



UNDERSTANDING MEASUREMENT: WHY ICER IS WRONG

Broadly speaking, the Quality Adjusted Life Year (QALY) is a generic measure of disease burden. One year of life lived in perfect health equals one QALY, with “imperfect” health counting – somewhat arbitrarily – for something less than one. The Institute for Clinical and Economic Review (ICER) uses a reference case cost-per-QALY value assessment framework to evaluate treatments and therapies. There are a number of reasons this methodology is flawed and should not be used. But the most fundamental issue is ICER does not seem to understand the limitations of measurement.

The Sting in the Tail

ICER will undoubtedly argue that they are merely following the standard practice in health technology assessment through assuming that the utility scale is, in practical terms and by assumption, a ratio scale with a true zero.

After all, if the ICER value assessment is built on modelled assumptions projecting 10, 20, or 30 years into the future, it really makes no difference if ICER makes just one more assumption.

However, there is a small but significant flaw. The utility scale – if it is to have ratio properties – must have a true zero. That is, no utility values can take negative scores. This is not true of the EQ-5D-3L scale, which – like other utility scales – can take negative values (states worse than death). In this case the values lie between -0.59 and 1.0.

This is not in dispute as it is created by the utility scoring algorithm for responses by patients to the various symptom levels. But it is wholly inappropriate for our purposes.

Fundamental Measurement

Let’s start with measurement theory. If we understand the limitations of measurement, then we can make quite clear why the QALY is an impossible construct. It might seem a small point, but ICER’s failure to understand – or perhaps failure to acknowledge – the ordinal nature of utility scores such as the EQ-5D-3L has effectively sabotaged its claims as a leader in value assessment.

To go back to first principles from high school mathematics, there are four measurement scales: nominal, ordinal, interval, and ratio. Each satisfies one or more of the properties of (i) identity, where each value has a unique meaning; (ii) magnitude, where each value has an ordered relationship to other values; (iii) interval, where scale units are equal to one another; and (iv) ratio, where there is a “true zero” below which no value exists.

- **Nominal scales** are purely descriptive and have no inherent value in terms of magnitude.

- **Ordinal scales** have both identity and magnitude in an ordered relation, but the unknown distances between the ranks means the scale is capable only of generating medians and modes and the application of nonparametric statistics.
- The **interval scale** has identity, magnitude, and equal intervals. It supports the mathematical operations of addition and subtraction.
- A **ratio scale** satisfies all properties, supporting the additional mathematical operations of multiplication and division.

The EQ-5D-3L is an ordinal scale. Why? Because it is constructed from responses to symptoms which are themselves ordinal scales (e.g., no problem, some problems, extreme problems). We can rank these, but we can't put a numerical value on the distance between them.

The incontrovertible fact is that utility scales are ordinal. The implications are obvious: you cannot multiply time spent in a disease state by an ordinal utility score (scale 0 = death to 1 =

perfect health). Why? Because it lacks ratio properties. The result is clear cut: the QALY created by utility scores is a mathematical possibility.

ICER's Persistence

Despite repeated warnings ICER persists in promoting its reference case cost per QALY value assessment framework.¹ The fact that this framework fails the standards of normal science in producing claims that are neither credible nor evaluable seems beside the point.

This is an untenable state of affairs. The media in the US, together with health care decision makers, continue to take ICER's value assessments at face value, factoring them into decision making even though the assessments themselves lack any credibility.

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REFERENCES

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