CENTRE FOR HEALTH PROGRAM EVALUATION

WORKING PAPER 76

The Assessment of Quality of Life (AQoL) Instrument

Construction, Initial Validation & Utility Scaling

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1 Introduction

The Australian Quality of Life (AQoL) Project was undertaken to construct and validate a health-related quality of life instrument which would: a) be a psychometrically appropriate instrument for the evaluation of a range of health interventions, from the medical and pharmacological treatment of acute illness through to health promotion activities; and b) enable the economic evaluation of programs through the computation of utilities before and after health-related interventions. This paper summarises the construction, preliminary validation evidence and scaling of the *Assessment of Quality of Life Instrument* (AQoL).

Interest in health-related quality of life (HRQoL) can be attributed to four interrelated changes that have occurred in the second half of the twentieth century (Imhof 1992). One, improvements in health care technology, the effect of which has been to reduce morbidity and early mortality, and to prolong the lives of those who would otherwise have died (Nordenfelt 1994). Two, there has been a fundamental shift in the nature of illness in economically developed societies, through drastic reductions in early mortality from exogenous causes (e.g. acute infections) to increases in endogenous causes (e.g. chronic illnesses such as cancers or circulatory disorders) (Walker and Rosser 1993). Three, a heightened awareness that 'curing' illness is not the only outcome from health interventions and that many services are designed to prevent any further deterioration in quality of life (Bowling 1991). And four, an increasing conflict between the availability of

Figure 1

The role of HRQoL measurement

Program outcomes		
	Physical health effects	Value of these effects
	⇓	⇓
Evidence of program effect:	Clinical & Epidemiologic evidence • RCT • Cohort • Case-control • Case studies	Evaluation & Economic evidence • Cost-benefit analysis ($s or physical outcomes) • Cost-utility analysis (Quality-adjusted life years [QALYs])
Measurement units:	Life years gained Change in health state	Value of life years gained Preference for health states

potentially useful interventions and the resources available to pay for them. There is a strong moral argument that health resources should be allocated in ways that best benefit communities (Imhof 1992; Nordenfelt 1994).

This implies the need for the explicit evaluation of health-related interventions, be they primary, secondary or tertiary in nature. The role of HRQoL measurement within this late 20th Century paradigm is to assist with the evaluation of health care interventions by quantifying the increasingly important quality of life dimension of health outcomes. As shown in Figure 1, the role of HRQoL measurement is to complement (not replace) epidemiological or clinical evidence of program effectiveness through providing estimates of the value of additional life-years gained or improved health status.

The importance of HRQoL is indicated by the number of instruments that have already been constructed (Bowling 1991; Walker and Rosser 1993; Bowling 1995). The vast majority of these are disease-specific and cannot be used for the comparison of a broad range of interventions. There are a smaller number of generic instruments which can be used in such comparisons. However, the majority of these provide health status profiles for specific dimensions of HRQoL and do not yield single utility scores which reflect the strength of preference for different health states as required for economic evaluations.

Only a handful of generic instruments have attempted to measure utility, *viz*; the UK Rosser-Kind Index (Rosser 1993), the US Quality of Wellbeing instrument (Kaplan, Ganiats et al. 1996), the Canadian Health Utilities Instruments (Feeny, Torrance et al. 1996), the Finnish 15D (Sintonen and Pekurinen 1993) and the European EuroQol (Kind 1996). Whilst these instruments have their strengths, to our knowledge none were constructed using normal psychometric principles to ensure construct validity. Several instruments achieve simplicity at the expense of sensitivity and there is some evidence others do not adequately validate the life/quality of life tradeoff that is implied (Nord, Richardson et al. 1993; Nord 1995). Consequently there was the challenge to develop and validate such generic instruments.

The AQoL project was designed to assist with meeting this challenge, through construction of an instrument that would: a) cover the full universe of HRQoL as far as was practicable; b) meet standard psychometric requirements for reliable and valid measurement; c) be sensitive to a wide range of health states; and d) be capable of use as a psychometric instrument (yielding health state scores) or as an economic instrument (yielding 'preference' scores). The present paper summarises the progress made to date in achieving these objectives.

2 AQoL Construction Procedures

The project commenced with a literature review of the key HRQoL instruments published since the early 1970s. Copies of these were obtained and subjected to critical analysis. The results suggested twenty aspects of life were important in measuring HRQoL (see Figure 4; column 1; page 8). A model was subsequently constructed comprising the HRQoL universe, and the five primary dimensions contributing to this universe (illness, independent living, physical ability, psychological wellbeing and social relationships). A pool of items was generated from the literature, interviews and focus groups with 24 clinicians from St Vincent's Hospital (Melbourne) and the Department of Public Health and Community Medicine at The University of Melbourne. A sample item is given in Figure 2.

Figure 2

Example item

Thinking about how easily I can get around my home and community:

1. I get around my home and community by myself without any difficulty.
2. I find it difficult to get around my home and community by myself.
3. I cannot get around the community by myself, but I can get around my home with some difficulty.
4. I cannot get around either the community or my home by myself.

Following editing and revision of items, the item pool was administered to a construction sample comprising two cohorts: a list sample of 143 patients from St Vincent's Hospital and a random sample of 112 Melbourne residents selected from the telephone directory.

Figure 3

AQoL factor loadings

Illness	**0.86**	0.15	0.09	0.07	0.18
	0.86	0.14	0.08	0.07	0.08
	0.84	0.24	0.07	0.06	0.08
Independent living	0.08	**0.87**	0.07	0.17	-0.02
	0.15	**0.71**	0.11	-0.03	0.17
	0.27	**0.76**	0.08	0.14	0.13
Social relationships	0.02	0.06	**0.84**	0.12	-0.11
	0.10	0.08	**0.71**	0.08	0.19
	0.16	0.47	**0.56**	-0.06	0.18
Physical senses	0.14	0.09	-0.05	**0.67**	-0.15
	0.14	0.08	0.14	**0.79**	0.13
	-0.13	0.03	0.14	**0.68**	0.35
Psychological well-being	0.08	0.07	0.11	0.07	**0.75**
	0.11	0.01	0.46	0.16	**0.64**
	0.20	0.24	-0.16	0.04	**0.53**

Standard psychometric procedures were used to examine item properties, and items failing to meet specified criteria were discarded. The remaining items were then pooled and a two-stage factor analysis (principal components and varimax) was used to identify redundant items. Reliability analysis was also carried out. These steps were repeated until the most parsimonious solution was derived consistent with

psychometric and measurement theory. (Rummel 1970; Anastasi 1976; Pedhazur and Schmelkin 1991). This resulted in an instrument with five factors, each with three items, as shown in Figure 3. In this figure the columns are the factors and the rows the individual items. For clarity, each resulting scale has been labelled. The average factor item loadings were 0.74 and on cross-factors they were 0.13; these data indicate the five factors were orthogonal to each other, and that each comprised a single scale. The internal consistency of the instrument was appropriate (Cronbach's $\alpha = 0.80$).

3 AQoL Validation

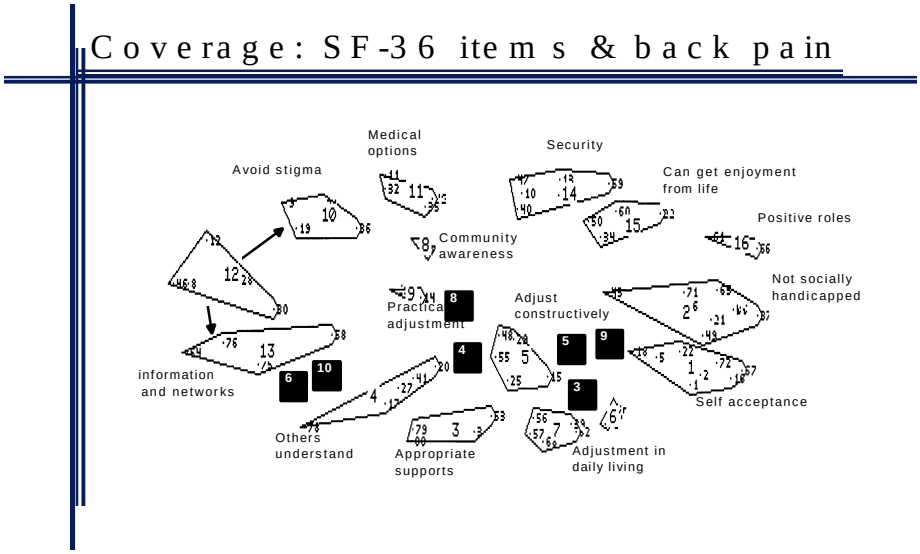
Generally, three forms of validation—content, construct and criterion—are accepted as providing evidence of the nomological net necessary for accepting that a measure possesses validity (Cronbach and Meehl 1955; Anastasi 1986; Pedhazur and Schmelkin 1991).
Content validity refers to the relationship between the hypothesised universe and the measurement: the measurement must provide adequate coverage of the universe. Following the procedures outlined by Lennon (1965), the content of each AQoL item was mapped against the HRQoL universe defined through the literature review. The results are given in Figure 4, along with those of several other popular HRQoL utility instruments (the EuroQol (EuroQoLGroup 1990), HUI-III (Torrance, Furlong et al. 1995; Feeny, Furlong et al. 1996; Feeny, Torrance et al. 1996), and 15D (Sintonen 1994; Sintonen 1995)) and a standard health profile instrument (the SF-36 (Ware, Snow et al. 1993)). This shows that the AQoL provides good coverage across the important HRQoL dimensions; coverage which is at least as good, if not better than, comparable instruments.

Figure 4

HRQoL coverage: key instruments

HROoL dimensions	SF-36	AOoL	EuroOol	HUI-III	15D
Relative to the body					
Anxiety/Depression	***	*	*		**
Bodily care	*	*	*	*	
Cognitive ability				*	*
General health	******				
Memory				*	
Mobility	***	*	*	*	*
Pain	**	*	*	**	*
Physical ability/Vitality	*******			*	*
Rest and fatigue	**	*			*
Sensory functions		**		****	*****
Social expression					
Activities of daily living		*	*		*
Communication		*		**	*
Emotional fulfilment	**			**	
Family role		*			
Intimacy/Isolation		*			
Medical aids use		*			
Medical treatment		**			
Sexual relationships					*
Social function	**	*			
Work function	**				

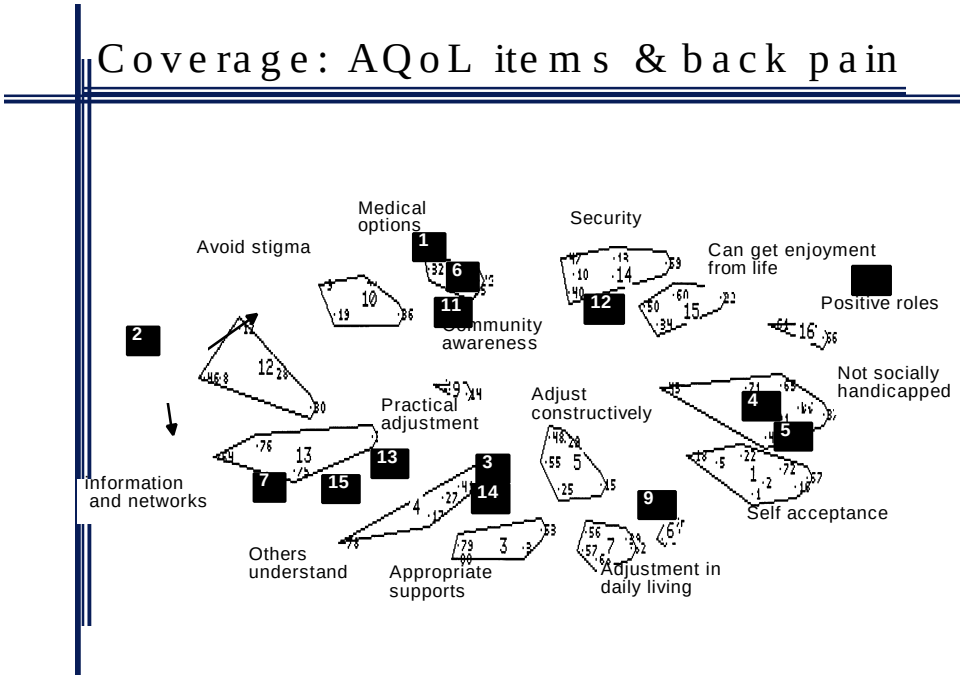
Figure 5



Source for Figures 5 & 6: Batterham (1997)

The importance of good coverage of HRQoL dimensions is graphically illustrated in Figures 5 & 6. Both figures draw on data from a study of back pain, involving concept mapping to derive the important HRQoL-dimensions to patients undergoing rehabilitation (Batterham 1997). Figure 5 shows that while the SF-36 provides reasonable coverage, it omits measurement on a range of medical and social issues. Figure 6, shows the same concept map with the AQoL items superimposed; this illustrates a much broader and more representative coverage.

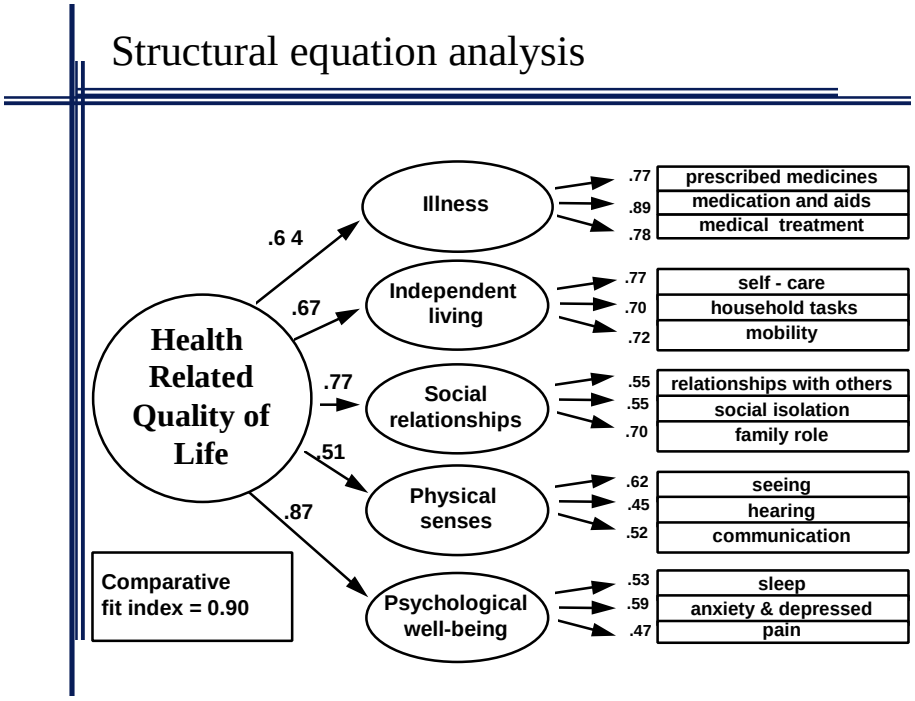
Figure 6



Construct validity refers to how well an instrument's score can be used to infer scores about the underlying psychometric universe or concept that is to be measured. Generally, construct validity is established by either examining how well empirical data 'fits' the hypothesised model or how well obtained scores 'predict' specified outcomes.

In order to understand the AQoL model and the relationships between the various scales, it was subjected to structural equation modelling (SEM) (Pedhazur and Schmelkin 1991; McArdle 1996). Assuming dimension orthogonality (see above), a *total disaggregation second order SEM model* was employed, in which each item was used to operationalise its respective hypothesised latent dimension. The model provides for the most detailed level of analysis since the properties of each item are described. Under these stringent requirements the measures of 'fit'—i.e. estimates of how well a specified model fits the data—typically provide values (around 0.80) below those advocated for less restrictive models, such as total or partial aggregation models (>0.90) (Bagozzi and Heatherton 1994). This model assumed the AQoL dimensions were independent (thus it assumed no correlations between the first level dimension disturbances), and that for each item any common variance was explained by one latent factor only. Analysis of the model, based on correlation and regression weights analysis, confirmed these assumptions (Pedhazur and Schmelkin 1991; McArdle 1996). Under these circumstances the loadings within the model also represent the correlations between the model components.

Figure 7



The results are given in Figure 7. This shows that, on average, the correlations between the latent five dimensions and the manifest items averaged 0.64 explaining an average of 41% of the item variance. The loadings of the five first order latent dimensions on the generic HRQoL index were 0.64 for the Illness scale (explaining 41% of the variance within the Illness scale), 0.67 for the Independent Living scale (45% of scale variance), 0.77 for the Social Relationships scale (59% of scale variance), 0.51 for the Physical Senses scale (26% of scale variance), and 0.87 with the Psychological State scale (76% of scale variance). The overall comparative fit index (CFI) was 0.90, indicating a much better fit than might be expected under the restrictive conditions of model construction outlined above (Pedhazur and Schmelkin 1991; Bagozzi and Heatherton 1994).

Summarising these results in simple terms, the analysis indicates that 90% of observed variation between observations may be explained by the structure of the AQoL. There is virtually no addition to explanatory power through relationships not postulated by the model.
Some preliminary evidence is available regarding criterion (concurrent) validity, where the criteria were other independent measures. Three such measures, each measuring an important aspect of HRQoL, are presented here: a measure of mood (the Affects Balance Scale (ABS) (Derogatis 1992)), a measure of functional status (the Barthel Index (Wylie and White 1964; Mahoney and Barthel 1965)), and a measure of general health (the SF-36 (Ware, Snow et al. 1993)). Since each of these instruments measures a different aspect of HRQoL, moderate correlations—r = 0.40–0.70—between the AQoL and each instrument were expected. Figures 8, 9 & 10 show the regression line between the AQoL and each of these instruments' scores and the 95%CIs.

Figure 8

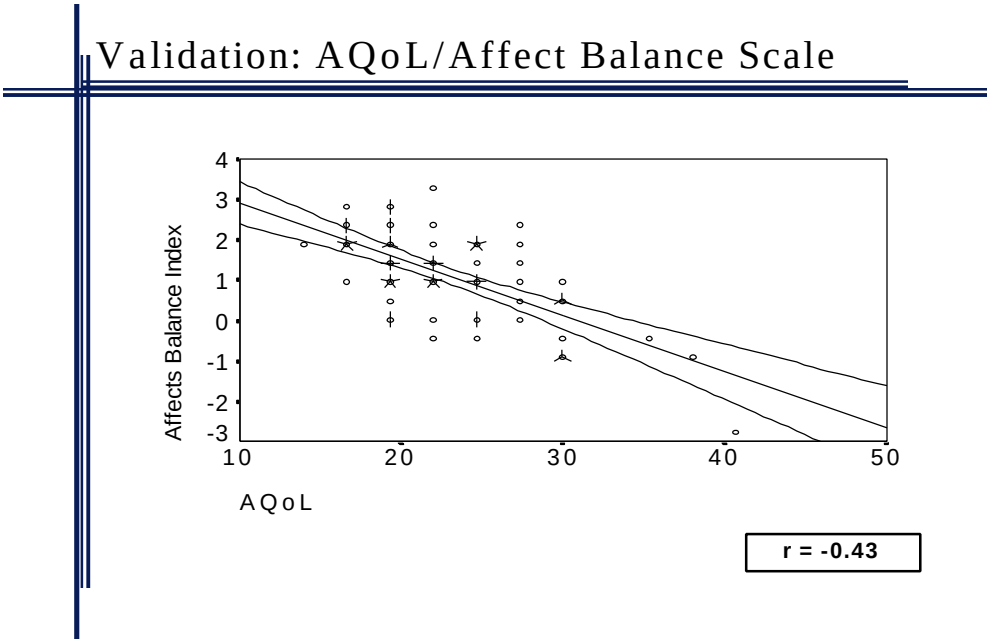


Figure 9

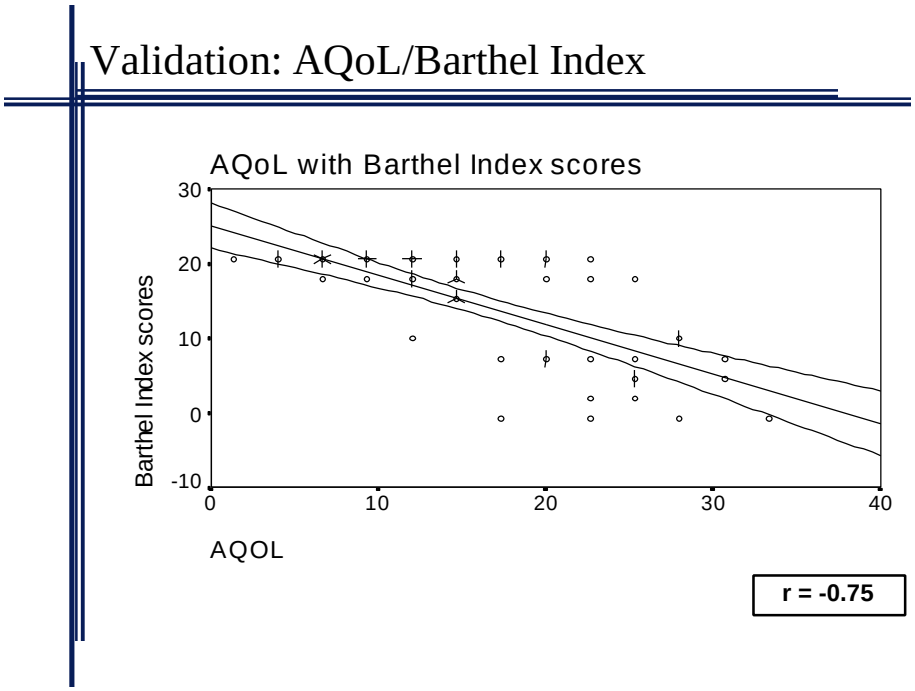
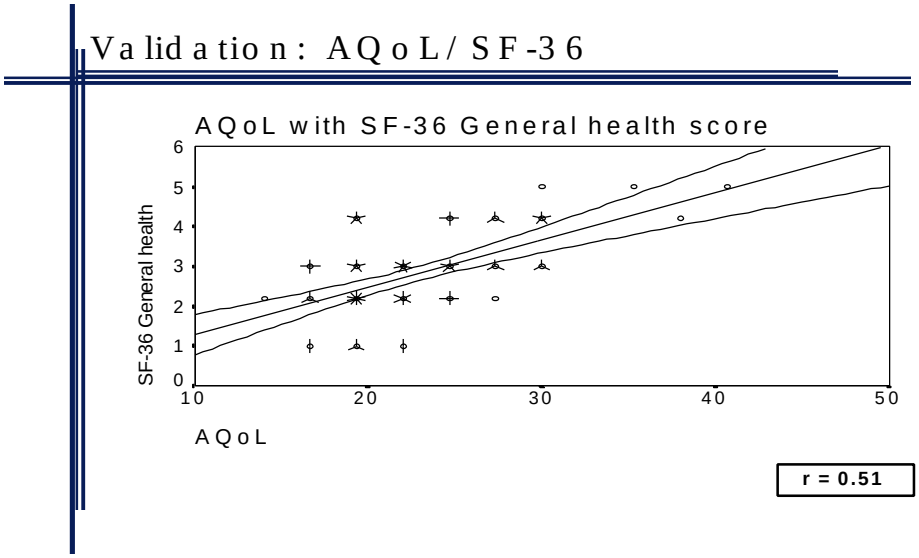


Figure 8 shows the relationship between AQoL and ABS scores, Figure 9 AQoL and Barthel Index scores, and Figure 10 AQoL and SF-36 general health scores. The data in Figure 8 are from 80 people attending a stress management program, and the data in Figures 9 & 10 are from 60 stroke victims assessed by a clinician at three and six months afterwards.

As shown in the three figures, the correlations between AQoL scores and the criterion scores

Figure 10



were as expected, given the different instruments were tapping into different aspects of HRQoL. However, the figures would suggest that the AQoL is sensitive to different affective state levels, that it is sensitive to different levels of functional capability, and it discriminates between those with different levels of general health

4 Utility Weights

The validity of a multi-attribute utility (MAU) instrument depends upon the achievement of preference independence such that utility scores on each dimension are independent of the other dimensions' scores (Feeny, Torrance et al. 1996). In addition, if there is a high correlation between attributes, some attribute may then be 'doubled counted' (Winterfeldt and Edwards 1986). The first property is usually assumed or achieved by careful item selection (Feeny, Torrance et al. 1996). The second requirement appears to have been largely ignored in the literature. The AQoL satisfies this property through the orthogonality of its dimensions, as described in Sections 2 & 3 above.

The character of an MAU instrument will reflect three key decisions; *viz*, (1) which scaling method is used to quantify health states (standard gamble, time tradeoff, rating scale, etc); (2) what form of model is employed to combine item scores (additive, multiplicative or statistical interpolation from the values of a limited number of health states); and (3) the relationship between the initial model scores and utility scores on a life-death scale (direct utility measurement or linkage between the model and a life death scale).

For reasons discussed by Richardson (1994) and Dolan et al (1996) scaling was carried out using the time tradeoff technique. Interviews were conducted with a random sample of 350 Victorians within electoral divisions stratified to represent the Australian population. Respondents were asked to evaluate each item response on an 'item best-worst' response scale; the item worst response was evaluated on a 'dimension best-worst' scale; dimension all worst health states and the instrument all worst health state were measured on a 'normal health-death' scale.

The AQoL adopted the hierarchical model structure shown in Figure 7 as this reduced the (inevitable) tradeoff between instrument sensitivity and the need for response orthogonality noted above. This latter property was achieved between dimensions. Within dimensions there was no attempt at achieving item independence, thereby allowing greater descriptive accuracy. The possibility of double counting was overcome by limiting the possible disutility from each dimension to the disutility of the dimension all worst health state as independently measured.

The AQoL measures approximately 1.1 billion health states and, consequently, direct utility measurement of each state is impossible. Of the two feasible MAU models available—additive and multiplicative—the latter is significantly more flexible and was adopted for modelling each of the five dimensions and the overall instrument score.

The multiplicative model creates a score between 100–0. This must be recalibrated on a 'normal health-death' scale. This has previously been carried out using the single value of the instrument

'all worst health' state on a 'full health-death' scale. If this value is incorrect then all of the MAU values will be systematically biased. When this approach was used with the AQoL a result was obtained which (as elsewhere) predicted lower MAU scores than those directly observed. As a consequence the final utility scores were computed from the five (independent) utility values of the five dimension 'all worst health' states. While this resulted in significantly higher utility values these have not, to date, been independently validated.

Dis-value (DV) results for the 15 items are given in Figure 11, where these were constrained between 0–1. These may be inserted in the five following multiplicative equations—the dimension formulae—to estimate an index number for each dimension's utility (on a 100–0 scale, where 100 and 0 represent the index number for the dimension 'all worst' and 'all best' respectively).

Figure 11

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Item dis-utility values

Dimension	Item	Health level			(I_i)
		1	2	3	4
Illness	1.	0.000	0.328	0.534	1.000
	2.	0.000	0.269	0.467	1.000
	3.	0.000	0.166	0.440	1.000
Independent	4.	0.000	0.154	0.403	1.000
Living	5.	0.000	0.244	0.343	1.000
	6.	0.000	0.326	0.415	1.000
Social	7.	0.000	0.169	0.396	1.000
Relationships	8.	0.000	0.095	0.191	1.000
	9.	0.000	0.147	0.297	1.000
Physical	10.	0.000	0.145	0.288	1.000
Senses	11.	0.000	0.253	0.478	1.000
	12.	0.000	0.219	0.343	1.000
Psychological	13.	0.000	0.107	0.109	1.000
Wellbeing	14.	0.000	0.141	0.199	1.000
	15.	0.000	0.104	0.312	1.000

Dimension formulae

1. Illness

$$DU_1 = 1.1641\left[1-\left(1-0.3350I_1\right)\left(1-0.5927I_2\right)\left(1-0.4896I_3\right)\right]$$

Equation 1

2. Independent living

$$DU_2 = 1.0989\left[1-\left(1-0.6097I_4\right)\left(1-0.4641I_5\right)\left(1-0.5733I_6\right)\right]$$

Equation 2

3. Social relationships

$$DU_3 = 1.0395\left[1-\left(1-0.7023I_7\right)\left(1-0.6253I_8\right)\left(1-0.6638I_9\right)\right]$$

Equation 3

4. Physical wellbeing

$$DU_4 = 1.6556\left[1-\left(1-0.2476I_{10}\right)\left(1-0.2054I_{11}\right)\left(1-0.3382I_{12}\right)\right]$$

Equation 4

5. Psychological wellbeing

$$DU_5 = 1.2920\left[1-\left(1-0.1703I_{13}\right)\left(1-0.2554I_{14}\right)\left(1-0.6347I_{15}\right)\right]$$

Equation 5

For each dimension there are 64 possible health states, the utility value of which may be estimated either directly from equations 1–5, (where the values of I_i are the item disutility values in Figure 11) or from the disutility values in the look-up tables provided in Hawthorne and Richardson (Hawthorne, Richardson et al. 1997) (an example is given in Figure 12).

Note that 'utility' scores may be derived from the disutility scores using the formula

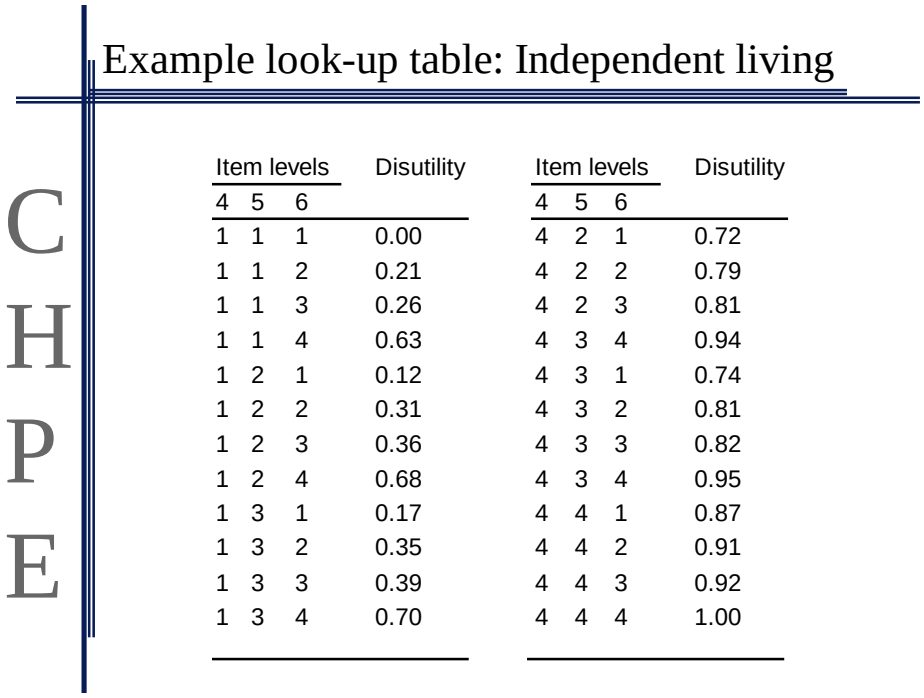
$$U = 1 - DU$$

Equation 6

where D and DU are the dimension utility and disutility values respectively. They represent 'utility' scores as they were derived using the TTO procedures[1]. However the scores are calibrated so that for each dimension the 'all best and 'all worst' utility scores take values of 1.00

[1] A distinction is sometimes drawn between 'utilities', derived from the standard gamble technique and 'values' derived from the TTO or other techniques which do not involve measurement 'under risk'. The validity of this distinction has been challenged (eg Winterfeldt and Edwards 1986 and Richardson 1994).

Figure 12



Example look-up table: Independent living

Item levels			Disutility	Item levels			Disutility
4	5	6		4	5	6	
1	1	1	0.00	4	2	1	0.72
1	1	2	0.21	4	2	2	0.79
1	1	3	0.26	4	2	3	0.81
1	1	4	0.63	4	3	4	0.94
1	2	1	0.12	4	3	1	0.74
1	2	2	0.31	4	3	2	0.81
1	2	3	0.36	4	3	3	0.82
1	2	4	0.68	4	3	4	0.95
1	3	1	0.17	4	4	1	0.87
1	3	2	0.35	4	4	2	0.91
1	3	3	0.39	4	4	3	0.92
1	3	4	0.70	4	4	4	1.00

and 0.00 respectively. This means that 'utilities' from different dimensions cannot be directly compared (as dimension 'all worst' health states do not have the same utility values on a life-death scale). For the same reason dimension utilities cannot be compared with utilities measured on a conventional scale where 1.00 and 0.00 represent full health and death respectively.

The five disutility values from the five dimensions may be combined to produce an overall utility score using Equation 7.

AQoL Utility score:

$$U = 1.22\left(1-.52DU_1\right)\left(1-.52DU_2\right)\left(1-.53DU_3\right)\left(1-.61DU_4\right)\left(1-.74DU_5\right)-0.22$$

Equation 7

The numbers obtained from the equation refer to utility values on a conventional scale where 1.0 and 0.0 refer to good health and death respectively.

5 Conclusion

Further work on the development and validation of the AQoL is currently underway. A formal validation study has commenced, using a stratified population sample representative of the Australian population. It is employing the leading utility instruments in this study, including the 15D, EuroQol, HUI-III and the health-profile SF-36 instrument. This will lead to publication of AQoL population norms which should greatly enhance its potential.

In addition, the AQoL will form the core around which a series of modules will be constructed, including several disease-specific modules, and modules for health promotion, adolescents, the aged, and Australian people from the non-English-speaking background communities characterised by very limited knowledge of English.

The AQoL is currently being employed or its use is planned in about 20 studies; including coordinated care in pharmaceuticals for the aged, two of the Commonwealth's coordinated care trials (one for the aged and the other for high-cost patients), several pharmacology trials, a stress management program, a study of stroke and its costs to the Australian community, research into the burden of Parkinson's disease, a study into breast cancer, a rehabilitation program for those suffering brain injury, a study into ocular disease, and a psycho-educational intervention for people receiving cardio-angioplasty. As data from these studies are collected and analysed, our understanding of the AQoL and its properties will rapidly expand.

* * * * *

As shown in this paper, the preliminary evidence suggests that a wide range of health states may be described by the AQoL's dimensions and that these dimensions broadly correspond with those found in the literature. The orthogonality of the dimensions supports the assertion that the AQoL is a valid descriptive system which may form the basis for a reliable, valid and sensitive HRQoL instrument. The findings also indicate that the psychometric instrument is suitable for scaling and validation as a QoL/QALY instrument.

The utility values given by Equations 1–5 may be used to produce a health profile. Results from Equation 6 may be used to estimate the total utility of different health states in a cost utility analysis. For the reasons noted earlier we recommend that these final utilities be used cautiously. To date they have not been independently validated.

7 Appendix: The AQoL Instrument

The attached version of the AQoL was designed for self-completion during an interview or through mail administration. A telephone administered version of the AQoL is available upon request.
The attached copy of the AQoL is for review purposes only, and prior to AQoL use, permission must be obtained from the authors.

THE Assessment of Quality of Life (AQOL) INSTRUMENT[2]

INSTRUCTIONS:

Please circle the alternative that best describes you during the last week.

ILLNESS

1 Concerning my use of prescribed medicines:

A. I do not or rarely use any medicines at all.
B. I use one or two medicinal drugs regularly.
C. I need to use three or four medicinal drugs regularly.
D. I use five or more medicinal drugs regularly.

2 To what extent do I rely on medicines or a medical aid? (NOT glasses or a hearing aid.)
(For example: walking frame, wheelchair, prosthesis etc.)

A. I do not use any medicines and/or medical aids.
B. I occasionally use medicines and/or medical aids.
C. I regularly use medicines and/or medical aids.
D. I have to constantly take medicines or use a medical aid.

3 Do I need regular medical treatment from a doctor or other health professional?

A. I do not need regular medical treatment.
B. Although I have some regular medical treatment, I am not dependent on this.
C. I am dependent on having regular medical treatment.
D. My life is dependent upon regular medical treatment.

INDEPENDENT LIVING

4 Do I need any help looking after myself?

A. I need no help at all.
B. Occasionally I need some help with personal care tasks.
C. I need help with the more difficult personal care tasks.
D. I need daily help with most or all personal care tasks.

5 When doing household tasks:
(For example, preparing food, gardening, using the video recorder, radio, telephone or washing the car)

A. I need no help at all.
B. Occasionally I need some help with household tasks.
C. I need help with the more difficult household tasks.
D. I need daily help with most or all household tasks.

6 Thinking about how easily I can get around my home and community:

A. I get around my home and community by myself without any difficulty.
B. I find it difficult to get around my home and community by myself.
C. I cannot get around the community by myself, but I can get around my home with some difficulty.
D. I cannot get around either the community or my home by myself.

SOCIAL RELATIONSHIPS

7 Because of my health, my relationships (for example: with my friends, partner or parents) **generally:**

A. Are very close and warm.
B. Are sometimes close and warm.
C. Are seldom close and warm.
D. I have no close and warm relationships.

8 Thinking about my relationship with other people:

A. I have plenty of friends, and am never lonely.
B. Although I have friends, I am occasionally lonely.
C. I have some friends, but am often lonely for company.
D. I am socially isolated and feel lonely.

9 Thinking about my health and my relationship with my family:

A. My role in the family is unaffected by my health.
B. There are some parts of my family role I cannot carry out.
C. There are many parts of my family role I cannot carry out.
D. I cannot carry out any part of my family role.

PHYSICAL SENSES

10 Thinking about my vision, including when using my glasses or contact lenses if needed:

A. I see normally.
B. I have some difficulty focusing on things, or I do not see them sharply.
(*For example: small print, a newspaper, or seeing objects in the distance.)*
C. I have a lot of difficulty seeing things. My vision is blurred.
(*For example: I can see just enough to get by with.)*
D. I only see general shapes, or am blind.
(For example: I need a guide to move around.)

11 Thinking about my hearing, including using my hearing aid if needed:

A. I hear normally.
B. I have some difficulty hearing or I do not hear clearly.
(*For example: I ask people to speak up, or turn up the TV or radio volume.)*
C. I have difficulty hearing things clearly.
(*For example: Often I do not understand what is said. I usually do not take part in conversations because I cannot hear what is said.)*
D. I hear very little indeed.
For example: I cannot fully understand loud voices speaking directly to me.

12 When I communicate with others:
(For example: by talking, listening, writing or signing)

A. I have no trouble speaking to them or understanding what they are saying.
B. I have some difficulty being understood by people who do not know me. I have no trouble understanding what others are saying to me.
C. I am only understood by people who know me well. I have great trouble understanding what others are saying to me.
D. I cannot adequately communicate with others.

PSYCHOLOGICAL WELL-BEING

13 If I think about how I sleep:

A. I am able to sleep without difficulty most of the time.
B. My sleep is interrupted some of the time, but I am usually able to go back to sleep without difficulty.
C. My sleep is interrupted most nights, but I am usually able to go back to sleep without difficulty.
D. I sleep in short bursts only. I am awake most of the night.

14 Thinking about how I generally feel:

A. I do not feel anxious, worried or depressed.
B. I am slightly anxious, worried or depressed.
C. I feel moderately anxious, worried or depressed.
D. I am extremely anxious, worried or depressed.

15 How much pain or discomfort do I experience?

A. None at all.
B. I have moderate pain.
C. I suffer from severe pain.
D. I suffer unbearable pain.