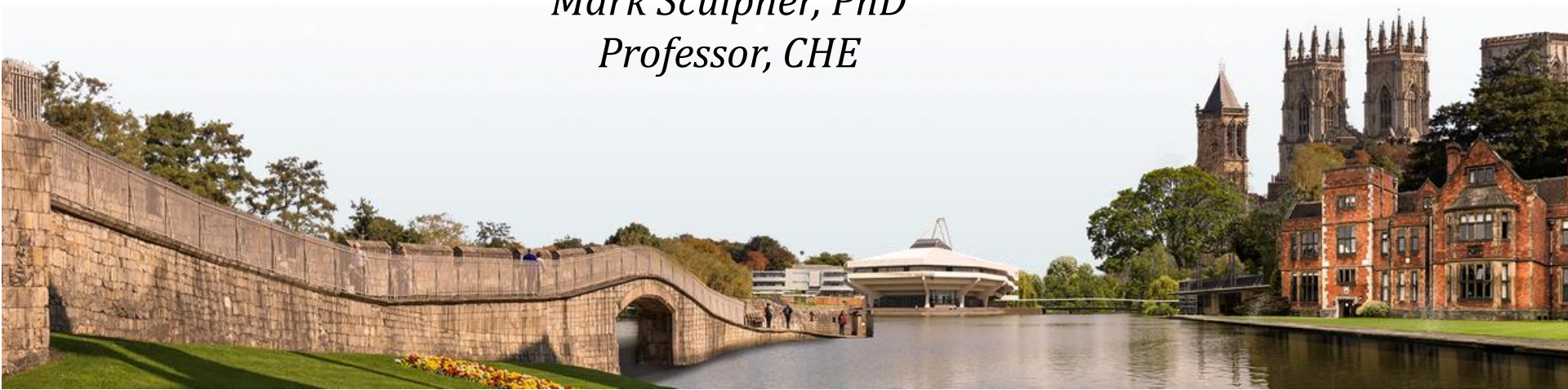
Online Advanced Methods for Cost-Effectiveness Analysis

Presentation 1: Analytical Starting Points
1.4: Net benefits

Mark Sculpher, PhD
Professor, CHE



Objectives

- Distinguish key features of ICERs and net benefits
- Understand net health benefits versus net monetary benefits
- Clarity about the calculation of net benefits
- Appreciate the advantages of ICERs and net benefits

Moving from the ICER to net benefit

- ‘Threshold’ based on opportunity cost can and should define value of health outcome
- Standard ICER decision rule:

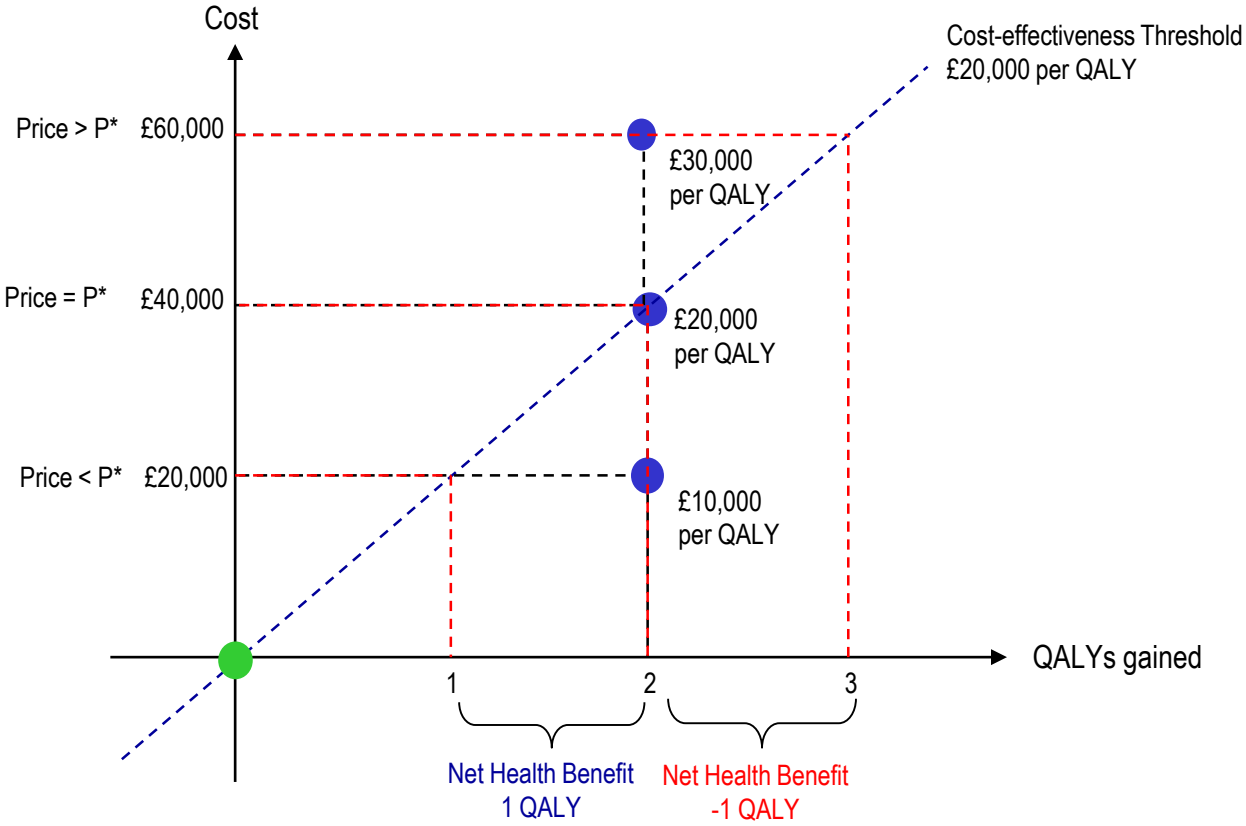
  $\Delta C/\Delta E < k$

  Where k is the threshold
- Net health benefit:

  $\Delta E – (\Delta C/ k) > 0$
- Net monetary benefit:

  $(\Delta E \times k) – \Delta C > 0$

Cost-effectiveness and net health benefit



Claxton *et al*. *British Medical Journal* 2008; 336: 251-4

Net health and net monetary benefit

Incremental cost-effectiveness ratio (ICER): $\frac{\bar{C}_1 - \bar{C}_0}{\bar{E}_1 - \bar{E}_0} = \frac{\Delta C}{\Delta \mathrm{E}}$

	Net health benefits	Net monetary benefits
Individual patient level	$NHB_i = E_i - \frac{C_i}{k}$	$NMB_i = (E_i \times k) - C_i$
Expected net benefit	$\Delta NHB = \Delta \mathrm{E} - \frac{\Delta C}{k}$	$\Delta NMB = (\Delta \mathrm{E} \times k) - \Delta C$

k is the cost-effectiveness ratio based on an estimate of opportunity cost

From individual to expected net health

Average ratios have no meaning

$$\frac{\bar{C}_1}{\bar{E}_1} - \frac{\bar{C}_0}{\bar{E}_0} \neq \frac{\bar{C}_1 - \bar{C}_0}{\bar{E}_1 - \bar{E}_0}$$

Average net benefits have a useful property:

$$NHB_1 - NHB_0 = (\bar{E}_1 - \frac{\bar{C}_1}{k}) - (\bar{E}_0 - \frac{\bar{C}_0}{k})$$

$$= (\bar{E}_1 - \bar{E}_0) - \frac{(\bar{C}_1 - \bar{C}_0)}{k}$$

$$= \Delta\bar{E} - \frac{\Delta\bar{C}}{k}$$

$$= \Delta\overline{NHB}$$

Net health benefits

Treatment of HIV				
Option	Costs	Effects	ΔC/ΔE	NHB*
A	30,000	25	-	13.9
B	56,000	40	1,733	19.3
C	78,000	42	ID	13.1
D	115,000	62	2,682	19.4
E	150,000	74	2,917	18.4

* Expected net health benefit for each option using a threshold = 2700

ICERs versus net benefits

Advantages of ICERs

- Can provide analysis when threshold unknown
- Avoids unrealistic thresholds being hidden in net benefits
- Rapid reassessment of cost-effective option with new threshold
- May be more intuitive

Advantages of net benefits

- Single most cost-effective option clear
- No problems with dominance and extended dominance
- Strategies can be ranked by cost-effectiveness
- Magnitude by which one option is more cost-effective than another can be shown
- Change in cost-effectiveness following sensitivity analysis clear
- Statistical advantages

Paulden, *Pharmacoeconomics* 2020; 38:785–807
O'Mahoney, *Pharmacoeconomics* 2020; 38:777–779

Summary

- ICERs widely used by decision making bodies to report cost-effectiveness
- They can be challenging to use
- Net health and net monetary benefits have some potential advantages
- Need to be able to understand these different metrics