Comparison of Costs and Effects

- Cost-effectiveness ratios
  \[ \frac{C}{Q} \]

- Net monetary benefit
  \[ R_c Q - C \]
  where \( R_c \) equals willingness to pay

Were Costs and Effects Compared?

- Yes: 34%
- No: 66%

N = 115

CER or NMB?

- C/YOLS or C/QALY: 25%
- C/Other: 67%
- NMB: 8%

Sampling Uncertainty

- Point estimates of observed cost / effect differences are the result of a single sample drawn from a population
- Had one drawn a different sample, one would have obtained different point estimates
- Data from the current sample provide a measure of the precision of the estimates in the light of sampling uncertainty
Methods for Quantifying Sampling Uncertainty for Cost-effectiveness Analysis

- Confidence interval for cost-effectiveness ratio
- Confidence interval for NMB
- Acceptability curve

CI for Cost-Effectiveness Ratios

- Confidence limits for cost-effectiveness ratios are defined by lines through the origin that each exclude \( \alpha/2 \) of the distribution of the difference in costs and effects (e.g., \( \alpha/2 \) of the distribution falls to the right and below the dashed and solid lower limit line)
- CL for CER represent NMB limits for the willingness to pay value represented by the CI

Policy Inferences, CI For CER

1) Confident B cost-effective compared to A
   \[
   \begin{align*}
   &\text{28,300} &\text{245,200} \\
   &\infty &\infty \\
   &\text{Maximum} &\text{WTP}
   \end{align*}
   \]

2) Not confident A differs from B
   \[
   \begin{align*}
   &\text{28,300} &\text{245,200} \\
   &\infty &\infty \\
   &\text{Maximum} &\text{WTP}
   \end{align*}
   \]

3) Confident A cost-effective compared to B
   \[
   \begin{align*}
   &\text{28,300} &\text{245,200} \\
   &\infty &\infty \\
   &\text{Maximum} &\text{WTP}
   \end{align*}
   \]
Conceptualizing a Confidence Interval for NMB

- What conclusions would you draw about one's maximum willingness to pay and one's confidence in adopting or rejecting drugs A and B?

Acceptability Curves

- Plotting the proportion of the distribution of the difference in costs and effects that is acceptable as a function of willingness to pay results in what is referred to as the cost-effectiveness acceptability curve

Was Sampling Uncertainty Measured?

- Yes 62
- No 36

N = 39
Are We Paying Attention

- In a recent study, authors reported a difference in costs of 449 Euros; a difference in YOLS of 0.04; and a cost per YOLS ratio of 11,225 Euros
- They also reported the following acceptability curve:

CI for Cost-Effectiveness Ratios

- They concluded as follows:
  "The predicted cost-effectiveness ratios were well below the threshold values generally considered cost-effective. Adding clopidogrel to aspirin appeared to be cost-effective in this model analysis of patients with unstable CAD undergoing PCI in Sweden."
- Do you agree?
Acceptability Curve Ignored

- The acceptability curve indicates:
  - The observed cost difference has a $p \approx 0.2$ (two-tailed)
  - The observed YOLS difference has a $p \approx 0.4$
  - It is unlikely that one can be more than 40% to 60% confident that the therapies differ from one another

Simulated Acceptability Curve

Simulated Distribution

Conclusion

- The number of clinical trial-based economic evaluations has increased considerably over the last decade
- During this same period, the methodologies for analysis and reporting of cost data collected alongside clinical trials has improved
Conclusion

• Comparison of our findings with those of Barber and Thompson’s (1997) suggests improvement over time in certain areas
  – Studies performing a statistical test for the difference in cost:
    53% in 1995; 82% in 2003
  • Studies performing non-parametric bootstrapping
    0% in 1995; 20% in 2003
  – Studies reporting an ICER
    10% in 1995; 30% in 2003
  • Studies reporting sampling uncertainty:
    0% in 1995; 50%+ in 2003

Conclusions

• However, our review reveals that concerns remain about the quality of the statistical methods in recent clinical-trial based economic studies
• Furthermore, we only evaluated specific statistical methods used for the analysis and reporting of cost data; other design and analysis issues may pose additional threats
• The ISPOR RCT-CEA Task force guidance document represents one of the many efforts that will be required to improve the quality and consistency of future studies.