Annals of Medicine

ISSN: 0785-3890 (Print) 1365-2060 (Online) Journal homepage: informahealthcare.com/journals/iann20

Health state values from multiattribute utility instruments need correction

Erik Nord

To cite this article: Erik Nord (2001) Health state values from multiattribute utility instruments need correction, Annals of Medicine, 33:5, 371-374, DOI: 10.3109/07853890109002091

To link to this article: https://doi.org/10.3109/07853890109002091

Health state values from multiattribute utility instruments need correction

Erik Nord

Cost-utility analysis uses the quality-adjusted life year (QALY) as a measure of the benefit of health interventions. It presupposes the assignment of utility scores to different states of health on a scale from zero (dead) to unity (healthy). A number of so-called multiattribute utility (MAU) instruments are available for this purpose. Analysts who wish to use MAU instruments in economic evaluations of health programmes and technologies may improve their performance by conducting two different analyses: the first is a conventional cost-utility study, in which the utilities from MAU instruments are used as they stand, and the second is a study in which the utilities are transformed into numbers that also encapsulate concerns for giving priority to the worst off. The term 'cost-value analysis' is used for the latter, broader approach. A figure is offered as a preliminary tool to help conduct the required transformations.

Keywords: cost-value analysis; multiattribute utility; instrument; person trade-off; QALY; utility.

Ann Med 2001; 33: 371–374.

Introduction

Cost-utility analysis (CUA) is a widely used technique for judging whether health technologies and programmes give adequate value for money. In CUA, the concept of value is operationalized as a product of two factors: the increase in well-being, often referred to as 'utility', that follows from interventions, and the number of years that people are able to enjoy these increases in well-being (utility). The unit of measurement of value in this approach is the quality-adjusted life year (QALY). The underlying idea of the approach is that medical technologies with low costs per QALY gained should be given priority over those with high costs per QALY gained (1).

From the National Institute of Public Health, Oslo, Norway.
Correspondence: Erik Nord, PhD, National Institute of Public Health, PO Box 4404 Nydalen, 0403 Oslo, Norway. E-mail: erik.nord@folkehelsa.no, Fax: +47 22042595.

The QALY approach presupposes the assignment of utility scores to states of illness or disability on a scale from zero (dead) to unity (healthy). Considering, for example, the conditions 'constant strong pain' and 'moderate pain half the time' and assuming that these are assigned utility scores 0.5 and 0.9, respectively, an intervention that takes a person from the former to the latter state and allows the person to live 10 years in this improved condition yields (0.9–0.5) x 10 = 4 QALYs. By comparison, a complete cure for a person with 'moderate pain half the time' and a life expectancy of 10 years scores only 1 QALY (0.1 x 10). The former intervention may thus be said to justify four times as high costs as the latter.

Utility scores may be determined in various ways. One approach is the time trade-off technique. The patients are asked what share of their expected remaining life time they would be willing to sacrifice if in return they could be restored to full health. The logic of the technique is that the more burdensome a condition is, the more willing a person will be to make sacrifices to be relieved of it. Assume, for example, that people with a given condition report on average a willingness to sacrifice 20% of their life time if they could live in full health. Their condition is then assigned a utility of 0.8 (a deduction of 20% from full score).

A number of so-called multiattribute utility (MAU) instruments are available for assigning utilities to health states (reviewed in (2)). Each instrument measures the health of individuals on a number of different dimensions, thereby producing so-called 'health profiles'. The instruments further transform these profiles into single index scores on the 0–1 scale by a mathematical formula. The transformations are based on statistical analyses of population preference data that show how highly the different dimensions of health are valued relative to each other. The time trade-off technique is one of several techniques used for collecting such population preference data.

The QALY approach to evaluating health programmes has considerable theoretical appeal, and MAU instruments are potentially useful tools for

analysts who wish to adopt this approach. However, the relevance of QALY calculations for priority setting rests heavily on the extent to which utilities assigned to different states of illness in fact reflect societal concerns for fairness in resource allocation. Previous research has shown that most MAU instruments do not satisfy this requirement. The purpose of the present paper is to draw attention to this problem, to explain the underlying reasons and to offer a simple tool that may to some degree resolve it.

Key messages

- Concerns for the worst off are weighed heavily in priority setting.
- Health state values used in cost-effectiveness analysis do not generally encapsulate such concerns.
- Preliminary functions are presented for transforming values from multiattribute utility instruments into values that encapsulate concerns for the worst off.

The problem

Consider two conditions A and B. Assume that in-depth interviews are conducted in representative samples of people with either one of these conditions to establish how burdensome the conditions are felt, or in other words, to establish the utility loss associated with each of them. The interviews include so-called time trade-off questions. Assume that, on average, people with condition A report a willingness to sacrifice 10% of their life time, while people with condition B on average are willing to sacrifice 20%. Assume that other data collected in the interviews support this sign of difference in the burden between the two conditions. One may then infer that the utility loss from condition B is experienced as approximately twice that from condition A. On the basis of the interviews, conditions A and B are thus assigned a utility of 0.9 and 0.8, respectively.

One might then conclude that the value of curing a case of B would to be twice the value of curing a case of A, and thus that curing one case of B would be equivalent to curing two cases of A (all else equal). One might also conclude that the value of curing a case of A (B) has been found to be one-tenth (fifth) of the value of saving a life (as the utility losses are one-tenth and one-fifth, respectively, of the utility loss of losing life altogether).

However, if one is speaking of value in the sense of societal value, ie, the degree to which society appreciates and is prepared to prioritize interventions for B relative to interventions for A, the matter is not as simple. The reason is that in most countries there is a strong feeling of obligation towards the worst off in health care priority setting. This feeling transcends simple considerations of individual utility gains. It is reflected in responses to so-called 'person trade-off questions': in the eyes of the public, a very high number of people with moderate conditions have to be treated to outweigh the treatment of a small number of people with severe conditions. Similarly, a high number of prevented of cases of severe disability is needed to outweigh the prevention of death in a few people (3–7). In the example above these independent feelings of obligation towards the worst off imply that even if two cases of condition A would be equivalent to one case of condition B in terms of utility loss to the individuals concerned, society would probably think that curing one person of condition B would be equally important as curing several (not only two) persons with condition A. Society would, furthermore, feel that the importance of saving life is much greater than the importance of averting five cases of B or ten cases of A.

To capture these ethical, distributive concerns that society holds in priority setting and resource allocation, patients' utilities for health states need an *upward adjustment* before they are used to estimate the societal value of health programmes. For example, in the above fictious cases, the values for conditions A and B might have to be set at 0.96 and 0.88 (instead of 0.9 and 0.8). Curing one person with condition B would then be equivalent to curing three (not two) persons with condition A, and saving a life would be equivalent to curing 25 and 8 persons with conditions A and B, respectively, rather than 10 and 5.

How then do the values provided by MAU instruments meet the need for upward adjustment of patients' utilities in health programme evaluation?

The answer is that MAUs generally provide values that are *lower* than the utilities obtained by asking patients how burdensome they feel their condition is. The reason is that the scoring functions of MAU instruments are based on studies in which samples of the general populations were asked to imagine themselves in different states of illness or disability and to value these imagined states. Such external, hypothetical valuations tend to lead to much lower utilities than those elicited from individuals who actually are in the states in question, the main reason being that people with chronic health problems or disabilities learn to cope with their impairments over time and enjoy life much more than people without those problems are able to imagine (reviewed in (8)).

While societal concerns for the worst off necessitate the use of health state values with a strong upper end

compression, a compression that is even stronger than that of utilities elicited in patients and disabled people, MAU instruments go the opposite way and offer values from external judges that are lower than the utilities of people who live with the various conditions. In summary, this leads to large discrepancies between the values that are needed in societal health programme evaluation and the values that MAU instruments offer (see Table 1). The Table uses three example levels of severity to indicate 'rules of thumb' for scoring health states in accordance with the above person trade-off evidence (line 1: 'societal values'). The Table further shows what scores the three example states would roughly obtain if mapped into and scored by various existing MAU instruments. (Documentation released later on the scoring function of the latest version of the Health Utilities Index (HUI3) suggests that this instrument yields utilities much similar to those of HUI2 (9)). The general picture is that existing MAU instruments lack the compression of states to the upper end of the scale that is required to encapsulate societal concerns for the worst off. Some of the discrepancies are huge.

A suggestion for economic evaluation

Direct person trade-off data are still too scarce to allow precise estimates of societal values for health states to be used in decisions of resource allocation. On the other hand, the evidence does indicate roughly in what parts of the 0–1 scale health states need to be located if they are to be consistent with societal preferences in such decisions. It seems, therefore, that analysts who wish to use MAU instruments in economic evaluations of health programmes and technologies may already at this stage improve their performance by conducting two analyses: one being a conventional cost-utility study, in which the utilities from generic instruments are used as they stand, and the other being a study in which the utilities are transformed into numbers that also encapsulate concerns for severity. The term 'cost-value analysis' has been suggested for the latter, broader approach (8, 10).

Figure 1 is offered as a simple tool to help conduct the required transformations. The figure uses the utilities given in Table 1 and the middle numbers in each of the intervals in the societal values in the first line of the table. The figure indicates the functional relationship between utilities and societal value numbers for each of the MAU instruments in the Table.

Example

Assume that a choice is to be made between a health programme that will cure 100 people with the given condition A and an equally costly programme that will take 30 people with the condition B to a functional level corresponding to condition A. Assume that life expectancy is 20 years for patients in both

Table 1. Societal values for health states vs individual utilities from multi-attribute utility (MAU) instruments.

Instrument	Problem level*		
	Severe	Considerable	Moderate
Societal values	0.65–0.85	0.90–0.94	0.98–0.995
QWB	0.45–0.55	0.65–0.70	< 0.80
HUI1	0.10–0.20	0.30–0.40	< 0.85
HUI2	0.40	0.70	0.90–0.94
EQ-5D	0.20	0.60	0.70
York EuroQol (TTO)	0.20–0.25	0.40–0.50	0.80
IHQL (3D)	0.50–0.70	0.75–0.85	0.89–0.93
IHQL (complex)	0.70–0.75	0.80–0.90	0.90–0.94
15D	0.77	0.86	0.91–0.93
Rosser/Kind	0.68	0.94	0.97–0.98

*The three states were described as follows:
Severe: Sits in a wheel-chair, has pain most of the time, is unable to work.
Considerable: Uses crutches for walking, has light pain intermittently, is unable to work.
Moderate: Has difficulties in moving about outdoors and has slight discomfort, but is able to do some work and has only minor difficulties at home.
HUI, health utility index (Marks 1 and 2); IHQL, index of health-related quality of life; QWB, Quality of Well-being; TTO, time trade-off. (Reproduced from (3) with permission.)

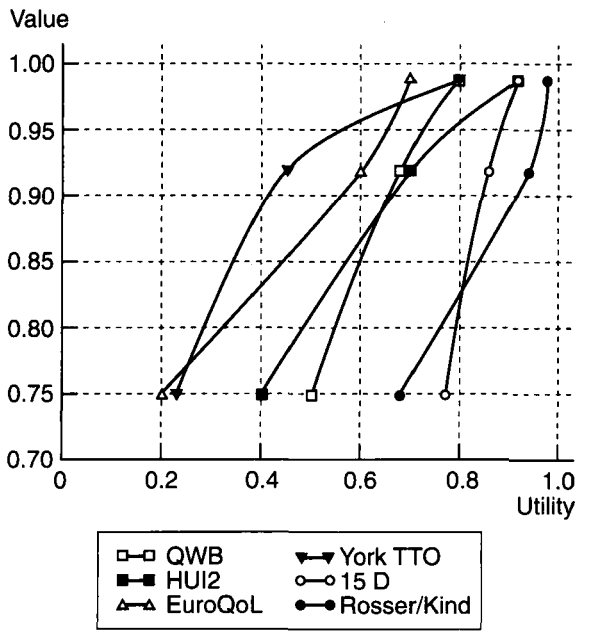

Figure 1. Health state utilities and corresponding societal values. See Table 1 for the abbreviations.

programmes and that conditions A and B are assigned utilities 0.8 and 0.4, respectively, if the HUI (Mark 2) is used. The former programme then yields 100 x (1–0.8) x 20 = 400 QALYs (undiscounted), while the latter yields 30 x (0.8–0.4) x 20 = 240 QALYs. A cost-utility analysis based on HUI2 thus suggests that the former programme should have priority. However, according to Figure 1, HUI utilities of 0.4 and 0.8 correspond roughly to societal values of 0.75 and 0.96. These numbers encapsulate societal preferences for severity *per se*. Using these numbers instead of the simple utilities changes the value score of the former programme to 100 x (1–0.96) x 20 = 80 and the value score of the latter programme to 30 x (0.96–0.75) x 20 = 126. In other words, the suggested preference order is reversed, the reason being the explicit introduction of societal concerns for severity *per se*.

Conclusion

Figure 1 is clearly a very rough tool. Considerably more data are needed to estimate the transformation functions more precisely and for a wider range of the 0–1 value scale. Figure 1 could, nonetheless, be useful, in as much as it is better to try to be roughly right rather than precisely and systematically wrong when estimating societal value. By doing a study based on transformed numbers as an add-on to a conventional cost-utility study, one would comply with a suggestion made by the Canadian Coordinating Office for Health Technology Assessment, ie to 'explore the impact of using direct person trade-off questions to establish society's valuation of different health programmes relative to each other' (11). If the two analyses give different answers, 'then a discussion of the reasons could be quite enlightening for the decision makers'.

References

1. **Weinstein MC, Stason WB.** Foundations of cost-effectiveness analysis for health analysis and medical practice. *N Engl Med* 1977; 296: 716–21.
2. **Nord E.** A review of synthetic health indicators. Background paper for the OECD Directorate for Education, Employment, Labour and Social affairs. OECD; June 1997.
3. **Nord E.** Health status index models for use in resource allocation decisions. A critical review in the light of observed preferences for social choice. *Int J Technol Assess Health Care* 1996; 12: 31–44.
4. **Pinto Prades JL.** Is the person trade-off a valid method for allocating health care resources? *Health Economics* 1997; 6: 71–81.
5. **Richardson J.** *Critique and some recent contributions to the theory of cost utility analysis.* Working paper no 77. Melbourne, Australia: Centre for Health Program Evaluation; 1997.
6. **Ubel PA, Kamlet M, Scanlon D, Loewenstein G.** Individual utilities are inconsistent with rationing choices: a partial explanation of why Oregon's cost-effectiveness list failed. *Med Decis Making* 1996; 16: 108–19.
7. **Ubel P.** How stable are people's preferences for giving priority to severely ill patients? Mimeo. Philadelphia, PA: Veterans Affairs Medical Center; 1997.
8. **Nord E.** Cost-value analysis in health care. Making sense out of QALYs. New York, NY: Cambridge University Press; 1999.
9. **Furlong W, Feeny D, Torrance G, Goldsmith C, DePauw S, Zhu Z, et al.** Multiplicative multi-attribute utility function for the Health Utilities Index Mark 3 (HUI3) system: A technical report. Paper 98–11. Hamilton, Ont: CHEPA; 1998.
10. **Nord E, Pinto JL, Richardson J, Menzel P, Ubel P.** Incorporating societal concerns for fairness in numerical valuations of health programs. *Health Economics* 1999; 8: 25–39.
11. **Canadian Coordinating Office for Health Technology Assessment.** *Guidelines for economic evaluation of pharmaceuticals: Canada.* 2nd edn. Ottawa: CCOHTA; 1997.

