UNIVERSITY of York RESEARCH

CHE Centre For Health Economics

Online Advanced Methods for Cost-Effectiveness Analysis

Presentation 5: Working with Individual Patient Data

5.4: Representing the results of the analysis

Andrea Manca, PhD
Professor, CHE

Objectives

- Learn (how) to
  - derive mean and confidence interval for the Net (Monetary) Benefits (NB)
  - represent (and interpret) the Net Benefits results for a range of λ
  - explain the relationship between net monetary benefits and acceptability curve
  - communicate the results to decision makers

Net Benefit Framework

Remember we have seen this before in Lecture 1.4

- One possibility is to reformulate the traditional decisional rule in terms of *Net Benefit* $= (\Delta E)\lambda - (\Delta C) > 0$

- Easy to calculate, to represent and it avoids problems with the ICER

- NB is function of the unknown value λ
  - Not necessarily a weakness of this approach
  - Forced to explicitly consider the value λ

The NB is a….
… linear combination of two random variables

- Remember A and B from earlier slide?
- We know that A and B have a mean and a variance
- If A and B are uncorrelated:
  - VAR (A+B)=VAR(A) + VAR(B)
- If A and B are correlated:
  - VAR (A+B)=VAR(A) + VAR(B) – 2 COV(A,B)
- Applying this logic to the net benefit formulas from the previous slide gives…..

Sampling Uncertainty in the Net Benefit

- If NB=λΔE-ΔC → let A=λΔE and B=ΔC, then
- The variance of the net benefit can be obtained as

$$Var(N\hat{M}B) = \underbrace{\lambda^2 \cdot Var(\Delta\bar{E})}_{\text{Var(A)}} + \underbrace{Var(\Delta\bar{C})}_{\text{Var(B)}} - 2\lambda \underbrace{Cov(\Delta\bar{E}, \Delta\bar{C})}_{\text{Cov(A,B)}}$$

or

$$Var(N\hat{H}B) = Var(\Delta\bar{E}) + \frac{Var(\Delta\bar{C})}{\lambda^2} - \frac{2}{\lambda} Cov(\Delta\bar{E}, \Delta\bar{C})$$

- We can also calculate the 95% (parametric) CI as

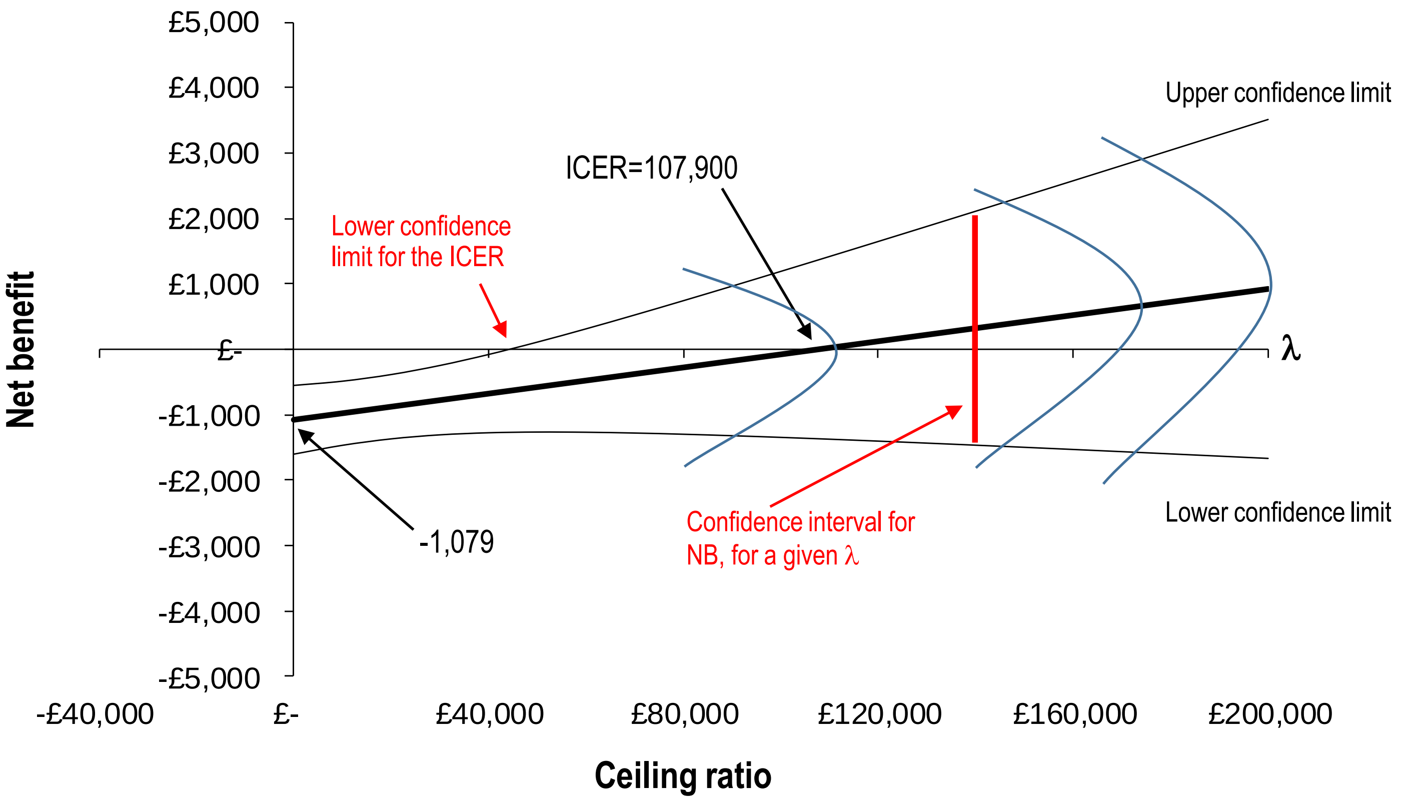
$$\left(N\bar{M}B - z_{\alpha/2} \cdot SE(N\bar{M}B), N\bar{M}B + z_{\alpha/2} \cdot SE(N\bar{M}B) \right)$$

or

$$\left(N\bar{H}B - z_{\alpha/2} \cdot SE(N\bar{H}B), N\bar{H}B + z_{\alpha/2} \cdot SE(N\bar{H}B) \right)$$

Net Benefit curve

ΔC=1,079 , SE(ΔC)=269 , ΔE=0.01 , SE(ΔE)=0.007 , COV(ΔC, ΔE)=0.38



Net Benefit line: facts

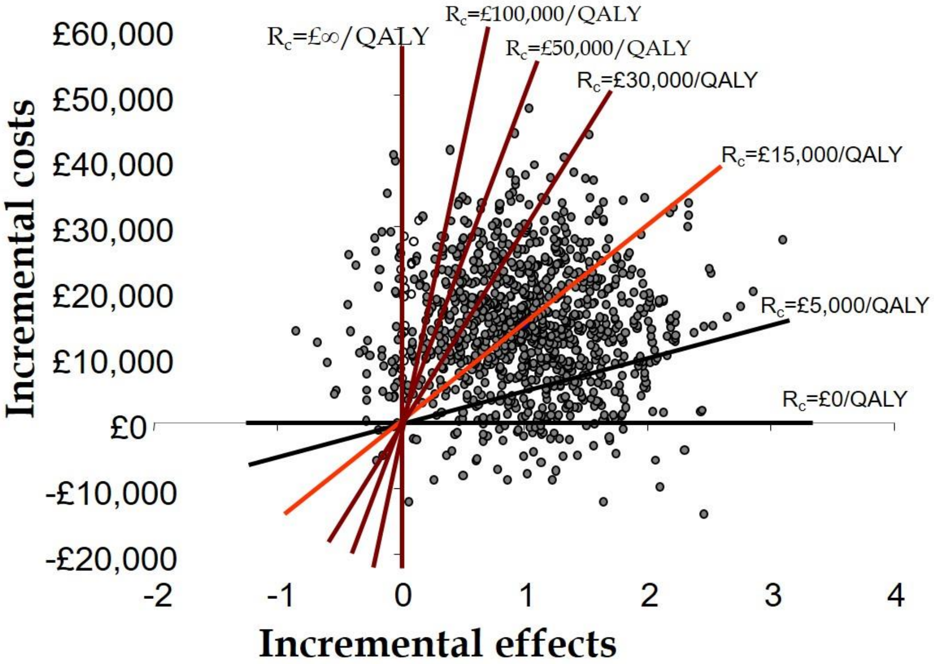
- It is linear with respect to λ
- It crosses the x-axes at the value of λ = ICER
- It crosses the y-axes at *minus* the difference in costs
- Can present CIs plot around the NB line (and ICER !)
  - Can see if upper or lower confidence limit is defined
- It is more informative than a simple ICER with CIs and can immediately give the necessary information for the decision making process

Representing decision uncertainty

- The value of λ is unknown to the analyst so
- An attractive solution to represent decision uncertainty in CEA is the use of the
    - *cost-effectiveness acceptability curve* (*CEAC*)

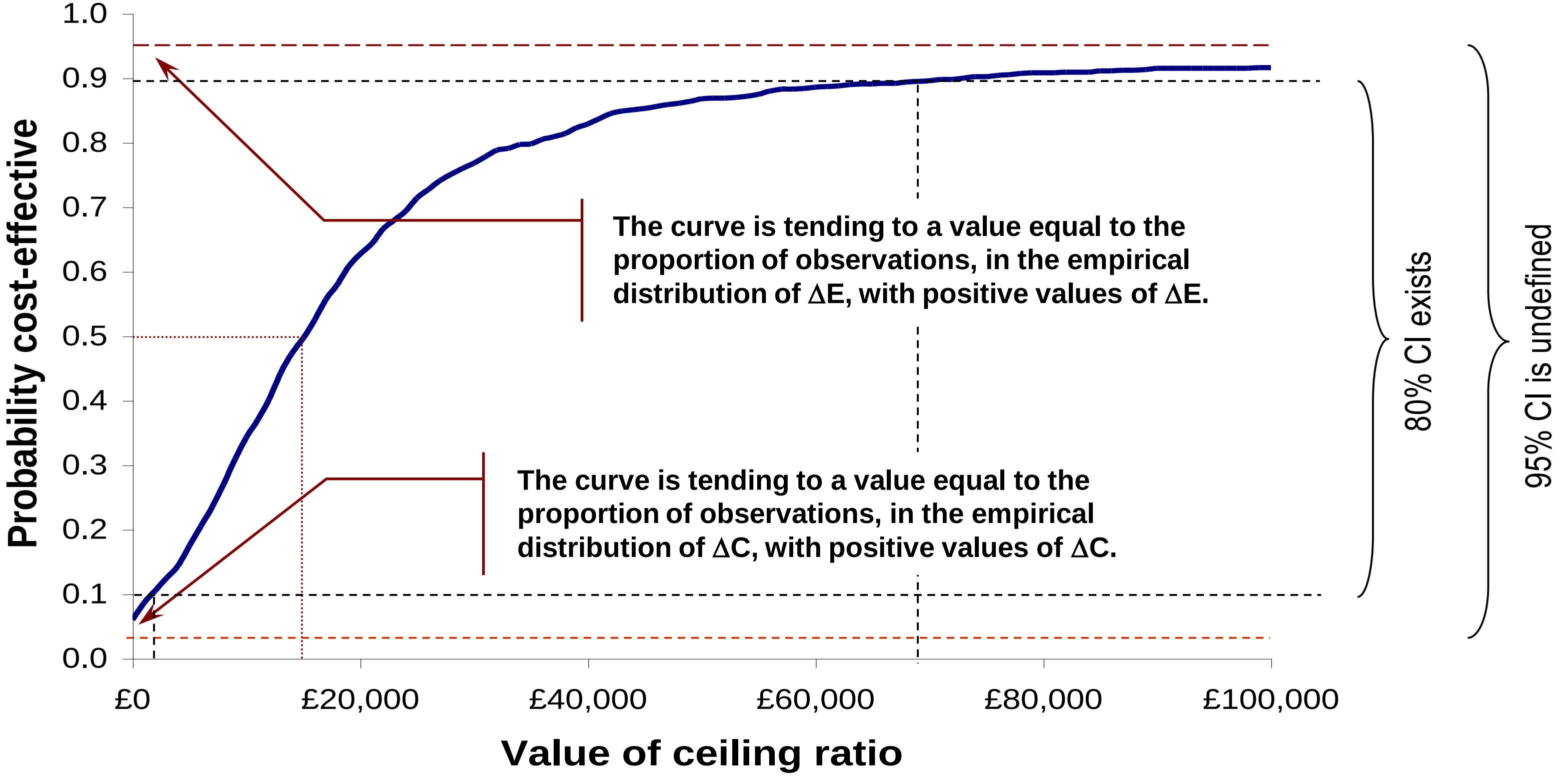
Probability that the new intervention is cost-effective for different values of λ, given the available data

Building the CEAC



Source: Briggs (2001)

Cost-effectiveness acceptability curve



Source: Adapted from Briggs (2001)

EVALUATE trial: Cost results

One year results. Values in table are mean (median) [IQR]

	Laparoscopic (N=573)	Abdominal (N=286)
Theatre cost	787 (646) [523-890]	453 (431) [381-489]
Hospital cost	548 (542) [407-678]	692 (678) [542-813]
Other post.op. cost	21 (0) [0-0]	13 (0) [0-0]
Follow up cost at 6 weeks	193 (46) [0-108]	128 (46) [0-108]
Follow up cost at 4 months	39 (0) [0-46]	88 (0) [0-46]
Follow up cost at 1 year	115 (46) [0-46]	146 (46) [0-46]
Total cost	**1706**	**1520**
Differential cost (95% CI)	***188 (-26 to 375)***	

Source: Sculpher MJ, Manca A, *et al.* (2004)

EVALUATE trial: EQ-5D and QALYs results

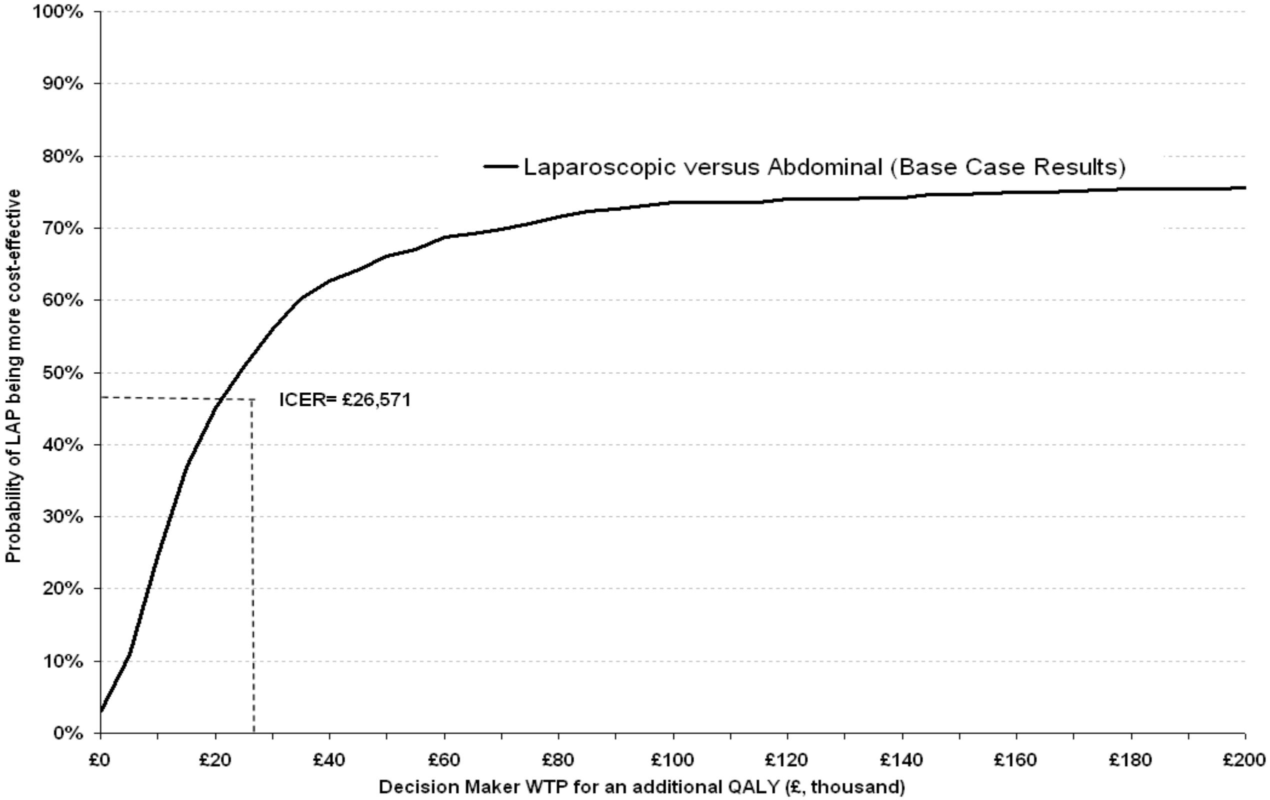
One year results. Values in table are mean (median) [IQR]

	Laparoscopic (N=573)	Abdominal (N=286)
Baseline	0.716 (0.760) [0.691-0.848]	0.690 (0.725) [0.689-0.812]
6 weeks	0.832 (0.869) [0.760-1]	0.833 (0.889) [0.760-1]
4 months	0.888 (0.959) [0.812-1]	0.866 (0.888) [0.796-1]
1 year	0.897 (0.929) [0.848-1]	0.897 (0.959) [0.822-1]
QALY	**0.870**	**0.862**

Differential QALYs (95% CI) ***0.007 (-0.008 to 0.023)***

Source: Sculpher MJ, Manca A, *et al.* (2004)

CEACs in the EVALUATE trial



Source: Sculpher MJ, Manca A, *et al.* (2004)

Summary

- An alternative to represent the result of an economic evaluation study is to frame the analysis in terms of net benefits

- There are several analytical advantages when using this numeraire over the ICER

- It is also a lot easier to communicate the results to decision makers using a net benefit framework