
EA Address
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Concerns?
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Can Cost-effectiveness Analysis Address Vertical Equity Concerns?

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Main messages

- Policy makers are interested in vertical equity
- Not many CEAs/HTAs incorporate vertical equity concerns
- Special weights are needed to do this
- NBRF automatically creates these weights

Introduction

- Decisions using economic evaluations involve comparing the incremental cost-effectiveness ratio (ICER) to societal willingness to pay (λ).
- Traditionally, analyses have used a single value of λ; however, decision makers may wish to use λ values that vary across groups.
  - Social justice concerns about equity or fairness
    - E.g., UK

Objectives

- We illustrate how analyses can use λ's that are group-specific using the net benefit regression framework (NBRF)[1].
  - E.g., $\lambda_{age \geq 65} \neq \lambda_{age < 65}$ or $\lambda_{\text{♂}} \neq \lambda_{\text{♀}}$
  - Or, $\lambda_{\text{♀}} \neq \lambda_{\text{👪}} \neq \lambda_{\text{🎗}} \neq \lambda_{\text{🚭}} \neq \lambda_{\text{👽}}$?
- NBRF produces the correct weights
  - The weights are equivalent to those made using another formula.

For more information about the net benefit regression framework see reference #1; for more on the net benefit, see refs #2 and #3.

Our Assumptions

- Decision makers (DMs) want different λ's.
- DMs are constrained $\Rightarrow$ can't discriminate.
  - DMs must decide about funding the intervention in its entirety (ie, unable to fund the program for only some groups).
- Analysts should provide results to assist DMs in making optimal societal decisions.

Example

	Group A (n=100)	Group B (n=100)	Overall (n=200)
Extra Cost (ΔC)	$20,000	$20,000	$20,000
Extra Effect (ΔE)	1 / 7 QALYs	3 / 7 QALYs	2 / 7 QALYs
ICER ($\Delta C/\Delta E$)	$140k / QALY	$47k / QALY	$70k / QALY

Example, continued

	Group A (n=100)	Group B (n=100)	Overall (n=200)
ICER ($\Delta C/\Delta E$)	\$140k / QALY	\$47k / QALY	\$70k / QALY
λ (Best guesses)	\$20,000	\$100,000	?
INB ($\lambda \cdot \Delta E - \Delta C$)	-\$17,143	\$22,857	\$2857

Observations from example

- IF we assume "overall" $\lambda = ½ \lambda_A + ½ \lambda_B$
  - "overall" λ = ½ ($20,000) + ½ ($100,000) = $60,000
  - SO overall, ICER = $70,000 > $60,000 = λ.
- ERROR! Since
  - ICER and INB yield different conclusions!
    - "overall" ICER > $60k *and* "overall" NB > 0.
  - Key message: Even with equal n,
    - "overall" λ ? ½ λ_A + ½ λ_B

Observations with equal n

- "Overall" ICER is an average of $ICER_A$ and $ICER_B$ with weights $\Delta E_A / \Delta E$ and $\Delta E_B / \Delta E$.
  - "Overall" INB is an average of INB_A and INB_B with weights ½ and ½ .
- The correct "overall" λ uses group ΔE weights:
  - $\Delta E_A / \Delta E$ = ¼, $\Delta E_B / \Delta E$ = ¾,
  - λ_A = \$20K / QALY, λ_B = \$100K / QALY

– ¼ · \$20k / QALY + ¾ · \$100k / QALY

= \$80,000 / QALY, the equity-adjusted λ

Lessons learned

- An “Overall” ICER and INB can be made from group-specific ICERs and INBs.
- The “Overall” stat should be compared to an equity-adjusted λ reflecting how society values:
  - The total gained (ΔE), **and**
  - The distribution of the gain ($\Delta E = \Delta E_A + \Delta E_B$)

The general case

- In general, to create an equity-adjusted "overall" lambda, calculate $\sum_{g=1}^{G} l_g q_g$

- Where θ_g =

$$\left(\frac{w_g^{TX} \overline{E}_g^{TX} - w_g^{UC} \overline{E}_g^{UC}}{\Delta E} \right)$$

- ω_g^t is the % of treatment t subjects who belong to patient group g.

- The NBRF gives equivalent weights

The Net Benefit Regression Framework (NBRF)

- The Net Benefit Regression Framework
  - $NB_i = \beta_0 + \beta_1 \cdot TX_i$
    - In general: $NB_i = \lambda e_i - c_i$
    - With groups: $NB_i = \lambda_g e_i - c_i$
- In this example, g = A and B
  - λ_A = \$20,000
  - λ_B = \$100,000

Data analysis: NB = β_0 + 2857·TX

Obs	Group	TX	λ (wtp)	Effect	Cost	NB
1	A	0	$20,000	2 / 7	$5,000	$714
2			$20,000	3 / 7	$20,000	-$11,429
3			$20,000	4 / 7	$15,000	-$3,571
4		1	$20,000	3 / 7	$25,000	-$16,428
5			$20,000	4 / 7	$40,000	-$28,571
6			$20,000	5 / 7	$35,000	-$20,714
7	B	0	$100,000	0 / 7	$5,000	-$5,000
8			$100,000	1 / 7	$20,000	-$5,714
9			$100,000	2 / 7	$15,000	$13,571
10		1	$100,000	3 / 7	$25,000	$17,857
11			$100,000	4 / 7	$40,000	$17,143
12			$100,000	5 / 7	$35,000	$36,429

Summary

- The “Overall” ICER or NB can be made from combining the patient subgroups’ stats.
  - Potential challenges involve:
    - Using the “correct” lambda
    - Using the “correct” weighting scheme
  - ω weights can be intricate with many groups or $\neq$ N
- A verdict of "cost-effectiveness" depends on the DM’s values of extra health benefits accruing to different patient groups.
- The NBRF is a person-level regression that allows for any λ for any person.

Conclusion

- With the NBRF it is easy to
  - Transparently derive and apply the correct societal equity-adjusted λ that incorporates group-specific equity and/or fairness concerns into economic evaluation.

References

- **Net Benefit Regression Framework**
  - Hoch J, Briggs A, Willan A. "Something old, something new, something borrowed, something BLUE: A framework for the marriage of health econometrics and cost-effectiveness analysis," *Health Economics*, 11(5): 415-430, 2002.

- **Net Benefits**
  - Stinnett AA, Mullahy J. Net health bene?ts: a new framework for the analysis of uncertainty in cost-effecctiveness analysis. Med Decision Making 1998; 18 (Special Issue on Pharmacoeconomics): S68–S80.
  - Tambour M, Zethraeus N, Johannesson M. A note on con?dence intervals in cost-effectiveness analysis. Int J Technol Assessment Health Care 1998; 14(3): 467–471.