

**The Australian Quality Of Life  
(AQoL) Instrument:  
Initial Validation**

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# 1 Introduction

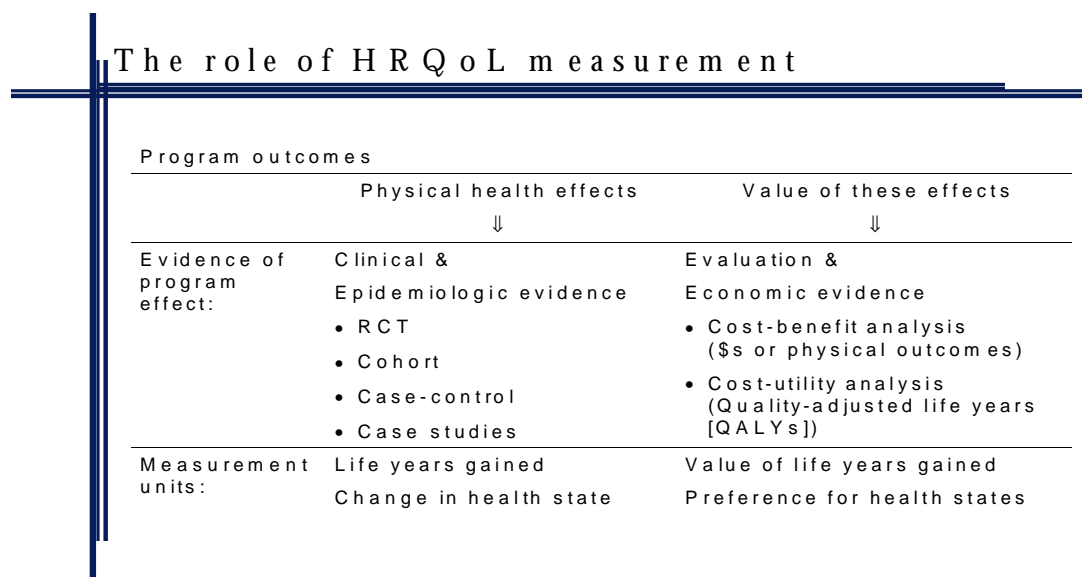
The Australian Quality of Life (AQoL) Project was undertaken to construct and validate a health-related quality of life instrument which would: a) be a psychometrically appropriate instrument for the evaluation of a range of health interventions, from the medical and pharmacological treatment of acute 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 and preliminary validation evidence with respect to the psychometric properties of the 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. 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. 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). 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. And an increasing conflict between the availability of 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. [1, 2]

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 outcome. 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. [3-5] The vast majority of these are disease-specific and cannot be used for the comparison of a broad range of interventions. There are a

Figure 1



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 a HRQoL index. Within the dimensions measured by these instruments the numerical values do not equate well with 'utility', as required for economic evaluations.

Only a handful of instruments exist incorporating the utility property, viz; the UK Rosser-Kind Index, [6] the US Quality of Wellbeing instrument, [7] the Canadian Health Utilities Instruments, [8] the Finnish 15D [9] and the European EuroQol. [10] Whilst these instruments have their strengths, to our knowledge none were constructed from psychometric principles with the intention of combining psychometric and utility measurement. Where psychometric and utility measurement is combined, the evaluation task as outlined can be greatly simplified.

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).

## 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.

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 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.

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. [11-13] 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. [13-15]

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, [16] 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, [17], HUI-III, [8, 18, 19] and 15D [20, 21]) and a standard health profile instrument (the SF-36 [22]). 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**

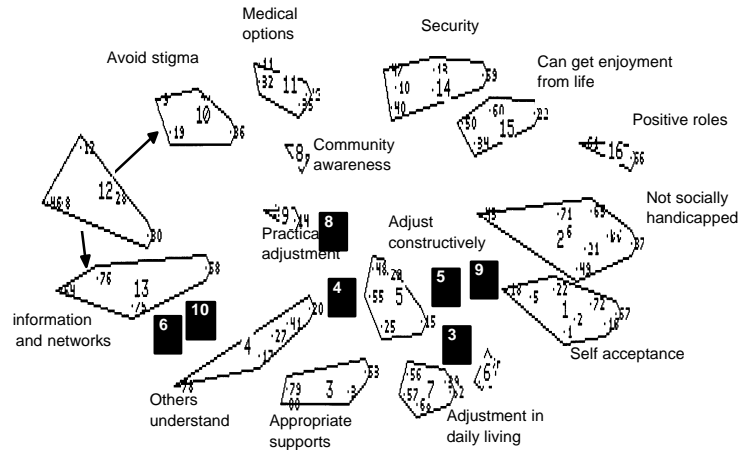
HRQoL dimensions	SF-36	AQoL	EuroQoL	HUI-III	15D
<b>Relative to the body</b>					
Anxiety/Depression	***	*	*		**
Bodily care	*	*	*	*	
Cognitive ability				*	*
General health	*****				
Memory					
Mobility					
Pain					
Physical senses					
Rest and relaxation					
Sensory					
<b>Social existence</b>					
Activities of daily living	0.08	0.87	0.07	0.17	-0.02
Communication	0.15	0.71	0.11	-0.03	0.17
Emotional well-being	0.27	0.76	0.08	0.14	0.13
Family and social relationships	0.02	0.06	0.84	0.12	-0.11
Family and intimate relationships	0.10	0.08	0.71	0.08	0.19
Intimate relationships	0.16	0.47	0.56	-0.06	0.18
Medical care	0.14	0.09	-0.05	0.67	-0.15
Medical care	0.14	0.08	0.14	0.79	0.13
Sexual health	-0.13	0.03	0.14	0.68	0.35
Social well-being	0.08	0.07	0.11	0.07	0.75
Work	0.11	0.01	0.46	0.16	0.64
	0.20	0.24	-0.16	0.04	0.53

**AQoL factor loadings**



Figure 5

## Coverage: SF-36 items & back pain



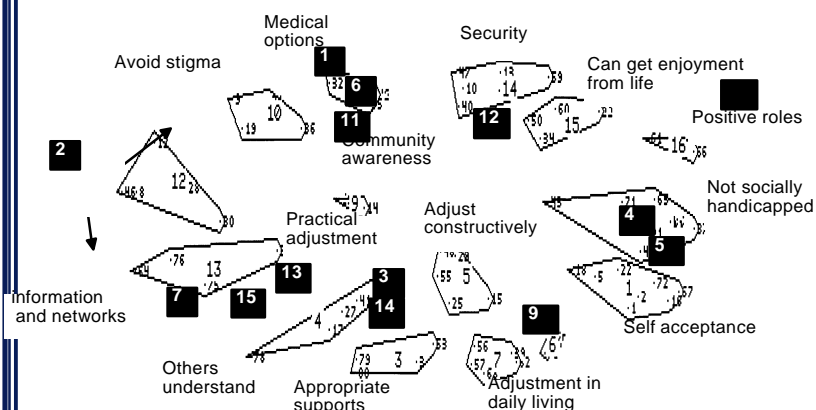
Source for Figures 5 & 6: Batterham (1997)

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. [23] 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

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

Figure 6

## Coverage: AQoL items & back pain



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) [13, 24]. 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). [25]. 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. [13, 24] Under these circumstances the loadings within the model also represent the correlations between the model components.

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 [13, 25].

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.

Figure 7

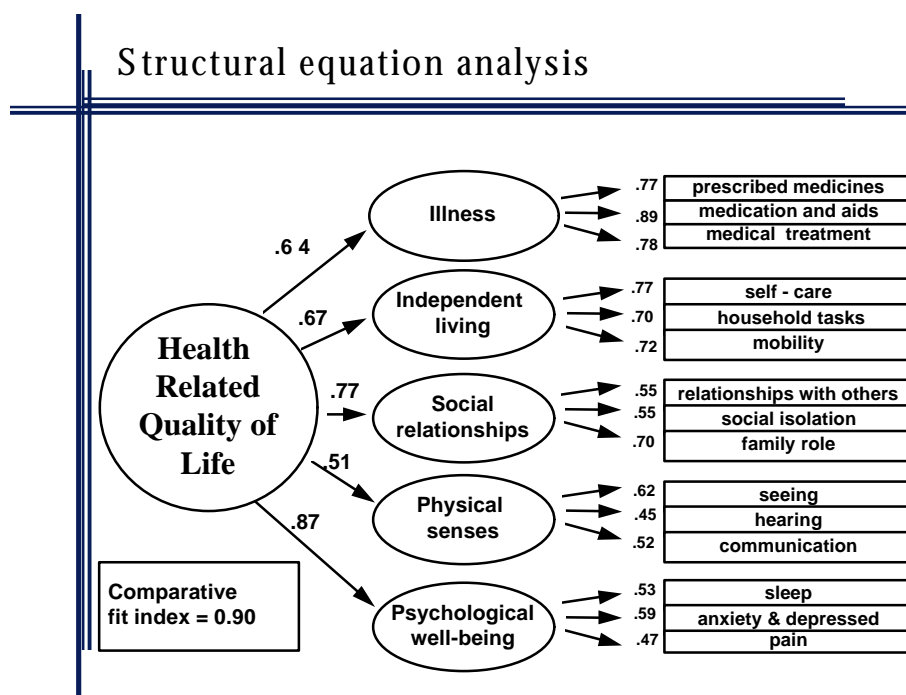
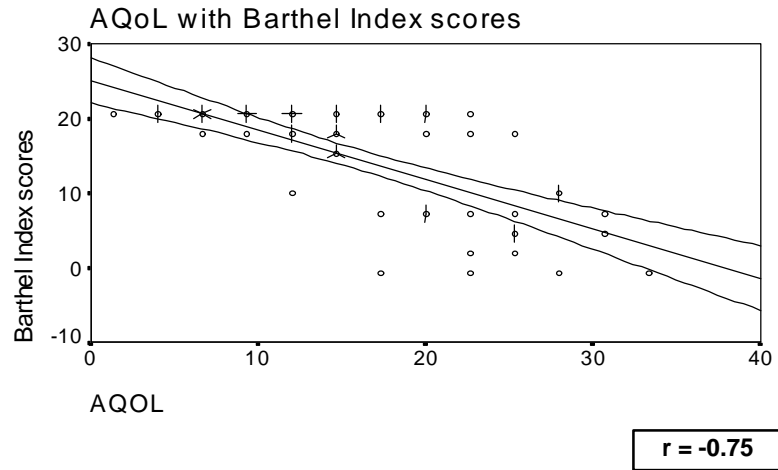


Figure 9

### Validation: AQoL/Barthel Index



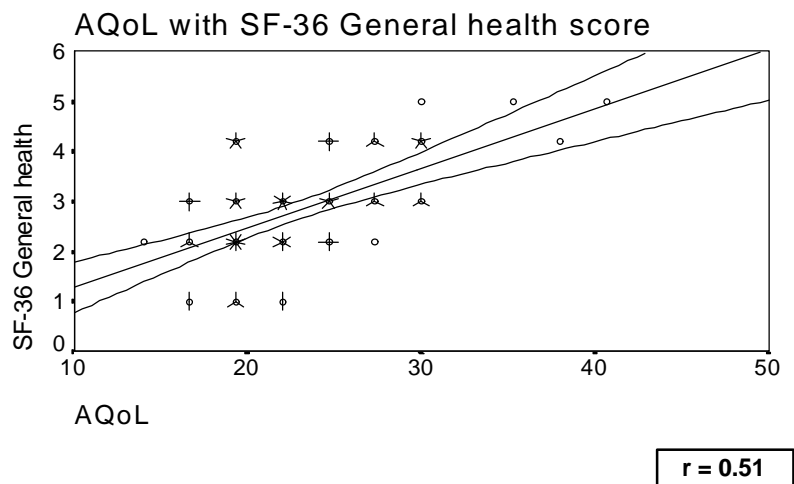
Some preliminary evidence is available regarding criterion (concurrent) validity, where the criteria were other independent measures. Three such measures, each measuring an important aspect of HRQoL, are presented here: a measure of mood (the Affects Balance Scale (ABS) [26]), a measure of functional status (the Barthel Index [27, 28]), and a measure of general health (the SF-36 [22]). 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 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

Figure 10

Fig

### Validation: AQoL/SF-36



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 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 Conclusion**

Work on further development and validation of the AQoL is continuing. This work includes the elicitation of utility weights from a random sample of 350 Victorians, within electoral divisions stratified to represent the Australian population. It is expected that publication of these values will take place in mid-1997. Once this is completed, the AQoL will be available for the economic assessment of programs, based on preferences for different health states.

A formal validation study is planned, using a stratified population sample representative of the Australian population. Subject to funding, it is proposed to employ 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 it is planned that the AQoL (as described in this paper) will form the core around which a series of modules will be constructed, including modules for health promotion, adolescents, the aged, NESB groups and several disease-specific modules.

The AQoL is currently being employed or its use is planned in studies of 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.

In the work so far—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 instrument is suitable for scaling and validation as a QoL/QALY instrument; this work is currently being undertaken.

In its present form as described in this paper the AQoL has sound psychometric properties and is ready for use in validation and evaluation studies as an unweighted HRQoL measure.

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## 6 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 *Australian Quality of Life* (AQOL) INSTRUMENT<sup>1</sup>

## **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.

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## **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.