

Multidimensional Health Assessment & Population-based Preference Weights

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“the question of identification of functionings has to be supplemented by that of their valuation” Amartya Sen (1985). *Capabilities and Commodities*

“the weighting exercise has to be done in terms of explicit valuations, drawing on the prevailing values in a given society...”

Amartya Sen (1996). *On the Foundations of Welfare Economics: Utility, Capability, and Practical Reason*

How does the experience in
multidimensional health
assessment inform efforts in
measuring multidimensional
poverty?

History

- Clinical tool for evaluation of disease-specific interventions
- Broadening to health states across disease groups (1970s)
- Population based multi-dimensional health assessment (1980s)

Multidimensional Health Measures

- EQ-5D (by the European Quality of Life Group- EuroQoL)
- Health Utility Index (by the Health Utility Group)
- Short-form multidimensional health surveys (SF-36; SF-12)

EQ-5D

- 5 dimensions: mobility, self-care, usual activities, pain or discomfort and anxiety or depression
- 3 levels: no problems (1), moderate problems (2), severe problems (3)
- 243 possible distinct health states (11111 indicating full health, 33333 indicating worst health)

Please indicate which statements best describe your own health state today.

Mobility

I have no problems in walking about

I have some problems in walking about

I am confined to bed

Self-Care

I have no problems with self-care

I have some problems washing or dressing myself

I am unable to wash or dress myself

Usual Activities (e.g., work, study, housework, family, or leisure activities)

I have no problems with performing my usual activities

I have some problems with performing my usual activities

I am unable to perform my usual activities

Pain/Discomfort

I have no pain or discomfort

I have moderate pain or discomfort

I have extreme pain or discomfort

Anxiety/Depression

I am not anxious or depressed

I am moderately anxious or depressed

I am extremely anxious or depressed

Health Utility Index

- 3 versions: HUI1, HUI2, HUI3, each with a health status classification system and formula for calculating utility scores
- 8 attributes: vision, hearing, speech, ambulation, dexterity, emotion, cognition, pain
- HUI2 describes 24,000 unique health states while HUI3 describes 972,000
- Together, HUI2 and HUI3 describe almost 1,000,000 unique health states

| ATTRIBUTE | LEVEL | DESCRIPTION |
|------------------|--------------|--|
| SENSATION | 1 | Able to see, hear, and speak normally for age. |
| | 2 | Requires equipment to see or hear or speak. |
| | 3 | Sees, hears, or speaks with limitations even with equipment. |
| | 4 | Blind, deaf, or mute. |
| MOBILITY | 1 | Able to walk, bend, lift, jump, and run normally for age. |
| | 2 | Walks, bends, lifts, jumps, or runs with some limitations but does not require help. |
| | 3 | Requires mechanical equipment (such as canes, crutches, braces, or wheelchair) to walk or get around independently |
| | 4 | Requires the help of another person to walk or get around and requires mechanical equipment as well. |
| EMOTION | 5 | Unable to control or use arms and legs. |
| | 1 | Generally happy and free from worry. |
| | 2 | Occasionally fretful, angry, irritable, anxious, depressed, or suffering night terrors |
| | 3 | Often fretful, angry, irritable, anxious, depressed, or suffering night terrors |
| | 4 | Almost always fretful, angry, irritable, anxious, depressed. |
| COGNITION | 5 | Extremely fretful, angry, irritable, anxious, or depressed usually requiring hospitalization or psychiatric institutional care. |
| | 1 | Learns and remembers school work normally for age. |
| | 2 | Learns and remembers school work more slowly than classmates as judged by parents and/or teachers. |
| | 3 | Learns and remembers very slowly and usually requires special educational assistance. |
| | 4 | Unable to learn and remember. |
| SELF-CARE | 1 | Eats, bathes, dresses, and uses the toilet normally for age. |
| | 2 | Eats, bathes, dresses, or uses the toilet independently with difficulty. |
| | 3 | Requires mechanical equipment to eat, bathe, dress, or use the toilet independently. |
| | 4 | Requires the help of another person to eat, bathe, dress, or use the toilet. |
| PAIN | 1 | Free of pain and discomfort. |
| | 2 | Occasional pain. Discomfort relieved by non-prescription drugs or self-control activity without disruption of normal activities. |
| | 3 | Frequent pain. Discomfort relieved by oral medicines with occasional disruption of normal activities. |
| | 4 | Frequent pain; frequent disruption of normal activities. Discomfort requires prescription narcotics for relief. |
| | 5 | Severe pain. Pain not relieved by drugs and constantly disrupts normal activities. |
| FERTILITY | 1 | Able to have children with a fertile spouse. |
| | 2 | Difficulty in having children with a fertile spouse. |
| | 3 | Unable to have children with a fertile spouse. |

Population-based Preferences

- Visual Analogue Scale (VAS)
- Time Trade Off (TTO)
- Standard Gamble (SG)

- EQ-5D uses the VAS and TTO
- HUI uses SG and VAS

Using VAS

“We are trying to find out what people think about health. We are going to describe a few health states that people can be in. We want you to indicate how good or bad each of these states would be for a person like you. There are no right or wrong answers. Here we are interested only in your personal views.”

Best imaginable health state

No problems in walking about
 No problems with self-care
 Some problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)
 No pain or discomfort
 Not anxious or depressed

No problems in walking about
 No problems with self-care
 No problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)
 Moderate pain or discomfort
 Not anxious or depressed

No problems in walking about
 No problems with self-care

 No problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)

 No pain or discomfort
 Not anxious or depressed

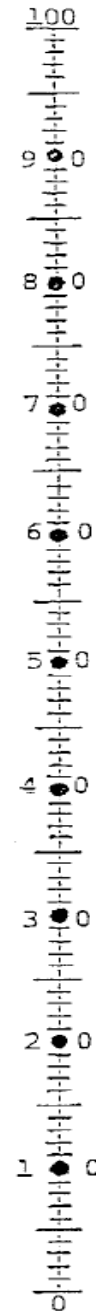
Some problems in walking about
 Some problems with washing or dressing self
 Some problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)
 Extreme pain or discomfort
 Extremely anxious or depressed

Some problems in walking about
 No problems with self-care
 Some problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)
 Extreme pain or discomfort
 Moderately anxious or depressed

Confined to bed
 Unable to dress or wash self
 Unable to perform usual activities (e.g. work, study, housework, family or leisure activities)
 Extreme pain or discomfort
 Extremely anxious or depressed

No problems in walking about
 No problems with self-care
 No problems with performing usual activities
 (e.g. work, study, housework, family or leisure activities)
 Moderate pain or discomfort
 Moderately anxious or depressed

Confined to bed
 Unable to wash or dress self
 Unable to perform usual activities
 (e.g. work, study, housework, family or leisure activities)
 Moderate pain or discomfort
 Not anxious or depressed



Worst imaginable health state

Please check that you have drawn one line from each box (i.e. eight line in all).

Time Trade Off

- Willingness to sacrifice life-expectancy in order to avoid poor health (or a particular health state described by a combination of dimensions/attributes)
- Trading *quantity* for *quality* of life
- depends on time preference and threshold effects (loss aversion and scale compatibility or negative time preference)

Use of TTO

- select a length of time in the 'perfect health' state that is regarded as equivalent to 10 years in the target state (the shorter the equivalent length of time, the worse the target state)
- for states worse than death, choice between dying immediately and spending a length of time (x) in the target state followed by $10-x$ years in the 'perfect health' state (the more time required in the 'perfect health' state to compensate for a shorter time in the target state, the worse the target state)

Standard Gamble

- Based directly on fundamental axioms of utility theory first presented by von Neumann and Morgenstern (1953). Used extensively in decision analysis.
- varies according to risk-behaviour (i.e. risk aversion, probability weighting, loss-aversion, scale compatibility)

Use of SG

- Choice between being in a described health state for a given period of time for certain and a risky option with one better (full health) and one worse (death) outcome
- Respondents asked the probability of a successful outcome that would make them indifferent to being in the described health state for certain, or go for the risky option

EQ-5D Scoring of Preferences

If VAS, scoring read directly off the VAS
then standardized using the formula:

$$V_x = (S_x - S_d) / (S_f - S_d)$$

where V_x is the adjusted score for health state x , S_x is the raw score for health state x , S_d is the raw score for death, and S_f is the raw score for full health

EQ-5D Scoring of Preferences

If using TTO, standardized scores are obtained through formula:

$$U_i = x/10$$

for chronic health states better than death and

$$U_i = -x/(10-x)$$

for chronic health states worse than death

where U_i is the score for the particular health state (either better or worse than death), and x the number of years in full health

HUI Preference Scores

- HRQL score for each health state is calculated using a utility function developed from preference scores measured in accordance with von Neumann-Morganstern utility theory
- Formula (Dead – Perfect Health scale): $u^* = 1.371(b1*b2*b3*b4*b5*b6*b7*b8) - 0.371$ where u^* is the utility of a chronic health state on a utility scale where dead has a utility of 0.00 and healthy has a utility of 1.00; b1 to b8 is the attribute utility score.

HUI Experience

- To date over 300 investigators have used HUI in a wide variety of studies in over 20 countries world-wide
- More than 200,000 subjects have been assessed using
- The HUI has been used in more than 200 clinical studies, and
- HUI has been included in every major Canadian general population health survey since 1990

EQ-5D Experience

- EQ-5D was initially developed simultaneously in Dutch, English, Finnish, Norwegian and Swedish but is now widely used in many countries around the world and has been translated into most major languages with the Group closely monitoring the process

EQ-5D Value Sets

| Country | N | Valuation method |
|-------------|------|------------------|
| Belgium | 548 | EQ-5D VAS |
| Denmark | 1179 | EQ-5D VAS |
| Denmark | 1332 | TTO |
| Europe | 6870 | EQ-5D VAS |
| Finland | 928 | EQ-5D VAS |
| Germany | 339 | EQ-5D VAS |
| Germany | 339 | TTO |
| Japan | 543 | TTO |
| New Zealand | 919 | EQ-5D VAS |
| Netherlands | 298 | TTO |
| Slovenia | 370 | EQ-5D VAS |
| Spain | 294 | EQ-5D VAS |
| Spain | 975 | TTO |
| UK | 3395 | EQ-5D VAS |
| UK | 3395 | TTO |
| US | 3773 | TTO |
| Zimbabwe | 2384 | TTO |

Assumptions & Shortcomings

- individuals have a consistent set of core values that can be unveiled using the above techniques. This disregards the complex and dynamic nature of preferences (which can vary depending on a variety of factors including experience, context and time).
- inconsistencies between individual versus societal preferences/values which mandate consideration
- Choice of technique depends on intended use & involves economic and ethical considerations

“It is not so much a question of holding a referendum on the values to be used, but the need to make sure that the weights – or ranges of weights – used remain open to criticism and chastisement, and nevertheless enjoy reasonable public acceptance. Openness to critical scrutiny, combined with—explicit or tacit—public consent, is a central requirement of non-arbitrariness of valuation in a democratic society.”

By placing a tick in one box in each group, please indicate which statement best describes your health today.

Mobility

- I have no problems in walking about
- I have some problems in walking about
- I am confined to bed

Self-Care

- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

Usual Activities

- I have no problems with performing my usual activities
- I have some problems with performing my usual activities
- I am unable to perform my usual activities

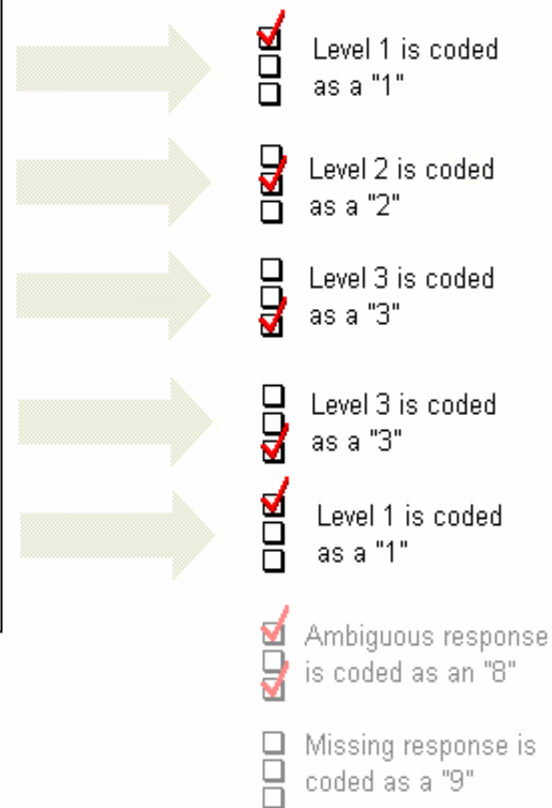
Pain/Discomfort

- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

Anxiety/Depression

- I am not anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

Levels of a perceived problem are coded as follows:



The health state is derived from the descriptive system.

| | | | | | | |
|--------------|---|---|---|---|---|--|
| health state | 1 | 2 | 3 | 3 | 1 | |
|--------------|---|---|---|---|---|--|

To score a health state you simply read off the corresponding value from a value set.

| | |
|-------|------|
| score | 0.07 |
|-------|------|

A value set:

| | | | | | |
|---|---|---|---|---|------|
| 1 | 2 | 3 | 2 | 3 | 0.09 |
| 1 | 2 | 3 | 3 | 1 | 0.07 |
| 1 | 2 | 3 | 3 | 2 | 0.00 |

EQ-5D

- A standardized non disease specific instrument for describing and valuing health-related quality of life
- A measure generating a single index value for health status with considerable potential for use in health care evaluation
- Valuation process includes the relative value attached to improved life expectancy on the one hand and improved quality-of-life on the other

Visual Analogue Scale

- line with clearly defined endpoints (most preferred health state at one end and the least at the other)
- health states placed on the line between the two in order of their preferences such that the intervals between the placements correspond to the differences in preference as perceived by the subject
- Category scaling is a variation wherein a specific number of categories are used
- often used in non-linear fashion (as determined by psychophysics)