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A comparison of 7 instruments in a small, general population

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ABSTRACT

Objectives: (a) To investigate the health related quality of life (HRQoL) of Bangladeshi migrants using 7 Multi-Attribute (MA) instruments: AQoL-8D, EQ-5D, SF-6D, HUI 3, PWI, SWLS and K-10, and (b) to compare the relative sensitivity of these instruments in a small ethnic community.

Method: Participants for this empirical study comprised Bangladeshi migrants living in Melbourne. Data were collected through a questionnaire designed for this study. Participants were recruited through community organisations, cultural groups, and businesses. The questionnaire was also administered by mail and face to face at different locations including community and social functions, family gatherings and individual households. Respondents who completed the questionnaire were aged between 18 and 65 years old.

Results: Over 50% of the participants possessed excellent or very good health and 83% did not have any significant illness. Both males and females were found to be more overweight but less obese compared with the Australian population. Some had 'high' or 'very high' levels of psychological distress. Analysis of quality of life compared with pre-migration revealed greater adaptation amongst the young, the educated, the employed and those on higher income.

The seven MA instruments were highly correlated. The recently developed AQoL-8D was most strongly correlated with the K-10, SF-6D, EQ-5D and PWI. The HUI 3 and EQ-5D had the greatest 'ceiling effect', ie produced the highest number of individuals in full health (91), AQoL-8D the fewest (25). A dimension specific comparison of instruments indicated that HUI 3 had least sensitivity in the domains of mental health and social relationships and AQoL-8D greatest.

Individual utility scores varied significantly at the individual level, producing very different frequency distributions. Weighting of the instruments had very little effect upon the correlation coefficients.

Conclusions: Despite a good overall level of health the instruments detected significant variation in HRQoL and its dimensions amongst the sample population. The instruments are related, but measure different constructs. EQ-5D and HUI 3 instruments are probably unsuitable for relatively healthy populations. AQoL-8D and EQ-5D are able to distinguish between the health states of such a population.

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1 Introduction

The health and quality of life of migrants provides an important insight into how people adapt to new environments: how they struggle to maintain old habits and customs without sacrificing what is important to them. Multi attribute (MA) instruments are a convenient and reliable way of conducting this research.

Numerous MA instruments are available to measure health related quality of life (HRQoL). These include a large number of psychometric, disease-specific instruments, as well as a small number of generic Multi Attribute Utility (MAU) instruments. These may be used to measure and evaluate the HRQoL of the general public and/or patients with or without the use of utility weights (Hawthorne, Richardson et al. 2003; Brazier, Roberts et al. 2004). With utility weights they may be used in economic analyses to produce the utility scores needed for the calculation of Quality Adjusted Life Years (QALYs), which are the unit of output in cost utility analysis (Torrance 1986). These multi attribute utility instruments (MAUI) include the Assessment of Quality of Life (AQoL)-8D, the EQ-5D (EuroQoL), the Short-Form Six-Dimension (SF-6D) and the Health Utilities Index (HUI 3). However, to date none of these instruments have been used for measuring the HRQoL of a small ethnic, although such communities are known to have unique health profiles.

The overall aim of this paper is to examine the HRQoL of Bangladeshi migrants in Melbourne using seven MA quality of life instruments – the above four MAUI plus the Satisfaction with Life Scale (SWLS), the Personal Wellbeing Index (PWI) and the Kessler Psychological Distress Scale (K-10). These last three instruments do not have utility weights but nevertheless measure aspect of quality of life. The specific aims of this paper are threefold: i) to compare the QoL of the Bangladeshi community with the Australian population; ii) to explore different aspects of this community related to their adaptation to their environment; and iii) to present a comparison of the instruments to assess the effectiveness of each in measuring the QoL among Bangladeshi migrants and thereby to conduct a test of the instrument's validity in this context.

1.1 Description of Bangladesh-Born Migrants

South Asian countries, particularly India, Pakistan, Bangladesh and Sri Lanka, which were formerly part of British India, have a history of migration dating back to the colonial period. In the last few decades migrants from South Asian countries have been settling down in developed countries including the USA, Canada, Western Europe and Australia. This movement is usually believed to be for reasons of employment, higher earnings, better education and training, better quality of life or greater political freedom (Sarmiento 1991).

Bangladeshi migrants comprise a small community in Australia. Following the end of the 'White Australia Policy' in 1976, only 66 Victorians were born in Bangladesh. Within 15 years the community had increased sevenfold to 519. Between 1991 and 2001 there was a dramatic increase in the number of arrivals from Bangladesh. By 2001, 1,418 Bangladesh-born people lived in Victoria (MuseumVictoria 2009). In 2009 the Bangladeshi community living in Melbourne is estimated to be approximately 4,000.

For the purposes of this study, Bangladeshi migrants include people with Bangladeshi parents, whether born in Bangladesh or overseas. The Bangladeshi community in Victoria is currently the second largest in Australia, after New South Wales. They are mainly concentrated in the local government areas of Monash, Maribyrnong, Moreland and Wyndham, with a high proportion of Bangladeshi migrants working as professionals in the fields of education, health and community services. The majority of Bangladeshi migrants, particularly males, are professional and well educated and have entered Australia under the category of 'skilled migration' (Khan 2003).

Recent literature suggests that migrants in general consistently report poorer HRQoL in host countries. Immigrants from Western Europe, Canada, Australia and New Zealand have health profiles that are better than those of their US-born counterparts (Singh 2001). It has been argued, and there is reason to believe, that migrant health will eventually resemble that of the host population (Benfante 1992; Pudaric 2000). In the short term, migrant health may differ markedly from the host population. However, when such studies are replicated in Australia, it is difficult to see the convergence of host and migrant health. It is believed that the non-convergence of migrants' health and wellbeing in Australia, particularly Bangladeshi migrants, is linked with a number of factors, including the process of adaptation and occupational adjustment in the host country.

The adaptation of social and cultural values in the host country by migrants has always been a challenge to the settlement process. It is suggested that social systems and other settings within migrant groups are central to the adaptation process as they provide opportunities for meaningful social engagement and participation in social roles (Sonn 2002). These settings can be conceptualised as activity settings (O'Donnell 1993) in which people spend time together and have opportunities and access to resources that facilitates the integration of identities and cultures into the new environment. Migrant groups create these settings to foster a sense of community and facilitate the adaptation and adjustment process. Length of residence is also identified as a determining factor for both social adaptation and the body mass index of the migrants in the host country (Sanchez-Vaznaugh, Kawachi et al. 2008).

With regards to Bangladeshi migrants, it has been reported that social and emotional disconnection, isolation and alienation, lack of recognition of professional skills, experiences of racism and discrimination, cultural incongruity, feelings of cultural uprooting and inadequate

English language competency, contribute to psychological distress and difficulties in adjustment to life in Australia (Munib 2006). The presence of co-ethnic communities, social support, networking, family cohesion, and retention of religious values and traditional cultural norms, has been associated with gradual acclimatization and successful resettlement in the host country. Networkings with the local Australian communities and acceptance of local cultural values have also been identified as important factors for promoting socio-cultural integration. In general, these factors appear to exert a protective effect against psychological distress in South-Asian migrants.

1.2 Seven Multi-Attribute Quality of Life Instruments

Selecting between preference-based MA instruments for measuring HRQoL in particular contexts is an important area for research. Even where instruments purport to measure the same thing, they may not be interchangeable. While some work has been done comparing the validity and sensitivity of alternative instruments (Hawthorne, Richardson et al. 2003), to date no multi-instrument comparison has been made for a small ethnic community. In this paper seven multi-attribute quality of life instruments have been selected because of their widespread use and a prior suitability.

The AQoL-8D instrument was developed at the Centre for Health Economics (CHE) at Monash University. The instrument consists of the eight dimensions and 35 items. The number of items and the number of responses per item vary. The dimensions and items are summarised in Box 1. The full instrument may be obtained from the CHE website (http://www.buseco.monash.edu.au/centres/che/).

Box 1 AQoL-8D instrument

Dimension	Items
Independent Living	1. Household tasks; 2. Mobility outside the home; 3. Walking; 4. Self-care
Life Satisfaction	5. Content of life; 6. Enthusiasm; 7. Degree of feeling happiness; 8. Pleasure
Mental Health:	9. Feelings of depression; 10. Trouble of sleeping; 11. Feeling of angry, 12. Self-harm, 13. Feeling of despair; 14. Worry; 15. Sadness; 16. Tranquility/agitation;
Coping:	17. Having enough energy; 18. Being in control; 19. Coping with problems;
Relationships:	20. Enjoying relationship with family and friends; 21. Close relationship with family and friends; 22. Social isolation, 23. Social exclusion; 24. Intimate relationship; 25. Family role; 26. Community role;
Self-worth:	27. Feeling burden; 28. Worthless, 29. Confidence;
Pain:	30. Experience of serious pain; 31. The degree of pain; 32. The interference with usual activities caused by pain;
Senses:	33. Vision; 34. Hearing; 35. Communication

The EQ-5D (EuroQoL) is a standardised instrument which was developed by a multi-disciplinary group of researchers from seven centres across five countries for use as a measure of health outcome (EuroQoL Group 1990).

The SF-6D was derived from the SF-12 and SF-36. The SF-36 has become the most widely used measure of general health in clinical studies throughout the world. The SF-6D focuses more on social functioning, while the EQ-5D gives more weight to physical functioning. Both instruments give similar weight to pain and mental health.

The Health Utilities Index Mark 3 (HUI 3) is a prominent measure of HRQoL and widely used in population health surveys, clinical studies and cost utility analyses, especially in Canada, where it originated. The HUI 3 has been used to assess health status in a number of chronic conditions.

The Kessler Psychological Distress Scale (K-10) dates from 1992. It has been widely used in the USA as well as in Australia. The K-10 scale is based on 10 questions (items) related to negative emotional states experienced by individuals during the past four week period. There are five response levels for each item based on the amount of time the respondent reports experiencing the particular problem.

The Personal Wellbeing Index (PWI) was developed from the Comprehensive Quality of Life Scale (ComQol). The PWI scale contains nine items relating to life satisfaction, each one corresponding to a quality of life domain. It comprises: standard of living, health, achieving in life, relationships, safety, community connectedness, future security, spirituality/religion and the level of satisfaction as a whole.

The Satisfaction with Life Scale (SWLS) uses five key statements associated with the level of satisfaction relating to the quality of life. Examples include: ‘in most ways life is close to ideal’; ‘the conditions of life are excellent’; ‘satisfied with life’; ‘so far gotten the things wanted in life’; and ‘if I could live my life over, I would change almost nothing’.

Table 1 Characteristics of 7 the Multi-Attribute Instruments

Instrument	Dimensions	No of items	Response level	Unweighted		Utility Scores	
				Min	Maximum	Minimum	Maximum
AQoL-8D	8	35	4 to 6	0	1	0.42	1.0
EQ-5D	5*	5	3	0	1	0.60	1.0
SF-6D	6*	6	4 to 6	0	1	0.60	1.0
HUI 3	8*	8	5 to 6	0	1	0.04	1.0
K10	10*	10	5	0	1	0.35	1.0
SWLS	5*	5	7	0	1	0.00	1.0
PWI	9*	9	10	0	1	0.10	1.0

* Number of Dimension is the same as number of items

The characteristics of these seven multi-attribute instruments, including the number of dimensions, items and response levels are reported in Table 1. This paper does not directly evaluate or assess the validity of these instruments but uses the instrument’s score to examine the relationships between the instruments. Both ‘unweighted’ and weighted utility weights were employed for comparative purposes. For all seven MA instruments, unweighted scores were obtained from the item responses from the participants using the following formula:

$$Score = 1 - \left(\frac{X - X_{\min}}{X_{\max} - X_{\min}} \right) \quad \ldots \quad (1)$$

Where x = Individual's total score from summing the response category rank; x_{min} = Instrument's total minimum score; x_{max} = Instrument's total maximum score. This simple algorithm results in values which vary between 1.0 and 0.0. Utility weights for the MAU instruments were obtained from the relevant algorithms.

2 Methods

This is an empirical study where the data is collected from primary sources. An open invitation to participate in the project, stating the brief aims and objectives of the study, eligibility, remuneration and how to participate, was prepared and distributed throughout the Bangladeshi community through the leaders of community organisations, cultural groups, family and friends, and community businesses, eg grocery shops and restaurants. Three hundred hard copy questionnaires were posted or distributed among the potential participants in five SEIFA (Socio Economic Indicators for Areas) groups to obtain a representative sample. The contents of the questionnaire are summarised in Box 2.

Box 2 Contents of the Questionnaire

- Assessment of Quality of Life (AQoL) 8D
- EQ-5D
- SF-6D
- HUI 3
- Personal Wellbeing Index (PWI)
- Satisfaction with Life Scale (SWLS)
- Kessler Psychological Distress Scale (K-10)
- Socio demographics and employment
- Lifestyle (smoking, alcohol use, physical exercise, weight concern, main meal, communication with relatives)
- Length of stay, postcode, and overall QoL compared to pre-migration

Upon agreement, people were given the registration form, explanatory statement and a soft copy of the questionnaire. When preferred, a hard copy of the questionnaire was posted to respondents with a pre-paid response envelope for its return. The questionnaire was also administered face to face among a sample of Bangladeshi migrants at different locations in Melbourne, including community and social functions, family gatherings and individual households. Secondary data also was collected from published and unpublished materials including the Australian Bureau of Statistics (ABS).

Upon receipt of the completed questionnaire from respondents, data was checked and edited before entry into SPSS (Statistical Package for the Social Sciences) for analysis. In the case of error or omission, the questionnaire was returned for completion. There was a random 20% data check on all variables. Analysis included comparison of descriptive statistics, correlation, ANOVA and logistic regression. More complex comparisons of instrument content are described in Section 4.

3 Results of Survey

In total 166 people expressed interest in participating in the research, of whom 158 completed the questionnaire, constituting a response rate of 95%. The response rate by question varied from a low of 98.7% (respondent's weight) to 100% to all other selected variables. The sample size of 158 permits a power of 80% and effect size of 22% (.22) at the 5% level (using a two tailed test) (Burns and Grove 2001). Results reported below are based upon data from all 158 respondents.

3.1 Socio-Demographic Characteristics

Table 2 reports participants' demographic and social characteristics. There were more males (54%) than females (46%) and most of them were married (78%), living with family (85%) and were born in Bangladesh (96%). The age distribution shows a similar proportion in each age group to the Australian population except for the larger number of young adults aged 25-34 and the much smaller proportion above the age of 55 (which reflects the recent history of immigration from Bangladesh).

Table 2 Demographics of the participants

Variables	Description	Gender		Total		Aust Standard (%) *
		Male	Female	No	% 18-64	
Gender	Male (Female)	53.8	46.2	158	100	48.9 (51.1)
Age Group	18-24 years	15.3	13.7	23	14.6	11.3
	25-34 years	37.6	32.9	56	35.4	22.3
	35-44 years	17.6	26	34	21.5	24.6
	45-54 years	27.1	26	42	26.6	23.5
	55-64 years	2.4	1.4	3	1.9	18.3
	Total	85	73	158	100	100.0
Marital Status	Married	70.6	86.3	123	77.8	
	Single	28.2	11	32	20.3	
	Divorced or Separated	1.2	2.7	3	1.9	
	Total	85	73	158	100	
Living arrangement	By myself	7.1	1.4	7	4.4	
	Family including parents/husband/wife/partner/children	75.3	95.9	134	84.8	
	Friends/shared accommodation	17.6	1.4	16	10.1	
	Other	0	1.4	1	0.6	
	Total	85	73	158	100	
Country of Birth	Australia	2.4	1.4	3	1.9	
	Bangladesh	95.3	97.3	152	96.2	
	Libya	0	1.4	1	0.6	
	Philippines	1.2	0	1	0.6	
	Other	1.2	0	1	0.6	
	Total	85	73	158	100	
SEIFA Group	1	20.1	16.4	29	18.4	
	2	9.4	8.2	14	8.9	
	3	30.6	27.4	46	29.1	
	4	30.6	34.2	51	32.3	
	5	9.4	13.7	18	11.4	
	Total	85	73	158	100	

*Percent of the age range covered by the survey. This excludes people under 18 or over 64 years of age.

The geographical distribution of participants according to SEIFA group, defined by the Socio-Economic Status (SES) of the respondents' postcode, indicated that the majority of Bangladeshi migrants (57%) were from the lower three SEIFA groups (1 to 3) and the remaining 43% were from the higher groups (4 and 5). A lower number indicates more disadvantaged and a higher number indicates a higher level of SES.

Education, employment and income of the participants are reported in Table 3. Most of the migrants are well qualified. About 91% had graduate or postgraduate degrees (compared to 30% of the Australian population). Only 6% had only completed year 12 or equivalent. About 50% were employed full time, 24% were part-time and 12% were unemployed. Males had more full-time and females had more part-time employment. About two-thirds of males (30% of females) had full-time and 36% of females (13% of males) had a part-time position. The 12% unemployment rate for Bangladesh-born migrants was higher than the Australian national unemployment rate (5.8% in July 2009). The unemployment rate for females was nearly double (15%) that of males (8.3%). About 33% of the respondents had a weekly household income of $650 to $1399 and 42% had income more than $1400 per week.

Table 3 Education, Employment and Income Distribution of the Participants

Variables	Description	Gender		Total	
		Male	Female	No	%
Highest Level of Education	High school	1.2	0	1	0.6
	Completed year 12 or equivalent	2.4	9.6	9	5.7
	Certificate/ Trade qualification	1.2	0	1	0.6
	Advanced diploma/ TAFE	0	4.1	3	1.9
	Bachelor/graduate diploma	27.1	46.6	57	36.1
	Postgraduate degree	68.2	39.7	87	55.1
	Total	85	73	158	100
Employment Status	Full-time: self employed or employee	66.7	30.1	78	49.7
	Part-time or casual: self employed or employee	13.1	35.6	37	23.6
	Unemployed, seeking work	8.3	15.1	18	11.5
	Not in the labour force/retired/pensioner	0	1.4	1	0.6
	Full time carer	1.2	0	1	0.6
	Student	9.5	9.6	15	9.6
	Other	1.2	8.2	7	4.5
	Total	84	73	157	100
Gross household income	Below $150.00pw	4.8	4.2	7	4.5
	$150 to $349pw	6	2.8	7	4.5
	$350 to $$649pw	15.5	15.3	24	15.4
	$650 to $1399pw	36.9	29.2	52	33.3
	$1400 to $1999pw	15.5	27.8	33	21.2
	Above $2000pw	21.4	20.8	33	21.2
	Total	84	72	156	100

3.2 Respondent's Self-reported health and illness

Bangladesh-born migrants' self-reported health, general health conditions, illness and psychological distress are reported in Tables 4 to 8. When a participant was asked to rate their health, for someone of their age, 13% reported 'excellent', 40% responded 'very good', 37% reported 'good', and 7.6% said 'fair'. Only 3.2% reported that they had 'poor' health and none had 'very poor' health (Table 4). Within the gender group, males and females had similar health.

Table 4 Self-reported health of the migrants

Current level of health	Response	Gender		Total	
		Male	Female	No	%
How would you rate your current level of health, for someone of your age?	Excellent	7.1	19.2	20	12.7
	Very good	41.2	38.4	63	39.9
	Good	40	32.9	58	36.7
	Fair	7.1	8.2	12	7.6
	Poor	4.7	1.4	5	3.2
	Total	85	73	158	100

However, the self assessment as ‘excellent’ was much more common for females (19%) than males (7%) while males were slightly more inclined to report ‘very good’ and ‘good’ conditions.

Table 5 reports general health conditions for the participants. About three quarters of all participants believe they are ‘as healthy as anybody’ and ‘do not get sick easier than other people’. Only 8% expect their health to get worse. When asked ‘Do you currently have a significant illness?’ 83% responded ‘no’ and 17% said ‘yes’. Within the gender group males and females had similar responses (Table 6).

Table 5 General health conditions of the Bangladesh migrants

General health conditions	Response	Gender		Total	
		Male	Female	No	%
I seem to get sick a little easier than other people	Mostly true	10.6	11	17	10.8
	Don’t know	18.8	15.1	27	17.1
	Mostly false	48.2	41.1	71	44.9
	Definitely false	22.4	32.9	43	27.2
	Total	85	73	158	100
I am as healthy as anybody I know	Definitely true	17.6	21.9	31	19.6
	Mostly true	57.6	61.6	94	59.5
	Don’t know	18.8	8.2	22	13.9
	Mostly false	4.7	5.5	8	5.1
	Definitely false	1.2	2.7	3	1.9
	Total	85	73	158	100
I expect my health to get worse	Definitely true	1.2	0	1	0.6
	Mostly true	9.4	4.1	11	7
	Don’t know	43.5	37	64	40.5
	Mostly false	18.8	19.2	30	19
	Definitely false	27.1	39.7	52	32.9
	Total	85	73	158	100

Table 6 Whether suffer from any significant illness

When asked	Response	Gender		Total	
		Male	Female	No	%
Do you currently have a significant illness?	No	82.4	83.6	131	82.9
	Yes	17.6	16.4	27	17.1
	Total	85	73	158	100

Table 7 Self-reported health and demographic characteristics

Age Group/ Education/ Income	How would you rate your current level of health, for someone of your age? (%)					Total	
	Excellent	Very good	Good	Fair	Poor	No.	%
18-24 years	30.0	12.7	10.3	8.3	40.0	23	14.6
25-34 years	45.0	33.3	34.5	50.0	0.0	56	35.4
35-44 years	15.0	19.0	27.6	16.7	20.0	34	21.5
45-54 years	10.0	33.3	24.1	25.0	40.0	42	26.6
55-64 years	0.0	1.6	3.4	0.0	0.0	3	1.9
Total (N)	20	63	58	12	5	158	100.0
High school	0.0	1.6	0.0	0.0	0.0	1	0.6
Completed year 12 or equivalent	20.0	4.8	1.7	0.0	20.0	9	5.7
Certificate/ Trade qualification	0.0	1.6	0.0	0.0	0.0	1	0.6
Advanced diploma/ TAFE	0.0	0.0	5.2	0.0	0.0	3	1.9
Bachelor/graduate diploma	45.0	28.6	36.2	58.3	40.0	57	36.1
Postgraduate degree	35.0	63.5	56.9	41.7	40.0	87	55.1
Total (N)	20	63	58	12	5	158	100.0
Below $150.00pw	5.3	8.1	6.9	16.7	0.0	12	7.7
$150 to $349pw	0.0	6.5	3.4	16.7	20.0	9	5.8
$350 to $$649pw	31.6	14.5	22.4	8.3	20.0	30	19.2
$650 to $1399pw	26.3	25.8	31.0	50.0	40.0	47	30.1
$1400 to $1999pw	15.8	24.2	17.2	8.3	20.0	30	19.2
Above $2000pw	21.1	21.0	19.0	0.0	0.0	28	17.9
Total (N)	19	62	58	12	5	156	100.0

Table 8 Level of Psychological Distress by Gender

Level of Psychological Distress	Gender		Total		National Health Survey 2001	
	Male	Female	No	%	Male	Female
Low (10 - 19)	68.2	72.6	111	70.3	85.8	79.6
Moderate (20 - 24)	16.5	17.8	27	17.1	8.3	10.6
High (25 - 29)	9.4	8.2	14	8.9	3.1	5.5
Very High (30 - 50)	5.9	1.4	6	3.8	2.7	4.4
Total	85	73	158	100	100	100

Self-reported health was also analysed according to participant's age, education and income. Table 7 shows that respondents who reported 'excellent' health were aged 34 years or less (75%), graduate or postgraduate degree holders (80%), and had income more than $1400 or more (37%). Fair and poor health is associated with older age groups (35 to 54 years) and low income (less than $1400 pw) people.

The level of psychological distress by gender is reported in Table 8. The Victorian Population Health Survey (2001) adopted the following set of cut-off scores and the prevalence of levels of psychological distress: 10 – 19 (Low); 20 – 24 (Moderate), 25 – 29 (High); and 30 -50 (Very High). The data show that most of the Bangladeshi participants had low levels of psychological distress - 68% of males and 73% of females. But the percentages are smaller than for the better off Australian population (86% for males and 80% for females). In contrast, more males and females had moderate distress and marginally more had 'high' or 'very high' levels of distress than in the Australian population (Table 8).

3.3 Lifestyle of the Migrants

The lifestyle of Bangladeshi migrants was defined to include physical exercise, concern with own weight, Body Mass Index (BMI), alcohol use, smoking behaviour, main meal, social participation and engagement, and communication with relatives. The lifestyles of the participants, so defined, are reported in Tables 9 to 11. Table 9 shows that Bangladeshi migrants were very concerned (28%) with their weight (either all of the time or most of the time) but did not do intense regular exercise. Only 11% (15% male 7% female) of the respondents reported that they had regular intense physical exercise, and 74% had moderate exercise. About eight in ten reported that they never drank alcohol or smoked cigarettes. The proportion of females reporting non-smoking and non-drinking was a little higher than males. It appears that they acquired these habits from their parents because nearly all of the respondent's parents (83% and 93% respectively) do not smoke or drink alcohol. About 97% of smokers started smoking with friends and close associates. About 91% of respondents said they usually eat home-cooked traditional Bangladeshi meals on most days. Most of the Bangladesh-born migrants (82%) had daily or weekly telephone or physical contact with family members who are not living with them.

The BMI of the respondents is reported in Table 10. This shows that about 50% of Bangladeshi migrants were either overweight or obese. Males were found to be more overweight than females. Both males and females were found to be more overweight but less obese when compared with the Australian population.

Table 11 presents respondents' participation, social engagement and commitments. When asked about participation, 37% said they help a local group as a volunteer and 49% had attended a local community event in the past six months. About 27 were active member of a local club, 17% were on a local group management committee and 19% had participated in community action to deal with an emergency in the past 3 years.

3.4 Effect of Migration

Length of stay in the host country is important for the adaptation process and occupational adjustment of migrants. The majority of Bangladeshi migrants are relatively new in Australia. About 54% of the respondents had lived less than 10 years and 46% 10 or more years in Australia. The BMI and psychological distress level of migrants were analysed by the length of stay (using ANOVA). Table 12 reports the results. It reveals that length of stay has a significant effect on BMI and K-10 scores. The mean varies from a low of 23.3 in the 10 to 14 year category to a high of 26.5 in the 5-9 year group for BMI, and 13.5 in the 15+ years to a high of 17.8 in the 5 year group for the K-10 score (sig 0.001 and 0.005 respectively).

Finally, migrants' overall quality of life compared to their pre-migration situation was analysed using socio-economic status and lifestyle as explanatory variables. The dependent variable had a value of 1.00 for an improved life as compared with pre-migration. The independent variables are shown in Table 13. Table 14 reports the result of the logit analyses. This indicates that age, education, employment and income are all associated with the likelihood of a person's QoL being greater than pre-migration. As expected, adaptation is more likely amongst the young, well educated, the employed and those with higher incomes. Unexpectedly the length of time since migration was not strongly associated, possibly reflecting a correlation with employment. BMI and smoking had no effect.

Table 9 Lifestyle of Bangladesh-born Migrants by Gender

Variables	Response	Gender		Total	
		Male	Female	No	%
Do you do any physical exercise during leisure time?	Regular - Intense	15.3	6.8	18	11.4
	Moderate - Sometimes	68.2	80.8	117	74.1
	Inactive - Never	16.5	12.3	23	14.6
	Total	85	73	158	100
Are you concerned with your weight?	All of the time	9.4	15.1	19	12.0
	Most of the time	21.2	9.6	25	15.8
	Some of the time	40	38.4	62	39.2
	A little of the time	20	19.2	31	19.6
	None of the time	9.4	17.8	21	13.3
	Total	85	73	158	100
How often do you have a drink containing alcohol?	Never	70.6	82.2	120	75.9
	Monthly or less	14.1	11	20	12.7
	2-3 times a month	10.6	6.8	14	8.9
	2-3 times a week	4.7	0	4	2.5
	Total	85	73	158	100
Do either of your parents drink alcohol?	Yes	5.9	8.2	11	7
	No	94.1	91.8	147	93
	Total	85	73	158	100
What is your current smoking status?	Never smoked	62.4	97.3	124	78.5
	Smoking daily	12.9	0	11	7
	Smoking occasionally	9.4	2.7	10	6.3
	Now quit	15.3	0	13	8.2
	Total	85	73	158	100
With whom did you first smoke?	By myself	3.3	0	1	3.1
	With friends/close associates	96.7	100	31	96.9
	Total	30	2	32	100
Do either of your parents smoke?	Yes	20	13.7	27	17.1
	No	80	86.3	131	82.9
	Total	85	73	158	100
What do you usually take as your main meal in most days?	Home cooked traditional Bangladeshi meal (rice/curry etc)	89.4	93.2	144	91.1
	Aussie food (steak, chicken, sausages, bread, mashed potato	4.7	4.1	7	4.4
	Different ethnic traditional food at restaurant	4.7	2.7	6	3.8
	Take away food from fast-food restaurant	1.2	0	1	0.6
	Total	85	73	158	100
How often do you see or talk to family members other than those who are living with you?	Daily	25.9	30.1	44	27.8
	Every week	52.9	54.8	85	53.8
	Every month	18.8	9.6	23	14.6
	Every few months	0	5.5	4	2.5
	Seldom or never	2.4	0	2	1.3
	Total	85	73	158	100

Table 10 BMI of Bangladesh-born migrants by Gender

BMI Categories	Gender		Total		Australian population 2007	
	Male	Female	No	%	Male (%)	Female (%)
Underweight (<20)	3.6	9.7	10	6.4	1.1	4.6
Normal (20.0 - 24.99)	41.7	47.2	69	44.2	40	50.8
Overweight (25.0 - 29.99)	45.2	37.5	65	41.7	41.3	26.2
Obese (30 +)	9.5	5.6	12	7.7	17.6	18.5
Total	84	72	156	100		

Table 11 Participation, Social Engagement and Commitment (N = 158)

When asked about participation	Response	
	Yes (%)	No (%)
Do you help out a local group as a volunteer?	36.7	63.3
Have you attended a local community event in the past 6 months (e.g., working bees, fete, school concert, craft exhibition)?	48.7	51.3
Are you an active member of a local organisation/community group or club (e.g., sports, social club)?	26.6	73.4
Are you on a management committee or organising for any local group or organisation?	17.1	82.9
In the past 3 years, have you ever joined a local community action to deal with an emergency?	19.0	81.0

Table 12 Effect of Length of Stay on BMI and Psychological Distress

Variables	Length of stay	N	Mean	SD	SE	95% Confidence Interval for Mean		Min	Max	Sig.
						LB	UB			
Body Mass Index	Less than 5 years	39	24.6	3.3	0.5	23.5	25.6	17.3	38.4	0.001
	5 to 9 years	45	26.5	4.1	0.6	25.2	27.7	18.4	40.1	
	10 to 14 years	27	23.3	2.8	0.5	22.2	24.4	18	28.5	
	15 years +	45	25.8	3.4	0.5	24.8	26.8	18.8	37.9	
	Total	156	25.2	3.7	0.3	24.7	25.8	17.3	40.1	
K10 Score	Less than 5 years	40	17.8	6.9	1.1	15.5	20	10	36	0.005
	5 to 9 years	46	16.6	6.2	0.9	14.8	18.4	10	31	
	10 to 14 years	27	17.4	6.5	1.3	14.8	20	10	32	
	15 years +	45	13.5	4.2	0.6	12.2	14.7	10	25	
	Total	158	16.1	6.1	0.5	15.2	17.1	10	36	

Table 13 Independent Variables Used in Logit Analysis

Name	Definition	Name	Definition
Age groups		Length of stay	
agegp1	18-24yrs	length1	<5yrs
agegp2	25-34yrs	length2	5-9yrs
agegp3	35-44yrs	length3	10-14yrs
agegp4	45yrs+	length4	15yrs+
Levels of education		bmi	
edu1	non graduate	bmi1	underweight
edu2	graduate	bmi2	normal
edu3	postgraduate	bmi3	overweight
Employment		bmi4	obese
emp1	full-time	Smoking	
emp2	part-time or casual	smok1	Never smoked
emp3	unemployed	smok2	smokers
emp4	not in the labour force		
emp5	student		
Income			
income1	<$350pw		
income2	$350-$649pw		
income3	$650-$1399pw		
income4	$1400-$1999pw		
income5	$2000+pw		

Table 14 Logistic Regression of Migrants' quality of Life and some socio-economic and lifestyle variables

Dependent: Life has improved = 1

```
Logistic regression                               Number of obs   =        145
                                                  LR chi2(23)     =      44.22
                                                  Prob > chi2     =     0.0049
Log likelihood = -46.089165                       Pseudo R2       =     0.3242
```

QoL	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
agegp2	3.824208	1.360564	2.81	0.005	1.157552	6.490863
agegp3	4.132262	1.428841	2.89	0.004	1.331784	6.932739
agegp4	3.609562	1.472405	2.45	0.014	.7237007	6.495423
edu2	-2.512514	1.33321	-1.88	0.059	-5.125557	.1005291
edu3	-5.00697	1.708767	-2.93	0.003	-8.356092	-1.657849
emp1	-16.71099	1.36339	-12.26	0.000	-19.38318	-14.03879
emp2	-18.12718	1.385345	-13.08	0.000	-20.8424	-15.41195
emp3	-15.72382	.	.	.	.	.
emp4	-17.00807	1.647948	-10.32	0.000	-20.23799	-13.77815
emp5	-17.26434	1.397101	-12.36	0.000	-20.00261	-14.52608
income1	3.895856	2.735859	1.42	0.154	-1.466328	9.258041
income2	3.937612	2.766769	1.42	0.155	-1.485155	9.360378
income3	6.180095	2.905201	2.13	0.033	.4860059	11.87418
income4	5.911771	2.998099	1.97	0.049	.035604	11.78794
income5	5.425123	2.954289	1.84	0.066	-.3651773	11.21542
length1	2.215217	1.306136	1.70	0.090	-.3447622	4.775195
length2	-.6346461	1.032841	-0.61	0.539	-2.658977	1.389685
length4	1.045388	1.039273	1.01	0.314	-.9915505	3.082327
bmi1	2.365075	2.194392	1.08	0.281	-1.935853	6.666004
bmi2	3.201327	2.062714	1.55	0.121	-.8415182	7.244171
bmi3	3.121439	2.109106	1.48	0.139	-1.012334	7.255212
bmi4	1.8552	2.298027	0.81	0.419	-2.64885	6.359249
smok2	-.1214126	.8520541	-0.14	0.887	-1.791408	1.548583
_cons	11.12334	3.834689	2.90	0.004	3.607491	18.6392

```
Note: 0 failures and 1 success completely determined.
```

4 Comparison of QoL instruments

4.1 Distribution of scores

Table 15 reports the summary statistics for the seven QoL instruments. The first 4 – EQ-5D, HUI 3, SF-6D and AQoL-8D are collectively referred to as the MAUI (MAU instruments); the remaining 3 as 'subjective well-being' (SWB) instruments. The mean values of the former group are very similar, ranging from 0.85 (AQoL-8D) to 0.92 (EQ-5D). Standard errors are similar except for HUI 3 which is 50 percent above the others. Minimum scores vary significantly with HUI 3 again the outlier. The greatest discrepancy is in the number of individuals assigned the maximum score (ceiling effects). Both EQ-5D and HUI 3 had 91 such respondents or 57.6 percent of the total group. SF-6D and AQoL-8D had 24.1 and 15.8 percent respectively. The two satisfaction scales had 8.2 and 9.5 respectively and the psychiatric K-10, 40.5 percent. These results indicate that EQ-5D and HUI 3 do not reflect variation in life satisfaction near the ceiling.

The extent of the difference in scales is shown in Figure 1 which plots the frequency distribution of the instruments. EQ-5D and HUI 3 have very significant ceiling effects. The SF-6D and EQ-5D reveal floor effects with no values below 0.6. (AQoL-8D and HUI 3 have minimum values of 0.42 and -0.04 respectively).Unlike HUI 3, EQ-5D reveals significant insensitivity near the ceiling in addition to its ceiling effect. The erratic frequency for SF-6D is partly a result of the small sample and partly due to the relatively small number of items in the instrument. The AQoL-8D frequency is closest to a normal distribution.

Table 15 Summary statistics by instrument

Description	EQ-5D	HUI3	SF-6D	AQoL-8D	PWI	SWLS	K-10
Mean	.92	.89	.86	.85	.75	.71	.85
SE	.008	.013	.008	.009	.013	.016	.012
Median	1.00	0.95	0.88	0.87	0.78	0.75	0.90
(IQR)	.17	.15	.14	.14	.18	.16	.25
Min	.60	-.04	.60	.42	.10	.00	.35
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00
% Score = Max (Ceiling effect)	57.6	57.6	24.1	15.8	8.2	9.5	40.5

4.2 Comparison of instruments

Selected pair-wise comparisons of frequencies are shown in Figure 2. The purpose of the figure is to visually emphasise the differences which are obtained using the different instruments. The data reflect the strong ceiling effect of the EQ-5D (the horizontal scale in the three left hand diagrams) and the significant ceiling effect of the HUI 3. Additionally, at all other levels of an instrument there was significant variation in the value of other instruments. When SF-6D = 0.6, HUI 3 and AQoL-8D values varied form (0.25-1.00) and (0.55-0.95) respectively; when AQoL-8D = 0.8, HUI 3 and SF-6D varied from (0.25-1.00) and (0.10-1.00) respectively. Some of this variation is random but a large amount undoubtedly attributable to the descriptive system as analysed below.

Figure 1 Frequency distribution of 7 instruments

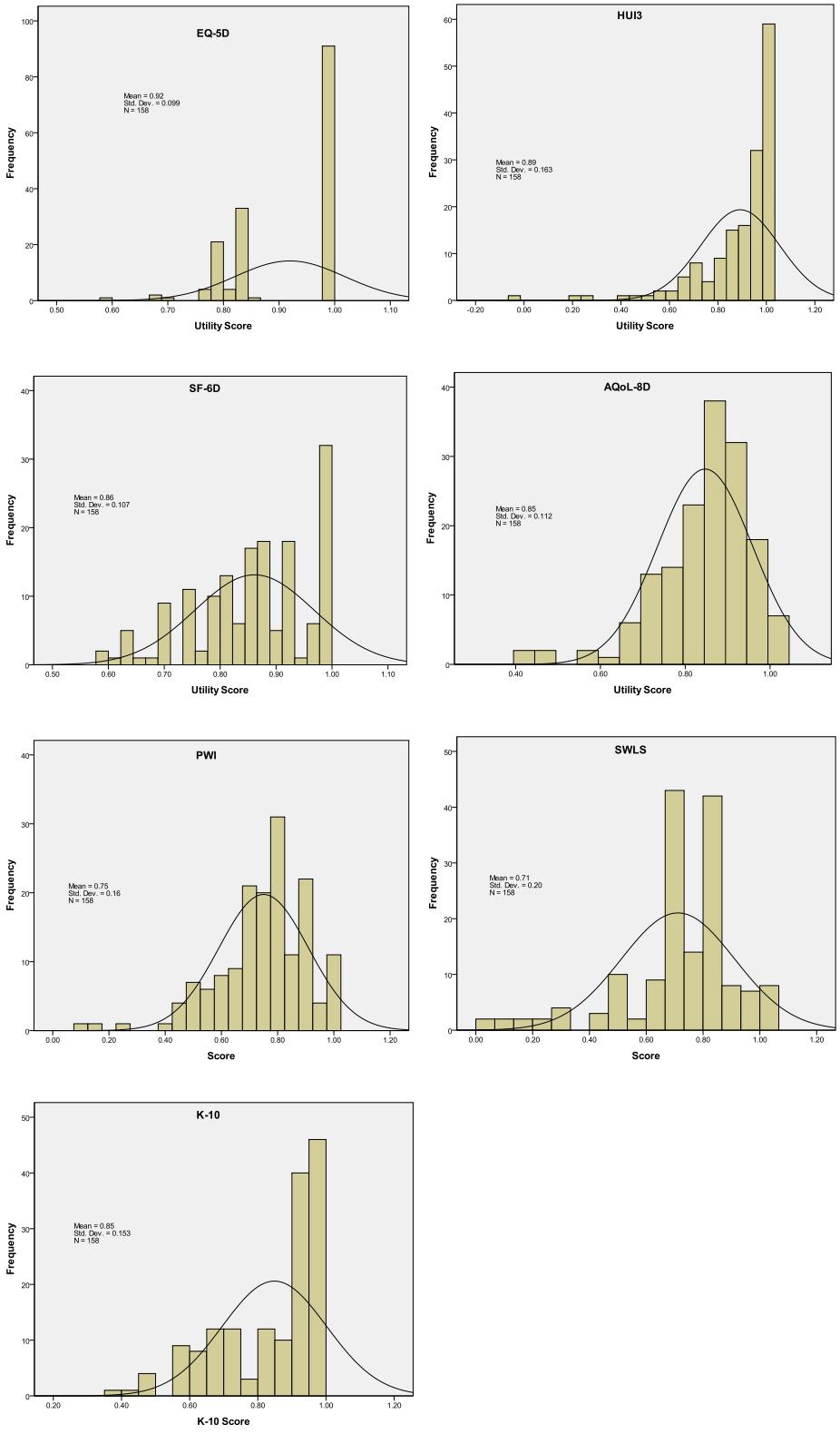
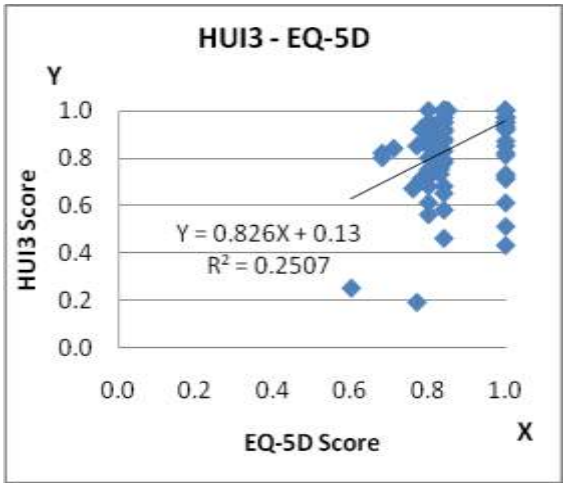
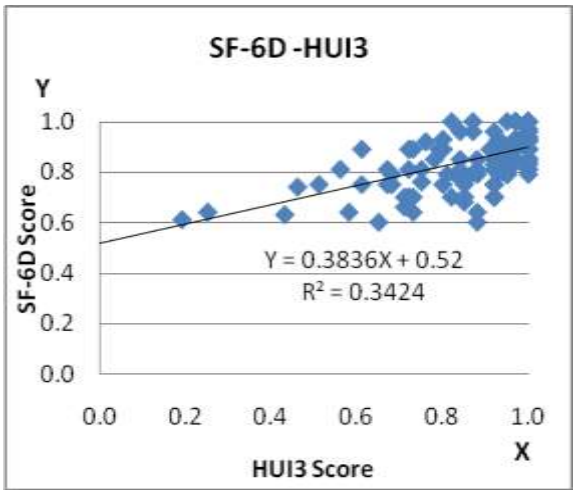
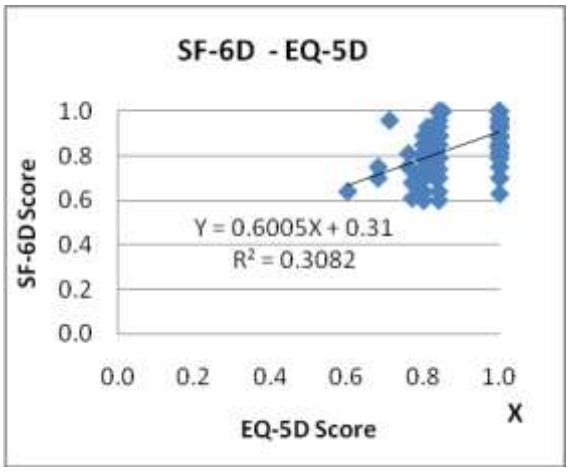
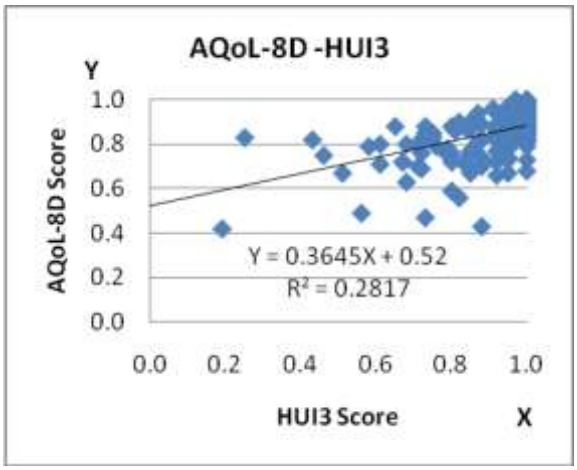


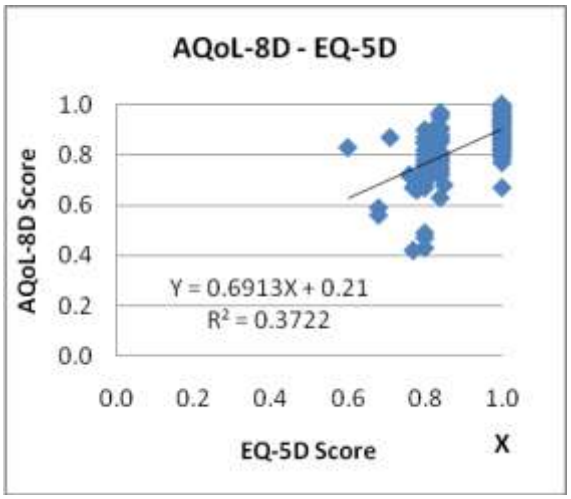
Figure 2 Selected pair-wise comparison of MAUI frequencies











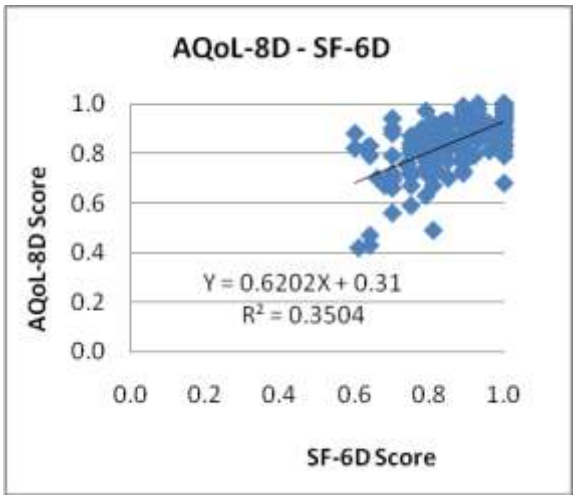


Table 16a and 16b are correlation matrices using unweighted and utility weighted MAUIs respectively. Since MAUIs purport to measure exactly the same construct, viz, utility, the correlations are low. Overall only about 33% of the variance in one MAUI is explained by another (R^2). The average highest correlation between MAUIs in the unweighted matrix is achieved by SF-6D. With utility weights attached SF-6D and AQoL-8D have the same average correlation. HUI 3 has the lowest average correlation. In contrast, HUI 3 has the highest correlation with the PWI and AQoL-8D with the two remaining SWB instruments. AQoL-8D has the highest overall average correlation.

Table 16a Correlation of 7 Measures (unweighted)

Measures	Correlations								Highest correlations with:
	1	2	3	4	5	6	7	8	
1. EQ-5D	1								SF-6D
2. HUI3	.555**	1							SF-6D
3. SF-6D	.605**	.644**	1						AQoL-8D
4. AQoL-8D	.558**	.487**	.666**	1					K-10
Average (1-4)	**0.57**	**0.56**	**0.64**	**0.57**					
5. PWI Score	.465**	.519**	.485**	.530**	1				SWLS
6. SWLS Score	.435**	.429**	.420**	.495**	.534**	1			PWI
7. K-10 Score	.559**	.418**	.550**	.680**	.460**	.440**	1		AQoL-8D
Average (1-7)	**0.53**	**0.51**	**0.56**	**0.57**	**0.5**	**0.46**	**0.52**		
8. Overall QoL	.189*	0.101	0.125	.267**	.179*	.192*	.232**	1	AQoL-8D

** Correlation is significant at the 0.01 level (2-tailed).

Table 16b Correlation of 7 Measures (Weighted)

Measures	Correlations							Highest correlation with:
	1	2	3	4	5	6	7	
1. EQ-5D	1							AQoL-8D
2. HUI3	.502**	1						SF-6D
3. SF6D	.558**	.586**	1					AQoL-8D
4. AQoL-8D	.610**	.531**	.593**	1				EQ-5D
Average (1-4)	**0.56**	**0.54**	**0.58**	**0.58**				
5. PWI	.452**	.521**	.476**	.496**	1			HUI3
6. SWLS	.395**	.477**	.348**	.503**	.534**	1		AQoL-8D
7. K-10	.567**	.456**	.514**	.668**	.460**	.440**	1	AQoL-8D
Average (1-7)	**.51**	**.51**	**.51**	**.57**	**.49**	**.45**	**.52**	

** Correlation is significant at the 0.01 level (2-tailed).

Weighted and unweighted MAU instruments have not been compared in the economics literature. The two correlation tables permit this and the relevant coefficients are reproduced in Table 16c. These are strikingly similar. The average correlation of an MAUI with the remaining MAUIs is, in fact, less following utility weighting for the EQ-5D, HUI 3 and SF-6D. AQoL-8D is the only instrument where the average correlation increases. The same similarity of average correlation coefficients exists between weighted and unweighted MAUI and SWB scores. The unweighted average correlation is greater for both EQ-5D and SF-6D and virtually the same for the other two MAUI.

Interclass correlations are reported in Table 16d. These reflect absolute agreement between scores. They are equivalent to the enforced assumption that the line of best fit passes through the origin. This reduces the correlation coefficient. Amongst MAUI, SF-6D and AQoL-8D have the highest ICC; EQ-5D and HUI 3 have the lowest.

Table 16e reports the regression of weighted on unweighted scores. Correlations are high and the process of weighting adds little to overall prediction.

Table 16c Average Pearson correlation between on MAUI and the other 3 MAUI's

Measures	MAUI		SWB – MAUI	
	Unweighted	Weighted	Unweighted	Weighted
EQ-5D	0.57	0.56	0.48	0.45
HUI 3	0.56	0.54	0.46	0.48
SF-6D	0.64	0.58	0.49	0.45
AQoL-8D	0.54	0.58	0.57	0.56

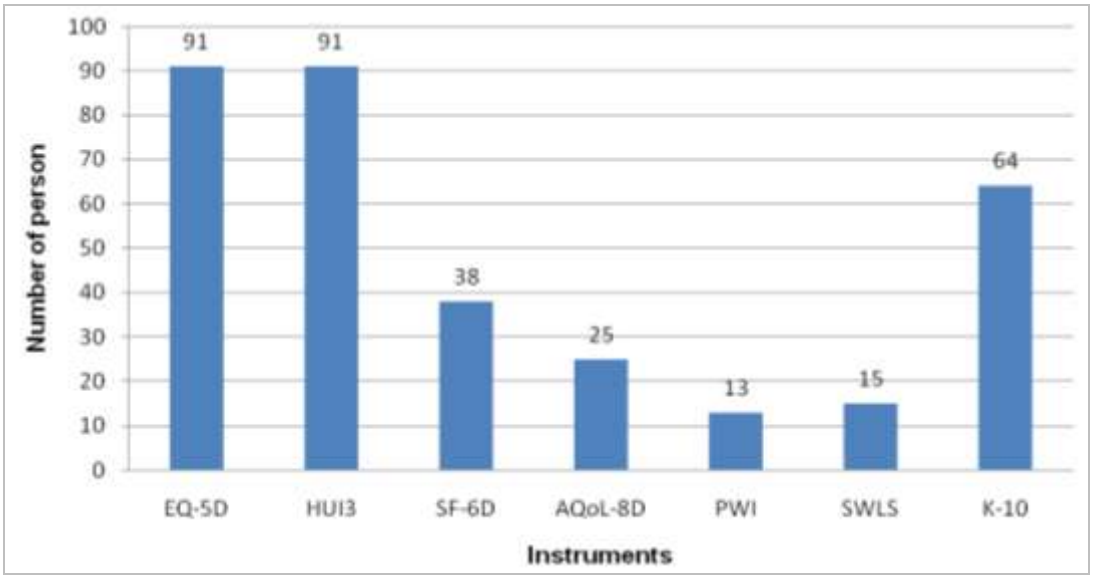
Table 16d Intra class correlation (ICC)

	EQ-5D	HUI 3	SF-6D	AQoL-8D	K10	PWI	SWLS	Ave
EQ-5D	100	0.44	0.48	0.49	0.45	0.22	0.17	0.28
HUI 3		1.00	0.52	0.47	0.44	0.38	0.32	0.38
SF-6D				0.59	0.48	0.33	0.20	0.34
AQoL-8D					0.74	0.38	0.32	0.45
Ave	0.47	0.48	0.53	0.52	0.5	0.32	0.28	

Table 16e Regression: weighted on unweighted

Dependent (weighted)	Constant	Independent (unweighted)				Adjusted R^2	Correlations
		AQoL-8D	EQ-5D	HUI 3	SF-6D		
AQoL-8D	-0.125	1.225				0.913	0.956
EQ-5D	0.086		0.898			0.892	0.945
HUI 3	-1.257			2.265		0.935	0.967
SF-6D	0.104				0.870	0.919	0.959

Figure 3 Comparison of Full Health by 7 MA Instruments (Non-weighted Score)- (N = 158)



4.3 Content (sensitivity)

Ceiling effects: The sensitivity of instruments to change depends upon their content validity in the same context. Figure 3 plots the data from Table 15 relating to ceiling effects. Figure 4 shows the distribution of scores for 'other' instruments when a particular instrument is at its ceiling value, ie U = 1.00. The figure shows the mean, 25th and 75th percentiles of the other instruments in the form of a box plot. The figure indicates that when AQoL-8D = 1 (Figure 4a) there was no variation in the other three MAU instruments, ie they also predicted U = 1.00. When each of the MAUI predicted U = 1.00 (Figures 4b, 4c, 4d) AQoL-8D detected variation in utility. In contrast, EQ-5D failed to identify any variation in any other instrument, MAUI or SWB, when the other instrument was at its ceiling level (Figures 4a-4f). Conversely when EQ-5D = 1, every other instrument had significant variation in its scores. HUI 3 and SF-6D were between the AQoL-8D and EQ-5D in these respects. When either was at its ceiling level other instruments except EQ-5D identified differences in utilities. HUI 3 identified no variation when SF-6D was it its ceiling but SF-6D identified variation when HUI 3 was at its ceiling. The three SWB instruments all detected variation when MAUI = 1.00 with least variation for AQoL-8D. When the SWB = 1.00 AQoL-8D and SF-6D identified variation but not EQ-5D or HUI 3.

The results indicate a clear ranking of sensitivity at the ceiling, viz, (i) AQoL-8D; (ii) SF-6D; (iii) HUI 3; (iv) EQ-5D.

Common incremental change: In Table 17 results are reported from the regression of each MAUI upon each of the other MAUIs. The explanatory power – the extent of the shared variance – is the same as in the Spearman correlation table and, as noted, is relatively low. If each of the MAUI was measuring utility without error the incremental change in one instrument would correspond with the incremental change in the other instruments. In Table 17 the coefficients would be a = 0, b = 1.00. From Table 17 this does not occur for any of the regressions implying that a valid estimate of one instrument score could not be inferred from any of the other instruments. Prediction of the HUI 3 is closest to the theoretically correct result. But prediction from the HUI 3 is furthest from the result.

Figure 4 Instrument frequency distributions when one is at the ceiling

Figure 4(a) AQoL = 1

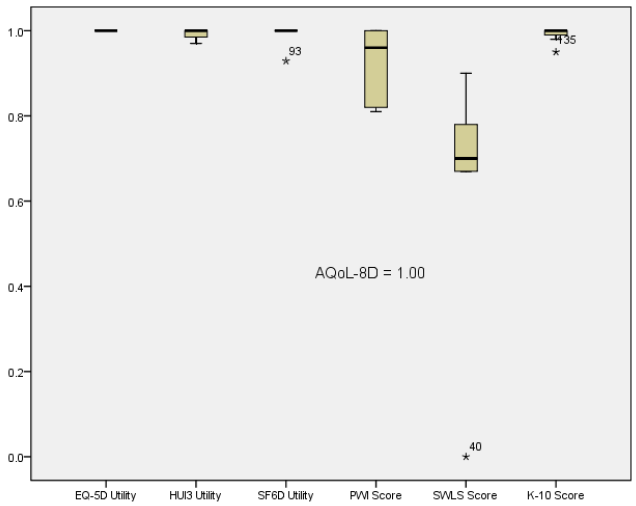


Figure 4(b) EQ-5D = 1

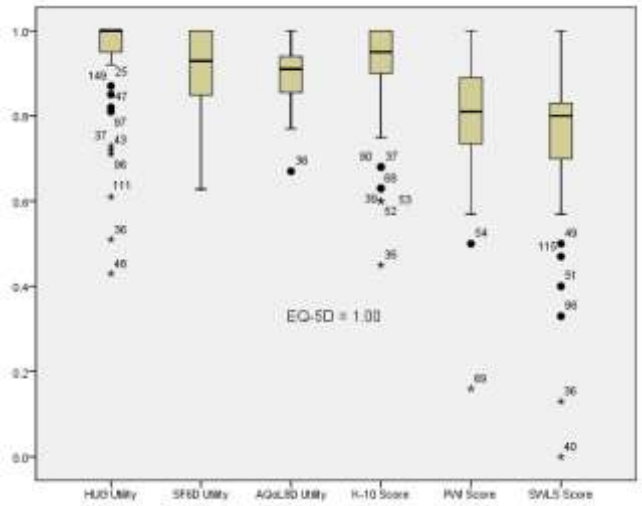


Figure 4(c) HUI 3 = 1

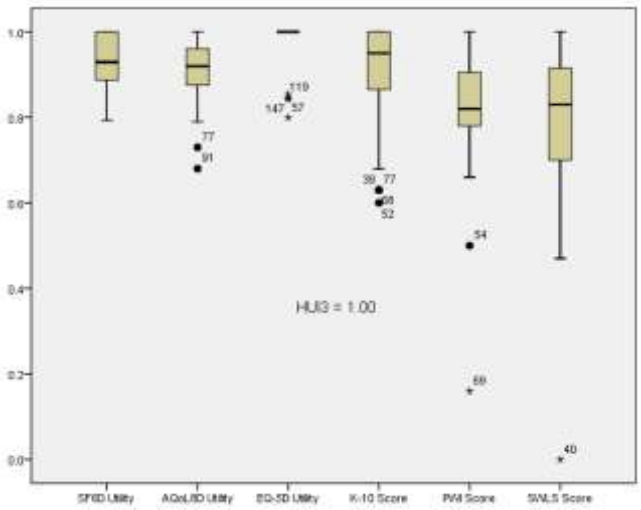


Figure 4(d) SF-6D = 1

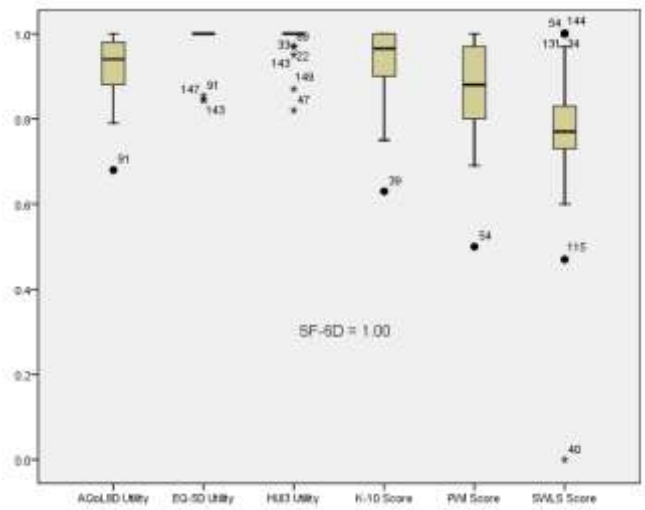


Figure 4(e) PWI = 1

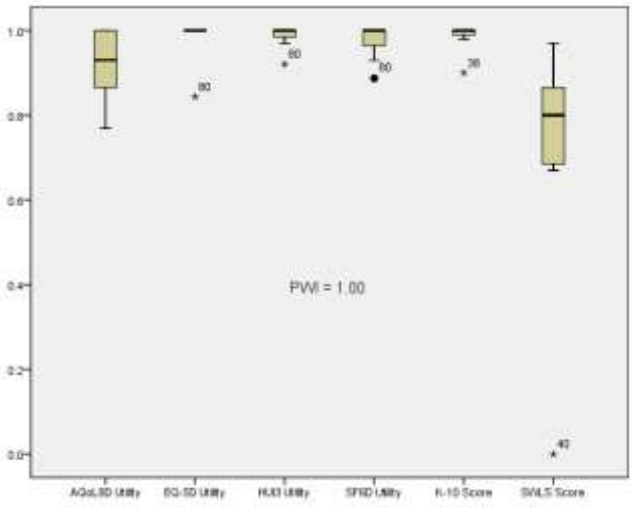


Figure 4(f) SWLS = 1

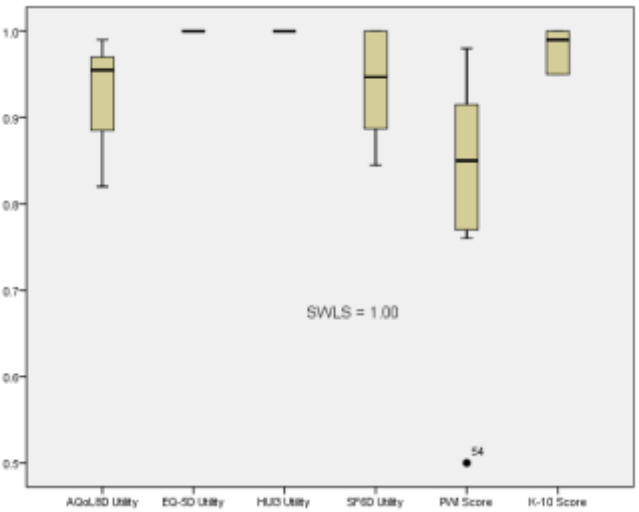


Table 17 Coefficient in regression instruments A = a + b Instrument B (1 dependent and 1 independent)

Dependent	Constant	Independent				Adjusted R Square
		EQ-5D	HUI3	SF-6D	AQoL-8D	
EQ-5D	-	-				
HUI3	0.130	0.829				0.247
SF6D	0.307	0.604				0.307
AQoL-8D	0.211	0.692				0.368
HUI3	-		-			
EQ-5D	0.648		0.304			0.247
SF6D	0.519		0.384			0.339
AQoL-8D	0.522		0.365			0.277
SF6D	-			-		
EQ-5D	0.474			0.516		0.307
HUI3	0.122			0.894		0.339
AQoL-8D	0.312			0.621		0.347
AQoL-8D	-				-	
EQ-5D	0.463				0.539	0.368
HUI3	0.238				0.773	0.277
SF6D	0.382				0.566	0.347

4.4 Discrimination by dimension

Each of the AQoL-8D dimensions is a psychometrically derived instrument with a Cronbach alpha indicating high reliability (α = 0.81 – 0.92) with senses 'the exception'. (It is a combination of dissimilar items relating to vision, hearing and communication). They may therefore be used for content analysis of the instruments, ie for analysing how much an MAUI detects differences in the dimensions. In the first such test, respondents were ranked then divided into a 'top' and 'bottom' group according to their score on each instrument. The difference between dimension scores were standardised and reported in Table 18.

The test favours AQoL which is comprised of the dimensions. Consistent with this, AQoL obtains the highest score for every dimension except pain where HUI 3 has the most significant difference. The second highest score is also obtained by HUI 3 for six other dimensions, independent living, life satisfaction, mental health, relationships, self worth and senses. SF-6D performs second best with respect to coping and AQoL-8D with respect to pain. SF-6D had lowest scores for three dimensions, and EQ-5D the lowest score for five.

Results are not reflected in the correlation between instruments and dimension scores (Table 19). In this, EQ-5D has comparatively high average correlation (0.40) and HUI 3 comparatively low (0.34). This possibly reflects the distorting effect of a small number of very low HUI 3 scores as these are of disproportionate importance in the calculation of correlations.

Pair-wise comparison of instruments: A second comparison of dimension scores was carried out to determine which dimensions explained high and low instrument scores relative to another instrument. For this the population was divided into those with scores above and those below the values predicted form another MAU. Prediction was made using the regression results shown in Figure 2.

Table 18 Dimension scores: Difference between top 50% (T) and bottom 50% (B) ranked by 4 MAUI

Dimensions and instruments	AQoL-8D (T-B)/se	EQ-5D (T-B)/se	HUI 3 (T-B)/se	SF-6D (T-B)/se
Dim IL	8.13	4.61	8.04	7.46
Dim LS	13.30	8.62	9.79	7.89
Dim MH	15.02	8.21	9.54	7.64
Dim Cop	11.10	7.65	7.96	8.67
Dim Rel	14.11	7.38	8.90	8.40
Dim SW	12.60	7.43	10.62	9.16
Dim Pain	11.99	10.74	14.24	9.09
Dim Senses	12.17	5.69	11.20	9.09
K-10	13.47	10.21	10.08	11.62
PWI Score	9.48	7.37	10.72	9.80
SWLS Score	7.73	5.96	8.36	6.88

Table 19 Instrument correlation with dimension scores

	IL	LS	MH	Cap	Rel	SW	Pain	Sense	Ave
EQ-5D	0.24	0.36	0.42	0.43	0.37	0.4	0.59	0.36	0.40
HUI 3	0.24	0.26	0.32	0.39	0.2	0.4	0.47	0.49	0.34
SF-6D	0.35	0.4	0.4	0.42	0.32	0.4	0.54	0.41	0.41
AQoL-8D	0.45	0.66	0.75	0.76	.066	0.71	.062	.059	0.65

Instruments on the vertical axis (dependent variable) which are sensitive to a dimension will have a lower utility than predicted by the independent (less sensitive) instrument. Points on the figure will be below the line; that is, the relative sensitivity of the instrument on the vertical axis to a particular dimension will result in points below the line with lower dimension scores and conversely points above the line will have higher dimension scores. Consequently the ratio of dimension scores above to below the line is an index of the relative sensitivity of the dependent instrument to that dimension. Random variation generates a positive ratio so results given in Table 20 are presented as deviations from the average in the 12 pair-wise comparisons.

Table 20 Pair-wise comparison of instruments

		Physical dimensions			Mental, Social dimensions					Overall	
		Ind Living	Pain	Senses	Mental Health	Life Satis	Coping	Relations	Self worth	Physical	Mental
Average ratio from 12 regressions		1.05	1.08	1.07	1.13	1.06	1.07	1.08	1.06	1.07	1.07
		Deviation from average ratio									
EQ-5D	HUI	0.0	0.06	0.0	0.08	0.02	0.02	0.05	0.02	0.02	0.04
Predicted	SF-6D	-0.01	0.03	0.08	0.09	0.02	0.15	0.06	0.03	0.02	0.05
By	AQoL-8D	-0.03	0.02	0.03	-0.06	-0.02	-0.05	-0.03	-0.02	-0.02	-0.03
HUI	EQ-5D	-0.01	0.00	0.02	-0.04	0.06	-0.01	-0.05	-0.01	-0.02	-0.02
Predicted	SF-6D	-0.05	-0.08	-0.03	-0.17	-0.07	-0.08	-0.10	-0.05	-0.08	-0.08
By	AQoL-8D	-0.05	-0.03	-0.03	-0.21	-0.07	0.07	-0.16	-0.05	-0.04	-0.10
SF-6D	EQ-5D	0.02	0.00	-0.02	-0.06	-0.01	-0.02	-0.05	-0.01	0.00	-0.02
Predicted	HUI	0.01	0.00	-0.04	-0.07	-0.01	-0.02	-0.01	-0.03	-0.01	-0.02
By	AQoL	-0.03	-0.02	-0.04	-0.12	-0.07	-0.03	-0.08	-0.03	-0.03	-0.05
AQoL-8D	EQ-5D	0.05	0.01	-0.03	0.14	0.07	0.06	0.08	0.04	0.03	0.08
Predicted	HUI 3	0.03	0.01	-0.02	0.18	0.06	0.06	0.15	0.06	0.02	0.10
By	SF-6D	0.03	0.01	0.03	0.15	0.07	0.06	0.10	0.07	0.02	0.11

Notes:

Average of 12 ratios of the dimension score for individual above the predicted instrument value, divided by the dimension score for individuals below the instrument value.

In this test AQoL-8D is not favoured as instruments must have points above and below the predicted values. As expected, HUI 3 has less content than other MAUI in the domains of mental health and relationships and AQoL-8D greater content for all of the mental and social dimensions. EQ-5D is relatively sensitive to pain. Unexpectedly HUI 3 is not significantly more sensitive with respect to senses but this is probably because the sample was small (n=158) and only 17% of reported (any) significant illness. SF-6D is relatively insensitive to mental health. Overall EQ-5D performed better in this test than HUI 3 and SF-6D.

Predicting dimensions: A converse question to the content of an instrument is the extent to which an instrument predicts variation in a dimension which may be of interest. Results are given in Table 21. The two coefficients of interest are the slope, b, and the R^2. These indicate respectively how responsive each MAU instrument is to changes in the dimensions and how important the dimension is in explaining the instrument. Results are not directly comparable as, again, AQoL-8D is created by the multiplicative combination and then econometric transformation of these dimensions. Nevertheless to the extent that the dimensions as measured, are of importance the results are also of importance.

From Table 21 there is a significant difference in the extent to which the instruments explain different dimensions. The very low R^2 for independent living reflect the fact that all respondents were living independently and were mainly between the ages of 18 and 55. A similar explanation applies to the low explanatory power of life satisfaction and relationships. In contrast, there is relatively high explanatory power for pain.

For the reason given above AQoL-8D outperforms other MAUI in terms of R^2 and the responsiveness of dimensions. EQ-5D had second greatest explanatory power for 4 dimensions and SF-6D for 3. HUI 3 had least explanatory power for all dimensions except senses.

Pair-wise Comparison 2: A third test of content is to use AQoL dimensions to explain the difference between instrument scores. These may vary because of either instrument content for scaling. To standardise for this, instruments were regressed upon each other and the unexplained residual then regressed upon AQoL-8D dimension scores. That is, the test was to determine whether AQoL dimensions would explain differences between instruments.

Frequency distributions of residuals – the dependent variable in this analysis – are shown in Figure 5 and regression results in Table 22. These must be interpreted in two groups – those where AQoL-8D does or does not affect the residual. In the first group the explanatory power of regressions will be higher as the 8 dimensions are the (not exclusive) basis of AQoL-8D.

The three regressions in the first block have very high R^2 coefficients. Nevertheless they vary. Every dimension except senses has greater explanatory power for the residual of AQoL on HUI 3 – block 1.2 – than for the remaining two residuals. This indicates that HUI 3 explains less of the dimension content embodied in AQoL-8D, ie that the unexplained dimension content is retained in the error variance to be explained by the dimension score.

For the remaining two residuals in block 1 the pattern is less clear. The residual of AQoL-8D on EQ-5D – block 1.1 – is less well explained for mental health, coping, relationships, self worth, pain and the mental health super dimension implying more of the AQoL-8D content of these dimensions is explained by EQ-5D and SF-6D. For the remaining dimensions and the physical super dimension, SF-6D explains more of the AQoL-8D content (ie has lowest explanatory power in block 1).

Table 21 Regression of AQoL-8D dimension on 4 MAU instruments

Dependent	Constant	Independent				Adjusted R Square	Significance
		EQ-5D	HUI3	SF-6D	AQoL-8D		
Independent Living	.593	.307				.060	.001
Independent Living	.721		.173			.051	.002
Independent Living	.532			.399		.125	.000
Independent Living	.477				.472	.194	.000
Life Satisfaction	.478	.375				.127	.000
Life Satisfaction	.669		.172			.070	.000
Life Satisfaction	.490			.386		.159	.000
Life Satisfaction	.309				.607	.443	.000
Mental Health	.047	.599				.175	.000
Mental Health	.352		.275			.098	.000
Mental Health	.144			.527		.158	.000
Mental Health	-.194				.934	.561	.000
Coping	.388	.489				.187	.000
Coping	.604		.262			.145	.000
Coping	.456			.443		.179	.000
Coping	.204				.748	.575	.000
Relationships	.332	.506				.136	.000
Relationships	.640		.176			.041	.006
Relationships	.456			.396		.096	.000
Relationships	.127				.792	.443	.000
Self Worth	.527	.404				.157	.000
Self Worth	.680		.244			.156	.000
Self Worth	.565			.387		.168	.000
Self Worth	.368				.626	.497	.000
Pain	.230	.724				.349	.000
Pain	.577		.358			.229	.000
Pain	.369			.612		.290	.000
Pain	.335				.663	.376	.000
Senses	.530	.395				.134	.000
Senses	.608		.320			.244	.000
Senses	.537			.414		.173	.000
Senses	.423				.555	.349	.000
Physical (SD)	.038	.821				.300	.000
Physical (SD)	.364		.482			.280	.000
Physical (SD)	.096			.810		.342	.000
Physical (SD)	-.022				.963	.534	.000
Psychological (SD)	-.305	.829				.244	.000
Psychological (SD)	.117		.381			.138	.000
Psychological (SD)	-.198			.760		.239	.000
Psychological (SD)	-.609				1.258	.733	.000

Table 22 Regression of residual (error term) form MAUI on MAUI (10 regressions per residual[1])

	Residual form	Coeffic-ients	IL	LS	MH	Coping	Rel	SW	Pain	Senses	PSD[2]	MSD[3]
Group 1												
1.1	AQoL on EQ-5D	(constant)	-0.241	-0.404	-0.236	-0.419	-0.295	-0.468	-0.211	-0.351	-0.239	-0.172
		b	0.275	0.491	0.395	0.500	0.370	0.521	0.236	0.393	0.301	0.377
		R^2	0.128	0.312	0.381	0.382	0.302	0.335	0.097	0.209	0.245	0.484
1.2	AQoL on HUI 3	(constant)	-0.265	-0.473	-0.278	-0.471	-0.372	-0.501	-0.299	-0.316	-0.271	-0.204
		b	0.303	0.575	0.466	0.563	0.467	0.558	0.334	0.353	0.342	0.447
		R^2	0.137	0.375	0.465	0.424	0.423	0.335	0.174	0.146	0.277	0.598
1.3	AQoL on SF-6D	(constant)	-0.193	-0.387	-0.246	-0.430	-0.322	-0.467	-0.245	-0.329	-0.232	-0.176
		b	0.221	0.471	0.411	0.513	0.404	0.520	0.274	0.368	0.292	0.385
		R^2	0.078	0.277	0.400	0.390	0.350	0.322	0.128	0.177	0.222	0.488
Group 2												
2.1	EQ-5D on HUI 3	(constant)	-0.100	-0.181	-0.111	-0.183	-0.159	-0.180	-0.258	-0.104*	-0.151	-0.085
		b	0.114	0.220	0.186	0.218	0.200	0.200	0.288	0.116*	0.190	0.185
		R^2	0.019	0.062	0.087	0.074	0.090	0.048	0.159	0.014	0.102	0.121
2.2	EQ-5D on SF-6D	(constant)	-0.041*	-0.110	-0.084	-0.149	-0.118	-0.152	-0.214	-0.116	-0.119	-0.061
		b	0.046	0.134	0.141	0.178	0.148	0.170	0.239	0.130	0.150	0.134
		R^2	-0.002	0.021	0.052	0.051	0.051	0.036	0.118	0.021	0.066	0.066
2.3	HUI 3 on SF-6D	(constant)	-0.034*	-0.05*	-0.06*	-0.169	-0.029*	-0.233	-0.202	-0.349	-0.166	-0.040*
		b	0.039*	0.061*	0.100*	0.201	0.036*	0.259	0.225	0.391	0.209	0.088*
		R^2	-0.005	-0.004	0.005	0.022	-0.005	0.032	0.036	0.09	0.048	0.006

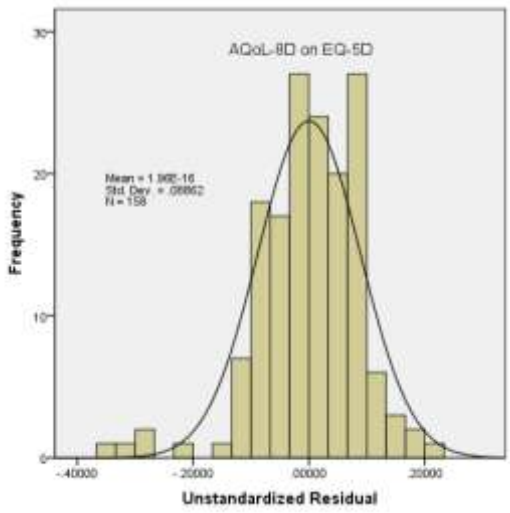
Notes:

* not significant

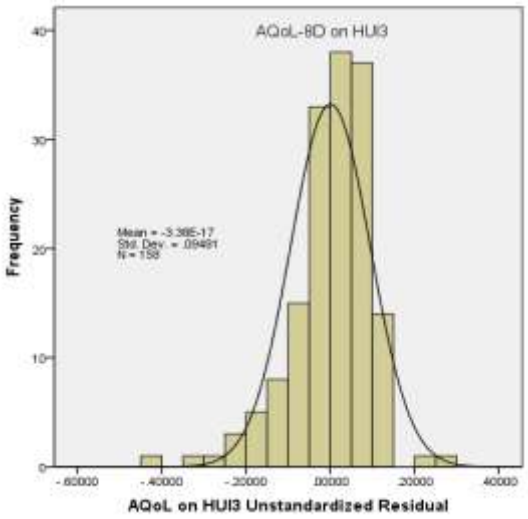
1. Residuals are regressed upon one dimension only. Each block of 3 rows reports 10 regressions
2. Physical super dimension
3. Mental health super dimension

Figure 5 Frequency distribution of Residuals from regression of MAU on MAU Instrument

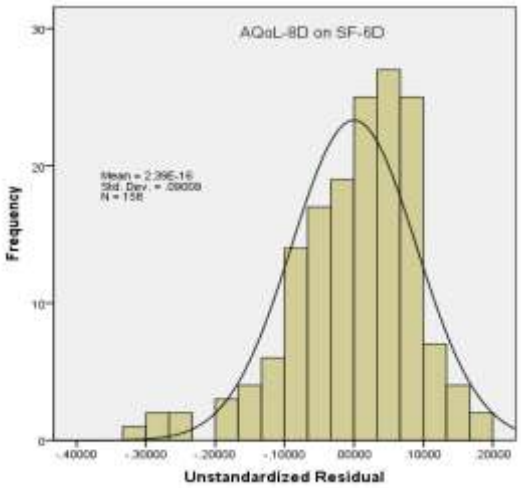
5a Residual AQoL-8D on EQ-5D



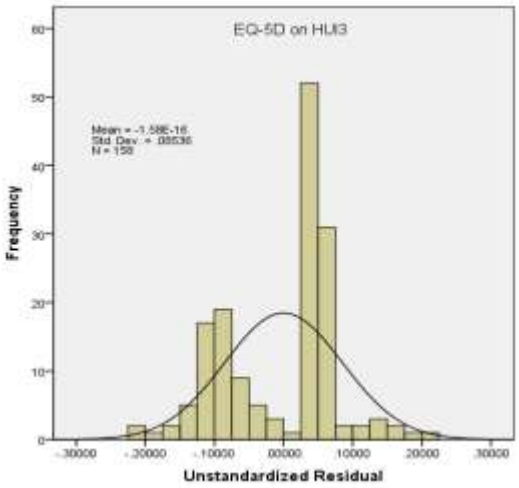
5b Residual AQoL-8D on HUI 3



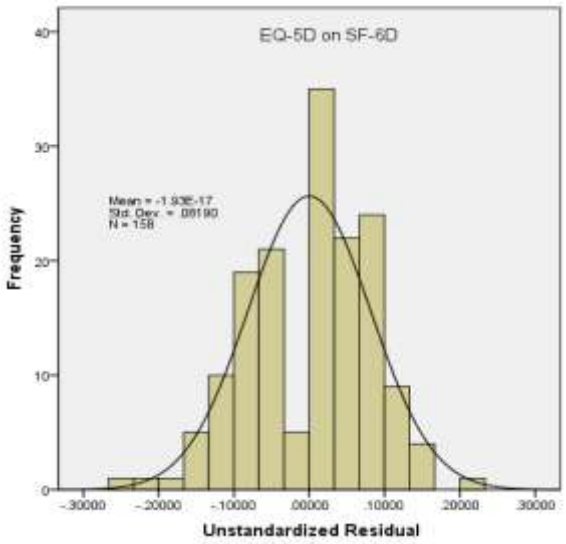
5c Residual AQoL-8D on SF-6D



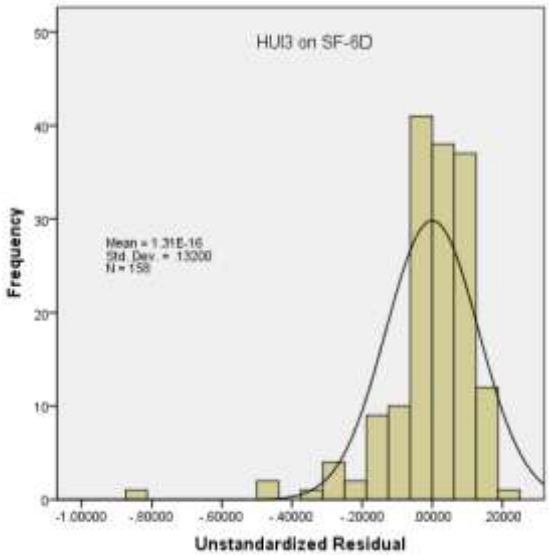
5b Residual EQ-5D on HUI 3



5e Residual EQ-5D on SF-6D



5f Residual HUI 3 on SF-6



The same logic applies in block 2. For each dimension the lower explanatory power of a regression indicates less association between the dimension and the dependent variable and therefore the smaller the difference in the dimension content of the two MAUI. For all dimensions except senses the residual of HUI 3 on SF-6D is least well explained implying that SF-6D best explains HUI 3 in block 2. For all dimensions except senses the residual of EQ-5D on HUI 3 is best explained implying that HUI 3 has poorest explanatory power of EQ-5D in these dimensions.

An anomaly with these results is that all by coefficients are positive, ie all dimensions are positively associated with all residuals. However some would be expected to be negative. For example, values of the residual of EQ-5D on HUI 3 will decrease as a dimension increases, where HUI 3 is relatively sensitive. The persistent positive signs are probably attributable to the fact that all of the regressions of MAUI on MAUI predict values less than 1.00 at the ceiling despite strong ceiling effects in each of the three instruments. Therefore there is an association between rising dimension scores, instrument values rising to the ceiling, under prediction and therefore positive residuals; that is, an association between rising dimension scores and positive residuals. In later analyses OLS regressions will be replaced by a technique which corrects this problem.

Table 23 Regression of 3 SWB instruments on 4 MAU instruments

Dependent	Constant	Independent				Adjusted R Square	Correlation
		EQ-5D	HUI 3	SF-6D	AQoL-8D		
PWI	0.079	0.730				0.199	0.452
PWI	0.295		0.510			0.267	0.521
PWI	0.137			0.712		0.222	0.476
PWI	0.151				0.708	0.241	0.496
SWLS	-0.022	0.798				0.150	0.395
SWLS	0.190		0.585			0.223	0.477
SWLS	0.151			0.651		0.115	0.348
SWLS	-0.050				0.899	0.249	0.503
K-10	0.040	0.879				0.317	0.567
K-10	0.466		0.428			0.203	0.456
K-10	0.214			0.737		0.259	0.514
K-10	0.075				0.913	0.442	0.668

Content and SWB: The three SWB instruments may also be used to analyse the content of the MAUI. Results are presented in Tables 23 and 24. The former reveal that in this population the PWI is most closely related to HUI 3 followed by AQoL-8D, SF-6D and EQ-5D. The SWLS is best explained by AQoL-8D followed by HUI 3, EQ-5D and SF-6D. Finally the K-10 psychological instrument is most closely related to AQoL-8D followed by EQ-5D, SF-6D and HUI 3.

Residuals from these equations – the unexplained variance – is analysed in Table 24. Results reflect those in Table 23. HUI 3 has greatest explanatory power for all of the regressions relating to PWI and for the residual of SWLS on EQ-5D. In the remaining equations AQoL-8D has greatest explanatory power.

Table 24 Regression of Residuals from A on 4 MAU instruments

Dependent	Constant	Independent				Adjusted R Square	Correlation
		EQ-5D	HUI 3	SF-6D	AQoL-8D		
ePWI&EQ-5D	-0.257		0.288			0.103	0.330
ePWI&EQ-5D	-0.288			0.338		0.057	0.251
ePWI&EQ-5D	-0.266				0.314	0.055	0.247
ePWI&HUI3	-0.282	0.307				0.044	0.233
ePWI&HUI3	-0.220			0.256		0.034	0.200
ePWI&HUI3	-0.265				0.313	0.060	0.257
ePWI&SF-6D	-0.276	0.301				0.039	0.211
ePWI&SF-6D	-0.212		0.237			0.070	0.275
ePWI&SF-6D	-0.258				0.305	0.053	0.243
ePWI&AQoL-8D	-0.221	0.241				0.023	0.172
ePWI&AQoL-8D	-0.225		0.252			0.082	0.297
ePWI&AQoL-8D	-0.234			0.272		0.038	0.210
eSWLS&EQ-5D	-0.305		0.342			0.086	0.303
eSWLS&EQ-5D	-0.205			0.238		0.013	0.139
eSWLS&EQ-5D	-0.397				0.469	0.076	0.286
eSWLS&HUI3	-0.288	0.314				0.025	0.176
eSWLS&HUI3	-0.110			0.128		0.000	0.078
eSWLS&HUI3	-0.378				0.447	0.075	0.285
eSWLS&SF-6D	-0.373	0.406				0.040	0.214
eSWLS&SF-6D	-0.299		0.335			0.079	0.292
eSWLS&SF-6D	-0.450				0.531	0.095	0.317
eSWLS&AQoL-8D	-0.163	0.177				0.004	0.101
eSWLS&AQoL-8D	-0.230		0.257			0.053	0.243
eSWLS&AQoL-8D	-0.079			0.092		-0.003	0.057
eK10&EQ-5D	-0.143		0.161			0.037	0.208
eK10&EQ-5D	-0.243			0.282		0.051	0.239
eK10&EQ-5D	-0.373				0.440	0.147	0.390
eK10&HUI3	-0.482	0.524				0.139	0.380
eK10&HUI3	-0.305			0.354		0.071	0.277
eK10&HUI3	-0.493				0.582	0.224	0.478
eK10&SF-6D	-0.400	0.435				0.101	0.327
eK10&SF-6D	-0.130		0.146			0.026	0.181
eK10&SF-6D	-0.421				0.497	0.174	0.423
eK10&AQoL-8D	-0.228	0.248				0.040	0.214
eK10&AQoL-8D	-0.085		0.095			0.012	0.136
eK10&AQoL-8D	-0.146			0.169		0.019	0.158

5 Discussion

This paper examines the quality of life – particularly, the health-related quality of life – of Bangladeshi migrants living in Melbourne, Australia, using 7 multi-attribute (MA) instruments. The socio-economic and lifestyle characteristics of the migrants have been analysed to throw light on the process of adaptation and adjustment in the host country. The instruments employed in this study vary substantially in terms of the number of dimensions employed, the items and response levels, and the maximum and minimum possible scores (Table 1).

The analysis of the sample indicated that gender, age and SEIFA distribution are al well represented. The higher proportion of middle aged respondents (compared to the Australian population) is due to the selection of particular age groups (18 to 65 years) for the study. Most of the respondents were married and had a family (Table 2). They were well educated, employed either full-time or part-time and had upper-end gross household incomes (Table 3).

The results indicate that the vast majority of Bangladeshi migrants are relatively healthy and have no significant illness over and above the Australian norm. The self-reported health conditions reinforce this conclusion. However, a relatively high level of psychological distress among this community is consistent with prior findings (Munib 2006).

The analysis of lifestyle characteristics of the migrants indicated that the Bangladeshi community is different from the Australian general population. More than three quarters did not smoke or drink alcohol. More than 90% ate home-cooked traditional Bangladeshi meals (Table 9). All these lifestyle aspects are associated with the quality of life, including health-related quality of life.

About 50% of Bangladesh-born migrants were either overweight or obese and only moderately integrated with the Australian community (Table 11). The analysis of time since migration, BMI and psychological stress indicated a significant effect the latter variables on the former (Table 12). However, this is not reflected in the multivariate analysis of overall QoL. But the result is consistent with previous results reporting the effects on BMI of education, gender and ethnicity (Sanchez-Vaznaugh, Kawachi et al. 2008).

Results of the 7 MA instrument comparisons indicated that all were highly correlated. The correlation matrix indicates that the recently developed AQoL-8D was most strongly correlated with the K-10, SF-6D, EQ-5D and PWI. In spite of their correlations, each of the instruments produced different results in terms of the non-weighted QoL scores. The wide variation is probably due to the varying number of dimensions, items and response levels. The range of scores was, however, limited by the overall good health of the respondents. This was reflected in the insensitivity of several instruments in the vicinity of full health. The EQ-5D and HUI 3 registered the largest number with the maximum score (91). In contrast AQoL-8D measured only 25 (Figure 3 and Table 15).

Tests of instrument content have not been well developed in the literature and this report experimented with a number of methods to distinguish between the relative sensitivity of instruments. These are summarised below (Table 25) along with the average performance of instruments on each test. An asterisk (*) indicates a test where AQoL had a structural advantage as the test used its own dimensions. The limited range of health states means that these results cannot be taken as indicative of instrument sensitivity in particular disease areas.

Table 25 MAUI ranking on various criteria

Test	Instrument ranking			
	Best	**2nd**	**3rd**	**Worst**
Ceiling effects	AQoL	SF-6D		EQ-5D; HUI 3
Spearman Correlation				
with other MAUI	SF-6D;AQoL	EQ-5D		HUI 3
with SWB	AQoL-8D	EQ-5D	SF-6D	HUI 3
ICC	SF-6D	AQoL-8D	HUI 3	EQ-5D
ICC	SF-6D			
Multiple regression: other MAU	AQoL-8D	SF-6D	EQ-5D	HUI 3
Dimension scores: split half*	AQoL-8D	HUI 3	SF-6D	EQ-5D
Dimension scores: explanatory power*	AQoL-8D	SF-6D	HUI 3	EQ-5D
Dimension score: MAU head to head	AQoL-8D	EQ-5D	SF-6D	HUI 3

6 Conclusion

This study was a pilot for a larger study of the entire Australian population. Nevertheless it had the additional benefit of obtaining a description of health related characteristics of an ethnic community – Bangladeshi migrants. It used utility weighted and unweighted QoL instruments and new sensitivity tests. It provides both baseline information about this community and statistically significant results with respect to the multi-instrument comparisons. Referring to the three aims of the paper, it firstly provided a comparison of the Bangladeshi community with the Australian community, and found that 91% of Bangladeshi migrants were highly qualified 12% unemployed and that the majority maintained family ties and ethnic cuisine. Very few drink alcohol, virtually no women and few men smoke but a higher proportion have 'high' or 'very high' levels of psychological distress and are overweight. Secondly the paper explored different aspects of the Bangladeshi community, focusing in particular on the process of social adaptation, finding that this is multifarious and in terms of progress non-uniform. Finally, it compared the effectiveness of a number of multi attribute instruments for measuring the quality of life among Bangladeshi migrants in Australia. It found that, even amongst a relatively homogeneous population instruments differ significantly in both 'utility' scores and content.

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