

Addressing the Distributional Consequences of Spillovers in Health Economic Evaluation: A Prioritarian Approach

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Health Spillovers and Economic Evaluation

- ▶ An individual's serious illness often presents a substantial stressor to a network of family members and close persons.
- ▶ Healthcare interventions may improve the lives of those in this network.
- ▶ Much support for including these wider health benefits of interventions in economic evaluation.
 - ▶ Guidelines on economic evaluation now reflect these calls for incorporation.
- ▶ Yet, inclusion of spillovers is still far from common practice.
- ▶ Prominent objections from dissenting voices within academia.
 - ▶ Potential for substantial distributional impacts and challenges to equity.

Aims of Paper

1. We propose a novel 'prioritarian approach' to health spillover incorporation in health economic evaluation.
 - ▶ Gives greater weight to the health gains of patients.
 - ▶ Moderates the equity impacts of spillover inclusion in analyses.
2. Describe the axiomatic basis for this prioritarian approach to health spillover incorporation.
3. Illustrate how the process might be undertaken in practice by means of an illustrative example.

Foundations of the Proposed Approach

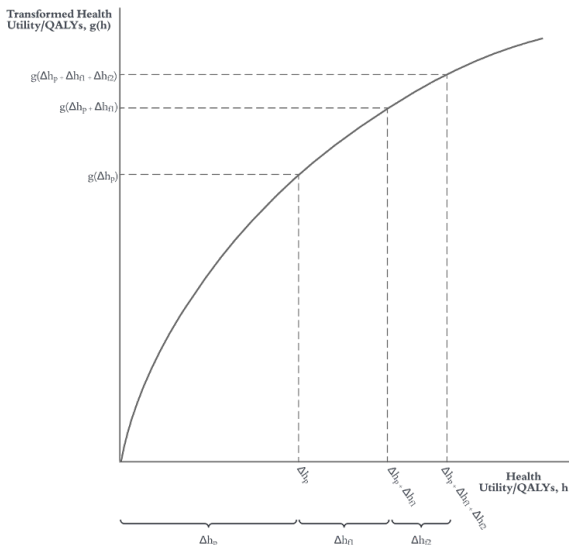
- ▶ Rooted in prioritarianism.
 - ▶ Imparts priority to someone who is 'worse off'.
- ▶ Considering spillovers, those with smaller family networks may be viewed as worse off.
- ▶ A prioritarian weighting of spillover health utility vectors, by means of a 'strictly increasing and strictly concave' transformation, is proposed.
 - ▶ Used to offset the adverse allocative impacts of inclusion.

Strictly Concave Transformation of QALYs in CEA (1)

- ▶ To describe the approach, we first define a 3-person 'family' (or household):
 - ▶ A patient (p)
 - ▶ A caregiving family member (f_1)
 - ▶ A non-caregiving family member (f_2)
- ▶ A hypothetical intervention is provided to the patient which affords health benefits across the entire network.
 - ▶ The described transformation function gradually assigns less weight to the health impacts of the intervention as 'proximity' to the patient decreases.

Strictly Concave Transformation of QALYs in CEA (2)

Prioritarian Transformation Function



Strictly Concave Transformation of QALYs in CEA (3)

Steps in Transformation

1. Rank health outcomes (absolute incremental QALYs) - sequentially placed on the horizontal axis in order of priority.
 - ▶ Patient $\succ$ Carer $\succ$ Non-caregiving Family Member
2. Transform QALY gains sequentially.
 - ▶ Patient: $g(\Delta h_p)$
 - ▶ Carer: $g(\Delta h_p + \Delta h_{f1})$
 - ▶ Non-caregiving family member: $g(\Delta h_p + \Delta h_{f1} + \Delta h_{f2})$
3. Arithmetic separation of transformed total.
4. Apply transformed spillover health increments, as a proportion of the transformed total to the non-transformed total health increment.
5. Cap patient health benefits at their original value so as to downweight health spillovers.

Strictly Concave Transformation of QALYs in CEA (4)

Functional Form

- ▶ To operationalise the approach, we need a functional form.
- ▶ The standard Atkinsonian function is proposed:

$$g(h_i) = \frac{h_i^{(1-\gamma)}}{(1-\gamma)} \quad (1)$$

where h denotes the health/QALY gain and γ represents a normative 'priority' parameter.

- ▶ γ expresses the degree of priority given to patient health gains.
 - ▶ Adler (2019) states that this priority parameter should be based on population preference.
 - ▶ We employ a recent empirical point estimate of the social value of carer HRQoL effects from Al-Janabi *et al.* (2022), and set the value of γ as 0.35.

An Illustrative Example (1)

- ▶ Assume Intervention A (current treatment) provides health benefits (QALY gains) solely to the patient.
- ▶ It is employed as the comparator to some new intervention B in a hypothetical CEA.
- ▶ Intervention B benefits both the patient and family network.
- ▶ Intervention A costs £25,000 and Intervention B, £30,000.
- ▶ Incrementally, Intervention B provides 0.35 additional QALYs relative to Intervention A
 - ▶ 0.20 assigned to the patient, 0.10 to the carer, and 0.05 to the non-caregiving family member.

An Illustrative Example (2)

- ▶ The analysis is undertaken via 4 scenarios.
 1. The 'base-case': spillovers are not incorporated.
 2. A utilitarian approach: spillovers included and valued equally to patient health gains.
 3. The proposed prioritarian approach: spillovers downweighted via the described method.
 4. An equivalence scale approach, previously described by Tubeuf *et al.* (2019).

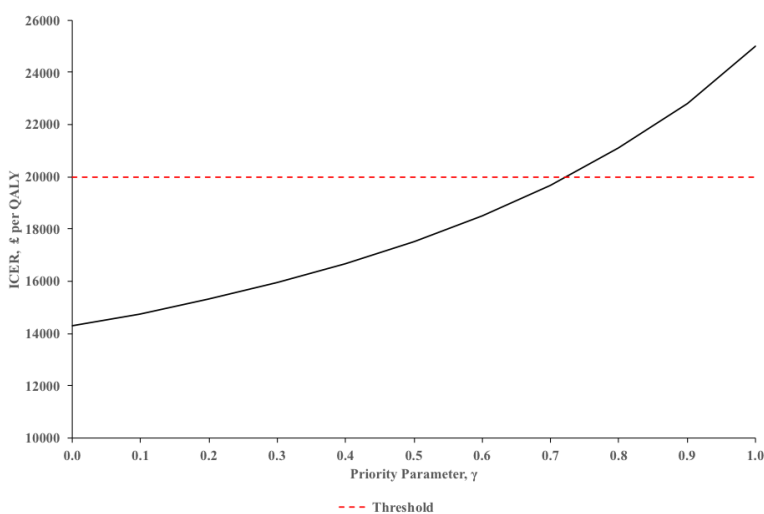
An Illustrative Example (3)

Step	Patient (p)		Family member 1 (f_1)		Family member 2 (f_2)
1 - QALY gains ranked	0.200	Y	0.100	Y	0.050
2 - Cumulative summation	0.200		0.300		0.350
3 - Transformation applied	0.540		0.703		0.778
4 - Arithmetic separation	0.540		0.163		0.074
5 - Proportion of total	0.695		0.210		0.096
6 - Proportions applied	0.200 (capped)		0.073		0.033

An Illustrative Example (4)

Scenario	Costs	QALYs	ICER (£ per QALY)	Cost-effective? (Threshold: £20,000)
Base-case				
Intervention A	£25,000.00	0.500		
Intervention B	£30,000.00	0.700		
	<i>Incremental Costs</i>	<i>Incremental QALYs</i>		
	£5,000	0.200	£25,000.00	No
Utilitarian Approach				
Intervention A	£25,000.00	0.500		
Intervention B	£30,000.00	0.850		
	<i>Incremental Costs</i>	<i>Incremental QALYs</i>		
	£5,000.00	0.350	£14,285.71	Yes
Prioritarian Approach				
Intervention A	£25,000.00	0.500		
Intervention B	£30,000.00	0.807		
	<i>Incremental Costs</i>	<i>Incremental QALYs</i>		
	£5,000.00	0.307	£16,301.12	Yes
Equivalence Scaling				
Intervention A	£25,000.00	0.500		
Intervention B	£30,000.00	0.802		
	<i>Incremental Costs</i>	<i>Incremental QALYs</i>		
	£5,000.00	0.302	£16,549.87	Yes

An Illustrative Example (5)



Discussion (1)

- ▶ This analysis highlights how adoption of a prioritarian perspective in economic evaluation may offset the distributional consequences of health spillover incorporation.
 - ▶ Novel, methodologically sound, and axiomatically robust.
 - ▶ Easily applied.
 - ▶ Allows for what some may view as a more equitable apportioning of scarce resources.

Discussion (2)

- ▶ Limitations:
 - ▶ It may conflict with the efficiency goals of the decision-maker.
 - ▶ Replication with empirical data necessary.
 - ▶ No threshold deflator applied to account for the inflationary impact of additional QALYs in the ICER denominator.
 - ▶ Does approach accord strictly enough with axiological prioritarianism?

Thank You for Listening!

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The Axiomatic Basis for a Prioritarian Approach

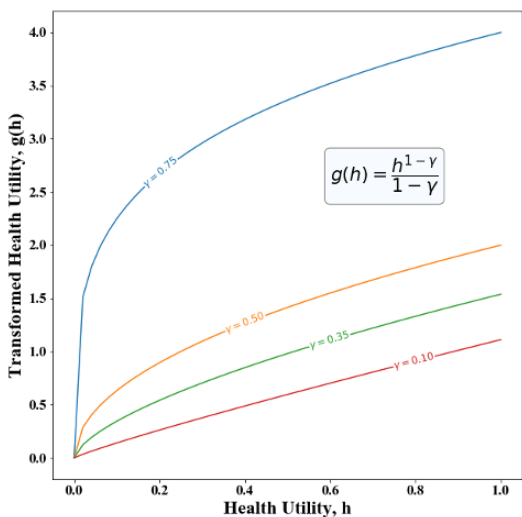
- ▶ There is a strong axiomatic motivation for employing such a prioritarian approach.

Prioritarian Axiom Cluster

1. This decision rule fits intuitively with the Pareto axiom.
 - ▶ Pareto improvements in health are possible whilst harming no one else.
2. It accords with an impartiality axiom.
 - ▶ Health utility vectors are considered regardless of *whom* receives them.
3. Addition of completeness and continuity axioms offer large benefits in terms of tractability.
 - ▶ As does an assumption of the separability of people/family networks.
4. Lastly, the Pigou-Dalton axiom.
 - ▶ Transfers from a 'better-off' to 'worse off' patient/family network and affecting no else is considered an improvement.

Strictly Concave Transformation of QALYs in CEA

Priority Parameter Selection



Strictly Concave Transformation of QALYs in CEA

Alternative Functional Forms

