

Severity weighting: GRACE-fully solved?

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# Outline

### Accounting for severity in HTA

• Describing approaches

Considering implicit and categorical approaches

• Straightforward but limits with respect to transparency, consistency and vertical equity

Continuous approaches and the GRACE framework

- Granular but greater complexity
- Potential for dramatic WTP adjustments









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#### **Policy Perspectives**

#### Considering Severity in Health Technology Assessment: Can We Do Better?

Chris Skedgel, PhD, Nadine Henderson, MSc, Adrian Towse, MA, MPhil, David Mott, PhD, Colin Green, PhD

#### ABSTRACT

There is strong evidence that individuals and the public assign relatively greater value to health gains from relatively more severe health states. This preference is increasingly reflected in health technology assessment, with some consideration of severity incorporated by health technology assessment bodies in, among others, The Netherlands, England and Wales, Norway, Sweden, and the United States. If a societal "severity premium" is to be considered fairly and consistently, we argue that a more explicit and quantitative approach is needed. We highlight drawbacks of categorical approaches, especially discontinuities between severity categories that arguably violate concepts of vertical equity, and argue that a more continuous approach to understanding severity is needed. We also note challenges to more explicit approaches, including implications of a lower threshold for less severe conditions and the relative complexity of calculating a continuous severity adjustment.

Keywords: health technology assessment, priority setting, public preferences, severity



Among countries taking a more explicit approach, we find that they adopt a **categorical approach**, where different intervals of severity are associated with the same value.

This 'step-wise' approach is straightforward, but it has potential drawbacks in terms of vertical equity.





Horizontal equity requires that similar people are treated similarly

Vertical equity requires that dissimilar people are treated dissimilarly

**Categorical approaches** to valuing severity, however, necessarily require that 'somewhat dissimilar' people are treated similarly, potentially violating vertical equity.

The critical questions with respect to vertical equity are *how dissimilar are the individuals* and *how similar is their treatment*?



Proportional Shortfall Severity



SEVERITY WEIGHTING: GRACEFULLY SOLVED?



A more **continuous approach** to valuing severity avoids issues of around vertical equity by treating each degree of severity differently, satisfying **vertical equity** and potentially providing an **objective basis** for the premium at any particular severity level.

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#### Methodology

### Health Technology Assessment With Diminishing Returns to Health: The Generalized Risk-Adjusted Cost-Effectiveness (GRACE) Approach

Darius N. Lakdawalla, PhD, Charles E. Phelps, PhD

#### ABSTRACT

*Objectives:* Cost-effectiveness analysis (CEA) embeds an assumption at odds with most economic analysis-that of constant returns to health in the creation of happiness (utility). We aim to reconcile it with the bulk of economic theory.

Methods: We generalize the traditional CEA approach, allow diminishing returns to health, and align CEA with the rest of the health economics literature.

*Results*: This simple change has far-reaching implications for the practice of CEA. First, optimal cost-effectiveness thresholds should systematically rise for more severe diseases and fall for milder ones. We provide formulae for estimating how these thresholds vary with health-related quality of life (QoL) in the sick state. Practitioners can also use our approach to account for treatment outcome uncertainty. Holding average benefits fixed, risk-averse consumers value interventions more when they reduce outcome uncertainty ('insurance value') and/or when they provide a chance at positively skewed outcomes ('value of hope'). Finally, we provide a coherent way to combine improvements in QoL and life expectancy (LE) when people have diminishing returns to QoL.

*Conclusion:* This new approach obviates the need for increasingly prevalent and ad hoc exceptions to CEA for end-of-life care, rare disease, and very severe disease (eg, cancer). Our methods also show that the value of improving QoL for disabled people is greater than for comparable non-disabled people, thus resolving an ongoing and mathematically legitimate objection to CEA raised by advocates for disabled people. Our Generalized Risk-Adjusted Cost-Effectiveness (GRACE) approach helps align HTA practice with realistic preferences for health and risk.

Keywords: CEA for disabled persons, value of hope, value of insurance, optimal CE decision threshold, severity of illness.

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# "Diminishing returns to health" in the GRACE model

Starting from the conventional cost per QALY model, Lakdawalla & Phelps propose a multiplier, **R**, that represents the ratio of the marginal value of a health gain in a "severe" health state and in (almost) full health:

 $R = \frac{\partial U(\text{Severe})}{\partial U(\text{Healthy})}$ 

- Under the conventional QALY model, R=1.0 ("A QALY is a QALY is a QALY")
- Under GRACE, R~1.0 for minor illness, but may be substantial (R>>1.0) for very severe conditions. This is
  applied to the acceptable cost-effectiveness threshold (CET) so that the decision rule becomes:

$$\frac{\Delta C}{\Delta E} \le (CET \cdot R)$$

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# Estimating the 'severity premium' in GRACE

R, the ratio of marginal utility of health gain, is a function of two elements:

- 1. The **relative health loss** (severity) associated with a condition.
- 2. The individual or societal utilities associated with a health gain from that state, measured in terms of **risk** aversion in health  $(r_H^*)$ . The greater the risk aversion over health, the greater the value of health gains from a severe state.

The interaction between relative risk aversion and severity determines R for any particular health condition, and as illustrated in Lakdawalla & Phelps (2021), this can produce dramatic adjustments to the acceptable cost-effectiveness threshold.

Table 1. R multipliers for various relative risk aversion and health loss values.						
Relative Health	Relative Risk Aversion in Health $(r_{\mu}^{*})$					
	0	0.25	0.5	0.75	1	1.25
0	1	1	1	1	1	1
0.1	1	1.03	1.05	1.08	1 1 1	1.10
0.3	1	1.09	1.2	1 31	1.11	1.13
0.5	1	1.19	1.41	1.01	1.43	1.56
0.7	1	1.05	1.41	1.62	2	2.38
0.9		1.35	1.83	2.47	3.33	4.5
0.9	1	1.78	3.15	5.61	10	177

# Considerations for a severity premium in practice

1. Severity adjustment could lead to substantial increases in the acceptable threshold for some conditions. In the absence of new funding for treating more-severe conditions, this will create winners and losers in terms of willingness-to-pay.



2. GRACE allows for a continuous severity-adjustment compatible with vertical equity, but its reliance on risk aversion as a measure of value will be unfamiliar in the context of HTA. Its theoretical rigor must be weighed against transparency and accessibility in methods.

# Key messages

- There is public support for prioritising patients in more severe conditions, and HTA bodies are beginning to account for these preferences in their assessment processes.
- Implicit considerations are not consistent with transparency and consistency, and categorical approaches arguably violate principles of vertical equity.
- More continuous severity adjustments are more consistent with vertical equity, but their complexity may be at odds with transparency and accessibility in methods.



# Thank you

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