system with a budget constraint needs to define a threshold
• Reasonably clear about principles of what the threshold is and should represent
• Much more uncertainty about its empirical value
• Need more research to estimate its value and how it will change over time