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Norms for the AQoL-6D and AQoL-8D multi attribute utility instruments

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PREFACE

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ABSTRACT

Norms for the AQoL-6D and AQoL-8D were estimated using data from an online survey. The chief challenge in the study was to overcome the effect of self-selection: participants were all individuals who had chosen to enrol with a panel company. The method used to offset the resulting bias was based upon the simultaneous administration of the AQoL-4D instrument. Norms for the AQoL-4D have been constructed using results from a large national survey conducted by the Australian Bureau of Statistics (ABS). For each demographic cohort web-based results were matched with the results from the ABS survey and a set of weights constructed to correct web-based results. These were applied to web-based norms for AQoL-6D, 8D and each of the constituent dimensions.

Unlike norms for other instruments the age profile of both the AQoL-6D and AQoL-8D are U-shaped. The result is attributable to the very large psycho-social component of both instruments. Psycho-social dimension scores improve significantly amongst the elderly. Scores for the dimensions of physical health declined almost monotonically.

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Norms for the AQoL-6D and AQoL-8D multi attribute utility instruments

1 Introduction

Five AQoL instruments exist. AQoL-4D, AQoL-6D and AQoL-8D were the result of independent research projects which recreated the descriptive systems and utility algorithms. Items in the descriptive systems represent 4, 6 and 8 psychometrically independent dimensions of the quality of life. An additional non-utility instrument, the VisQoL, was constructed for use with visually impaired patients. It was combined with AQoL-6D to form the AQoL-7D. Utility weights were calculated for the new instrument in a dedicated survey and analysis. AQoL 8 is a 'brief' version of AQoL-4D in which a single item from each dimension was removed and its value estimated by interpolation from the remaining two items so that the AQoL-4D algorithm could be used to derive utility weights.

The instruments are summarised in Box 1. Their relationship to each other is shown in Figure 1 and the linear relationship between the instruments given in Box 2. The content of AQoL-4D is largely subsumed by AQoL-6D and AQoL-8D. However wording and items differ. In contrast, AQoL-6D items and dimensions are reproduced identically in AQoL-8D. However dimension scores and utilities differ as they were independently calculated from independent surveys as described below. AQoL-6D is similarly subsumed by AQoL-7D but utilities were also assessed independently. The AQoL-7D utility survey included equal number of visually impaired and randomly selected Australians.

[Figure 1 about here]

[Box 1 about here]

[Box 2 about here]

Table 1 classifies the AQoL items by dimensions of the quality of life (QoL). The classification of dimensions was drawn eclectically from the MAU literature to facilitate the comparison of instruments.

The AQoL instruments are all available for use without charge on the AQoL website [1] (or Google 'AQoL'). The website includes user instructions, notes on the instruments, on cost utility analysis, and access to the online self-completion version of the AQoL-8D which may also be accessed by the CHE website (see Box 3).

[Table 1 about here]

[Box 3 about here]

To assist with the interpretation of the numbers produced by instruments it is common practice to provide 'population norms': estimates of the average instrument values for different age-gender cohorts. Population norms are generally estimated from the results of a large and reputable national or area based survey which achieves a sufficiently high response rate to give confidence in the representativeness of the results. Norms were published for AQoL-4D in 2013 using data from the 2007 National Survey of Mental Health and Wellbeing (NSMHWB) [2, 3]. No such national survey has included the AQoL-6D or AQoL-8D.

The objective of the present paper is threefold. First, it illustrates a general method for estimating population norms for an instrument using web-based data when suitable auxiliary variables are available. In this case, AQoL-4D scores, age and gender are employed as the auxiliary variables. Secondly, it presents the resulting norms for the AQoL-6D and AQoL-8D instruments and for their constituent dimensions.

A third objective is to present a second set of norms for AQoL-6D, 8D and for each of the dimensions based upon results which have not been weighted for the relative importance of items and dimensions but have been adjusted to allow for self-selection as described below. The reason for the duplication is that the universal practice in economics of attaching importance weights to social data is rejected by many psychologists whose instruments (including all subjective wellbeing instruments) remain unweighted.

. In a landmark article, Dawes [4] argued that complex statistical algorithms add little to the predictive power of simple scoring methods, a view which has been subsequently defended theoretically and empirically [5, 6]. The theoretical arguments have drawn upon Locke's [7, 8] 'Range of Affect' hypothesis. This maintains that the response to satisfaction questions will reflect the importance of the subject to the individual even when there is no explicit reference to its importance in the question: people will take importance into account psychologically and give more extreme responses when the subject matter is of importance. Empirical evidence for the hypothesis has been found by Dana and Dawes [9], Wu and Yao [10, 11] and Wu et al. [12].

A second theoretical explanation for Dawes' conclusion is that utility weights derived from regression analysis may be non-optimal. Regression coefficients are unbiased but can be inefficient. Coefficients from a sub-sample of the total population may 'over-fit' the data by adjusting to best fit a specific sample. As a result there will be 'shrinkage' (a reduction in R^2) when results are applied to the full population or another sample [13]. For related reasons it has been argued that regression coefficients may not be the most efficient for achieving predictive validity [9, 14]. Parameters obtained from any weighting methodology may not correctly represent the preferences of a subset of patients in a particular study. Summarising psychological research, Kahneman [15] reports that 'formulas that assign equal weights to all the predictors are often superior because they are not affected by accidents of sampling' (p226). It is further suggested that for specific purposes – which, in the present context is the measurement of utility – a simple adjustment to the unweighted, global score may achieve equal or better results than the use of variable weights [13].

In sum, there are theoretical reasons for the use of health state specific utility weights rather than a simple adjustment to the global score obtained from the use of equal weights. However there are also counter arguments and evidence for doubting the advantage of this approach.

To test these conflicting hypotheses unweighted scores were calculated for all of the instruments in the multi instrument comparison (MIC) survey [16] and differences in utility compared with differences in scores (n=8019). Linear scale effects accounted for 30.3 percent of the average

difference; content – unweighted scores – for 66 percent and the 'micro utility effect' – the unexplained difference attributable to weighting, accounted for 3.7 percent [17]. These results fail to disconfirm the arguments in the psychologists' literature and therefore justify publication of norms with and without importance weights.

2 Methods

A web-based survey was conducted which administered the AQoL-4D, AQoL-6D, and AQoL-8D to members of the public enrolled with the panel company, CINT Pty Ltd. The survey was administered by a speaking avatar. After an initial introduction participants were asked to complete the AQoL-4D.

Utility scores were calculated and the respondent was assigned to the relevant demographic cohort. The interview continued if the quota for that cohort was not full. The order of the AQoL-8D questions, which followed, were randomised to offset bias from an ordering effect. Education and economic status were obtained at the end of the survey. The survey was approved by the Monash University Human Research Ethics Committee Approval ID: CF15/2829 – 2015001164.

Analysis: Four criteria were applied to edit the data. These are discussed in Appendix 1.

While the reasons behind self-selection and non-response bias are complex, post-stratification survey weights can mathematically align the survey to the population along a small number of dimensions, to reduce many of these complex biases.

In the present study age, gender and AQoL-4D utility were selected as post-stratification auxiliaries to adjust results for the bias arising from the self-selection of survey participants. Age and gender were obtained from the Australian Bureau of Statistics (ABS) census [3]. Estimates for the cohort specific distribution of the AQoL-4D distribution were obtained from another ABS survey. The 2007 National Survey of Mental Health and Wellbeing (NSMHWB) was a nationally representative cross sectional household survey.

For each age (i) and gender (j) cohort the NSMHWB provides the distribution of AQoL-4D utilities across *k* categories, where each category is defined by a range of utility scores [-0.04 to <0.2; 0.2 to <0.4; 0.4 to < 0.6; 0.6 to <0.8; 0.8 to <1 and 1]. Age and gender cohort counts available from the National Census data (N_{ij}) were further split into AQoL-4D categories in the same proportion as occurred in the NSMHWB data to produce counts by age, gender and AQoL-4D categories (N_{ijk}).

The population in each cell N_{ijk} was converted to a proportion, p_{ijk}, of the total Australia population, N aged 15 to 74. Therefore, $p_{ijk} = N_{ijk}/N$. Similarly p^*_{ijk} was calculated as $p^*_{ijk} = n_{ijk}/n$ where *n* is the total number of valid web-based survey respondents and n_{ijk} the respondent numbers in cell *ijk.* Consequently p^*_{ijk} is the proportion of web-based survey respondents in the cell *ijk*. These proportions were used to calculate the proportional weights $w_{ijk} = p_{ijk}/p^*_{ijk}$ and cohort specific population weights $W_{ijk} = w_{ijk} \times N/n = N_{ijk}/n_{ijk}$. The sum of the weights W_{ijk} equals the population size within each post-stratum and were used to estimate stratum means and standard errors.

Standard errors were estimated using a 'design based' method that makes no assumptions about the model that is generating the data, but instead uses available sample information. The population weight, W_{ijk}, scales cohort counts to the correct population level while maintaining

information found in the proportional weights. This is necessary since the standard error of the mean estimate is the standard deviation of those sample means of all possible samples drawn from the population and hence is a property associated with the population size across cohorts. The data is scaled to the population level and standard errors estimated using jackknife methodology.

Jackknife replication simulates the distribution of repeated samples by taking a series of random, but unbiased, sub-samples from the observed sample and measures the variability between these sub-samples to estimate the sampling variance. Each sub-sample gives an unbiased estimate of the population mean and therefore the variance between the sub-sample means gives an estimate of the true sampling variance which is the definition of the standard error. The STATA 'svy' package was used to estimate standard errors using Jackknife variance estimation with weights, W_{ijk}, defined as described above.

Weighted versus unweighted results: Weighted norms were based upon methods used for obtaining the AQoL-6D and AQoL-8D and their dimensions [18, 19]. Unweighted dimension scores were calculated as the sum of the item scores (derived from the rank order of the response) for each item in the dimension converted to a (0.0-100) scale where 0.0 and 100 correspond with the worst and best response on every item. Unweighted AQoL scores were calculated as the average of the dimension scores. Unweighted results were corrected for self-selection as described above.

3 Results

A total of 6,488 individuals commenced the survey but 3,019 (47 percent) were screened out as cell quotas were filled. Of those passing the quota process 99 percent finished the survey. There were 3,228 individuals aged 74 or less. Data editing removed 497 cases (or 15.4 percent). The deletions by criteria and by age-gender cohort are reported in Appendix 1. The remaining 2,731 respondents are classified by age and gender in Table 2.

Respondents had a mean age of 46.6 years, (*SD*=16.05). In total, 58 percent of the sample were married or in a de-facto relationship, 28 percent were single; 31.9 percent had only completed primary or secondary school; 35.9 and 31.1 percent respectively held a vocational certificate or diploma or had completed a university degree. Twenty-eight percent of respondents were employed full-time in the labour force; 31.8 percent were retired/pensioners/homemakers; and 6.3 percent were students. Median reported income was in the range $52,000 to $72,748 per annum; 11 percent reported incomes less than $18,200 per annum (10 percent refused the income question).

Instrument Utility Norms: AQoL-6D and AQoL-8D norms – ie average utilities by age gender cohort – are reported in Table 3(a) and (b) respectively. The profile for both genders, for both instruments is U-shaped with the nadir for both genders for both instruments occurring in the 45-54 year old cohort. The decline to the nadir is almost identical for the two instruments (0.06), with a greater decline for men than for women. The subsequent recovery on the AQoL-8D is insignificantly greater for both men and women. This is because the AQoL-6D does not include happiness or self-worth both of which exhibit pronounced U shaped profiles for both men and women. Table 4 presents summary norms – average utilities – by education and gender.

[Table 3(a) (b) about here]

Norms for the AQoL-8, an 8 item brief instrument based upon a reduction of the AQoL-4D by Hawthorne [20] can be found on the AQoL website.

[Table 4 norms about here]

Dimensions: Population norms for the dimensions of the AQoL-8D, derived from dimension algorithms are shown in Table 5 and as bar charts in Appendix 3. Dimension scores are obtained from item responses weighted for self selection, but not by utility weights. The number of response categories per item, the number of items per dimension and the minimum and maximum scores per dimension vary. Consequently, each dimension scale is unique and scores across different dimensions cannot be compared. Differences between scores on a single scale may be compared and the significance of a change in the score assessed in relation to the standard error.

[Table 5 about here]

Psycho-social dimensions: For both men and women the age profile of the psycho-social super-dimension (MSD) is U-shaped against age with the lowest scores for men and women in the cohorts aged 35-44 and 45-54 respectively. The age related variation is greater for men than women primarily because of the high male scores in the age range 16-24 and 65-74 and, particularly, the former. The profile is largely driven by happiness and coping. The mean values for 16-24 year old men for these dimensions are 0.084 and 0.089 points above the mean value in the 45-54 year old cohort. Mean values for mental health relationships and self-worth in the 16-24 age cohort exceed mean values for men at their psycho-social nadir (age 35-44) by 0.082, 0.058 and 0.042 points respectively. By age 65-74 the mean MSD score for men has risen from its nadir (0.463) by 0.113 and is only 0.029 below the mean value for 18-24 year old males. At age 65-74 male self-worth reaches the highest score for any cohort.

The U shaped profile for women is more muted. Self-worth rises monotonically except for a small decline in the overall nadir years of 45-54. Happiness, coping, mental health, and relationships all reach their minimum in the age range 45-54, and are respectively 0.032, 0.023, 0.032 and 0.029 points below their score in the youngest cohort. However all psycho-social dimensions subsequently rise and the oldest cohort has an MSD score which is 0.094 above the nadir cohort, (age 45-54) and a higher score for every psycho-social dimension than women aged 16-24.

Physical dimensions: The physical super-dimension (PSD) declines monotonically with age for both men and women. The decrease is driven primarily by pain. Individual living and senses both decline monotonically for both genders but the decline is less steep. Males obtain higher values in most cohorts for pain and senses with the exception of men aged 35-44.

The male cohort aged 16-24 have a mean value for every physical dimension which is greater than any other cohort; the 25-34 year old cohort mean values are similarly greater than for any other older cohort and those aged 35-44 also achieve greater mean values for all physical dimensions than more elderly men. In contrast with the psycho-social dimensions there is little difference between average scores for men and women on the physical dimensions. Men have higher scores for pain (less pain is experienced) but no significant differences exist between genders for independent living or senses. The PSD score for men is greater than for women in every age cohort, with the exception of the age group 45-54. Differences however are small and the mean value of the PSD for men exceeds the mean for women by only 0.013.

Unweighted population norms: Tables 6 and 7 present the unweighted norms for AQoL-6D and AQoL-8D by age and gender. Tables 8-15 present the unweighted dimension norms and Tables 16 and 17 norms for the 'physical super dimension' (PSD) and the (psycho-social) 'mental super dimension' (MSD).

4 Discussion

The methods described in this paper illustrate how the problem of self-selection by web-based respondents may be overcome or significantly ameliorated. The analytical basis of this method is theoretically plausible. To the extent that the ABS profile of the age-gender distribution, and the profile of AQoL-4D utilities reflect the true profiles in the Australian population and to the extent that AQoL-4D utilities reflect the relevant attributes of the AQoL-6D and AQoL-8D then adjusting our sample to replicate the ABS profile ensures a valid set of AQoL-6D and AQoL-8D norms. ABS age-gender distributions were derived from the national census. AQoL-4D norms were derived from an ABS survey which employed best available survey techniques. [3].

However, as outlined in Appendix 2 the content of AQoL-4D, AQoL-6D and AQoL-8D differ. The differences are not random. Both AQoL-6D and AQoL-8D increased the psycho-social content of the construct measured. Consequently, individuals with the same AQoL-4D score may have dissimilar but compensating physical and psycho-social scores.

The existence or extent of residual bias in the present norms cannot be determined as there is no gold standard against which to validate results. Norms for the two new AQoL instruments differ significantly from those obtained from other MAU instruments. This reflects the greater psycho-social content of the instruments and the improvement in these dimensions which occurs beyond a certain age. The difference implies that they have a comparative advantage for the measurement of health states where psycho-social health is of importance.

In practice all instruments which purport to measure utility give numerical values which differ significantly. The largest six instrument comparative study to date found, on average, absolute differences between utilities predicted for individuals of 0.11. The discrepancy was attributable to differences in questions in the descriptive system and to differences in the measurement scale which compressed or inflated responses differently [17]. The AQoL instruments are subject to the same caveats. Their properties have been compared and documented [21]. A statistical transformation exists on the AQoL website which aligns the scales [22]. Likewise, transformations have been published between both AQoL-6D and AQoL-8D and each of the major MAU instruments: EQ-5D-5L, SF-6D, HUI 3, 15D, QWB [23]. Transformations align instrument scales but largely preserve the sensitivity of the original instrument.

5 Conclusion

This paper has demonstrated the use of post-stratification weights to mitigate the effects of self-selection in a web-based survey to obtain population norms. Both the AQoL-6D and AQoL-8D instruments give U-shaped age profiles reflecting the positive effect of ageing upon the psycho-social dimensions which are heavily represented in these instruments.

Table 1 Items per dimension: AQoL and other MAU instruments

Dimensions	AQoL instruments					Other MAUI			
	8	4D	6D	7D	8D	EQ-5D-5L	SF-6D	HUI 3	15D
Dimensions of physical health									
Physical ability/mobility/vitality/coping/control	1	1	3	6	4	1	1	2	2
Bodily functions/self care	2	2	1	1	1	1			3
Risk of pain/discomfort	1	1	3	3	3	1	1	1	1
Senses	2	2	3	3	3			2	2
Usual activities/work/role			1	2	1	1	1		1
Communication	1	1	1	1	1			1	1
Dimensions of psycho-social health									
Depression/anxiety/anger/harm	1	1	1	2	5	1	1	1	3
Vitality			2	2	2		1		
Sleeping	1	1			1				1
General satisfaction/contentment					5				
Self esteem/confidence				1	3				
Cognition/memory ability								1	
Social functioning/relationships	3	3	1	2	3		1		
(Family role) Intimacy/sexual relationships			1	1	4				1
Total number of items	12	12	20	26	35	5	6	8	15

Table 2 Number and percent of respondents by age and gender after editing

	n	%	16-24	25-34	35-44	45-54	55-64	65-74	Total
Males	1,258	46.1	8.4	15.5	17.7	18.2	21.5	18.7	100
Females	1,473	53.9	14.1	17.0	17.6	18.3	18.5	14.5	100
Total	2,731	100	11.5	16.3	17.7	18.2	19.9	16.4	100

Table 3 Population norms by age and gender[(1)]

3(a) AQoL-6D													
Gender	**Age group**	**Mean**	**Std Err**	**Est Pop SD**	**Gender**	**Age group**	**Mean**	**Std Err**	**Est Pop SD**	**Gender**	**Age group**	**Mean**	**Std Err**	**Est Pop SD**
Male	16-24	0.904	0.010	0.076	Female	16-24	0.840	0.012	0.147	All	16-24	0.873	0.008	0.114
	25-34	0.865	0.010	0.134		25-34	0.834	0.011	0.166		25-34	0.849	0.007	0.151
	35-44	0.846	0.009	0.145		35-44	0.819	0.010	0.165		35-44	0.832	0.007	0.156
	45-54	0.824	0.012	0.182		45-54	0.803	0.011	0.188		45-54	0.813	0.008	0.185
	55-64	0.851	0.010	0.187		55-64	0.837	0.009	0.184		55-64	0.844	0.007	0.186
	65-74	0.869	0.009	0.186		65-74	0.850	0.010	0.191		65-74	0.859	0.007	0.189
	Total	0.859	0.004	0.152		Total	0.828	0.004	0.174		Total	0.844	0.003	0.164
3(b) AQoL-8D														
Gender	**Age group**	**Mean**	**Std Err**	**Est Pop SD**	**Gender**	**Age group**	**Mean**	**Std Err**	**Est Pop SD**	**Gender**	**Age group**	**Mean**	**Std Err**	**Est Pop SD**
Male	16-24	0.869	0.013	0.093	Female	16-24	0.786	0.014	0.167	All	16-24	0.828	0.010	0.133
	25-34	0.807	0.012	0.218		25-34	0.789	0.013	0.191		25-34	0.805	0.009	0.173
	35-44	0.820	0.012	0.154		35-44	0.777	0.012	0.187		35-44	0.784	0.008	0.174
	45-54	0.791	0.011	0.161		45-54	0.757	0.012	0.204		45-54	0.769	0.009	0.202
	55-64	0.780	0.013	0.198		55-64	0.785	0.011	0.203		55-64	0.796	0.008	0.211
	65-74	0.836	0.010	0.217		65-74	0.814	0.011	0.213		65-74	0.825	0.007	0.216
	Total	0.816	0.005	0.173		Total	0.782	0.005	0.194		Total	0.799	0.004	0.185

(1) Weights derived from AQoL-4D ABS age and gender census data applies to web data.

Table 4 Population norms by gender and education[(1)]

AQoL Measure	Gender	Level of Education	Mean	Std. Err.	Std. Dev.
AQoL-6D	Male	High School	0.840	0.010	0.180
		TAFE/Diploma/Trade qualifications	0.855	0.007	0.165
		Graduate/postgraduate	0.876	0.006	0.118
	Female	High School	0.814	0.008	0.192
		TAFE/Diploma/Trade qualifications	0.818	0.008	0.196
		Graduate/postgraduate	0.851	0.007	0.133
AQoL-8D	Male	High School	0.793	0.012	0.203
		TAFE/Diploma/Trade qualifications	0.815	0.009	0.188
		Graduate/postgraduate	0.833	0.007	0.137
	Female	High School	0.770	0.010	0.219
		TAFE/Diploma/Trade qualifications	0.767	0.009	0.213
		Graduate/postgraduate	0.807	0.008	0.152

(1) Weights derived from AQoL-4D ABS age and gender census data applies to web data.

Table 5 Dimension norms by age and gender

Weighted only to correct for self-selection: ie unweighted by utilities

		Physical Dimensions					
Age	Gender	Independent Living			Senses		
		Mean	Std. Err.	Std. Dev.	Mean	Std. Err.	Std. Dev.
	Female	0.962	0.005	0.066	0.935	0.007	0.087
16-24	Male	0.966	0.006	0.050	0.947	0.008	0.055
	Total	0.964	0.004	0.059	0.941	0.005	0.072
	Female	0.959	0.005	0.090	0.935	0.006	0.084
25-34	Male	0.955	0.005	0.080	0.938	0.006	0.085
	Total	0.957	0.004	0.085	0.937	0.004	0.085
	Female	0.946	0.005	0.100	0.922	0.006	0.085
35-44	Male	0.947	0.005	0.092	0.924	0.006	0.092
	Total	0.946	0.004	0.096	0.923	0.004	0.089
	Female	0.938	0.006	0.117	0.885	0.006	0.095
45-54	Male	0.930	0.007	0.124	0.880	0.008	0.107
	Total	0.934	0.005	0.121	0.883	0.005	0.101
	Female	0.918	0.007	0.143	0.894	0.005	0.092
55-64	Male	0.919	0.007	0.149	0.880	0.006	0.113
	Total	0.918	0.005	0.146	0.887	0.004	0.103
	Female	0.898	0.009	0.177	0.886	0.006	0.110
65-74	Male	0.910	0.008	0.169	0.871	0.007	0.130
	Total	0.904	0.006	0.174	0.878	0.005	0.120
	Male	0.941	0.003	0.106	0.911	0.003	0.099
Total	Female	0.940	0.002	0.113	0.912	0.003	0.094
	Total	0.941	0.002	0.110	0.911	0.002	0.097
		Pain			Physical Super Dimension (PSD)		
	Female	0.912	0.010	0.127	0.877	0.010	0.126
16-24	Male	0.937	0.011	0.080	0.904	0.011	0.082
	Total	0.925	0.008	0.104	0.891	0.008	0.105
	Female	0.900	0.010	0.166	0.871	0.010	0.156
25-34	Male	0.906	0.010	0.133	0.874	0.010	0.134
	Total	0.903	0.007	0.149	0.872	0.007	0.145
	Female	0.856	0.013	0.199	0.826	0.011	0.173
35-44	Male	0.882	0.011	0.160	0.847	0.011	0.158
	Total	0.869	0.008	0.181	0.836	0.008	0.166
	Female	0.841	0.012	0.220	0.795	0.011	0.194
45-54	Male	0.836	0.014	0.208	0.787	0.013	0.195
	Total	0.839	0.009	0.214	0.791	0.008	0.195
	Female	0.806	0.014	0.243	0.767	0.012	0.218
55-64	Male	0.833	0.013	0.249	0.778	0.012	0.224
	Total	0.819	0.010	0.247	0.772	0.008	0.221
	Female	0.771	0.015	0.274	0.732	0.013	0.243
65-74	Male	0.805	0.014	0.264	0.749	0.012	0.245
	Total	0.788	0.010	0.271	0.740	0.009	0.245
	Male	0.873	0.005	0.180	0.831	0.005	0.174
Total	Female	0.854	0.005	0.206	0.818	0.005	0.187
	Total	0.864	0.004	0.193	0.825	0.004	0.181
		Psycho-social Dimensions					
Age	Gender	Mental health			Relationships		
		Mean	Std. Err.	Std. Dev.	Mean	Std. Err.	Std. Dev.
	Female	0.665	0.017	0.168	0.781	0.014	0.141
16-24	Male	0.758	0.020	0.116	0.836	0.015	0.094
	Total	0.713	0.013	0.148	0.809	0.010	0.120
25-34	Female	0.667	0.013	0.166	0.793	0.012	0.153

	Male	0.706	0.013	0.151	0.803	0.012	0.141
	Total	0.686	0.009	0.160	0.798	0.008	0.147
	Female	0.652	0.012	0.158	0.776	0.011	0.153
35-44	Male	0.676	0.012	0.145	0.778	0.010	0.133
	Total	0.664	0.008	0.152	0.777	0.007	0.143
	Female	0.650	0.011	0.164	0.767	0.010	0.156
45-54	Male	0.697	0.013	0.174	0.783	0.012	0.166
	Total	0.673	0.009	0.171	0.775	0.008	0.162
	Female	0.681	0.010	0.157	0.790	0.010	0.171
55-64	Male	0.714	0.011	0.183	0.797	0.010	0.180
	Total	0.697	0.007	0.171	0.793	0.007	0.176
	Female	0.720	0.010	0.169	0.807	0.010	0.178
65-74	Male	0.744	0.010	0.187	0.827	0.010	0.187
	Total	0.732	0.007	0.179	0.817	0.007	0.183
	Male	0.713	0.006	0.164	0.802	0.005	0.150
Total	Female	0.668	0.005	0.167	0.784	0.005	0.158
	Total	0.691	0.004	0.167	0.793	0.003	0.155
		Coping			**Self Worth**		
	Female	0.817	0.013	0.146	0.795	0.015	0.160
16-24	Male	0.899	0.011	0.074	0.881	0.014	0.089
	Total	0.859	0.009	0.114	0.839	0.010	0.129
	Female	0.803	0.012	0.159	0.818	0.012	0.166
25-34	Male	0.849	0.011	0.124	0.852	0.012	0.134
	Total	0.826	0.008	0.143	0.835	0.008	0.151
	Female	0.799	0.010	0.149	0.829	0.010	0.155
35-44	Male	0.815	0.009	0.128	0.846	0.010	0.135
	Total	0.807	0.007	0.139	0.838	0.007	0.146
	Female	0.794	0.011	0.167	0.821	0.011	0.171
45-54	Male	0.812	0.011	0.147	0.860	0.010	0.149
	Total	0.803	0.007	0.157	0.840	0.007	0.161
	Female	0.824	0.009	0.151	0.855	0.009	0.153
55-64	Male	0.839	0.009	0.163	0.889	0.008	0.150
	Total	0.831	0.006	0.157	0.871	0.006	0.153
	Female	0.845	0.008	0.154	0.899	0.008	0.144
65-74	Male	0.851	0.008	0.160	0.916	0.007	0.147
	Total	0.848	0.006	0.157	0.907	0.005	0.146
	Male	0.844	0.004	0.135	0.870	0.005	0.139
Total	Female	0.811	0.004	0.157	0.831	0.005	0.165
	Total	0.827	0.003	0.147	0.850	0.003	0.153
		Happiness			**Mental Super Dimension (MSD)**		
	Female	0.803	0.012	0.141	0.473	0.026	0.243
16-24	Male	0.855	0.014	0.088	0.605	0.029	0.170
	Total	0.829	0.009	0.117	0.540	0.020	0.216
	Female	0.791	0.011	0.153	0.475	0.019	0.244
25-34	Male	0.810	0.011	0.130	0.526	0.021	0.229
	Total	0.800	0.008	0.142	0.500	0.014	0.239
	Female	0.788	0.011	0.155	0.458	0.017	0.227
35-44	Male	0.766	0.010	0.136	0.463	0.016	0.204
	Total	0.777	0.007	0.146	0.461	0.011	0.216
	Female	0.771	0.009	0.157	0.444	0.015	0.228
45-54	Male	0.777	0.012	0.163	0.498	0.019	0.246
	Total	0.774	0.007	0.161	0.471	0.012	0.240
	Female	0.792	0.010	0.158	0.483	0.015	0.240
55-64	Male	0.799	0.010	0.181	0.528	0.016	0.261
	Total	0.795	0.007	0.170	0.505	0.011	0.251
65-74	Female	0.828	0.008	0.147	0.538	0.014	0.242
	Male	0.848	0.007	0.147	0.576	0.015	0.276

	Total	0.838	0.005	0.148	0.556	0.010	0.260
	Male	0.806	0.005	0.147	0.529	0.009	0.239
Total	Female	0.793	0.004	0.155	0.473	0.008	0.241
	Total	0.799	0.003	0.151	0.501	0.006	0.242

Table 6 Unweighted AQoL-6D population norms by age and gender

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	85.80	0.801	84.23	87.37	9.26
	Male	89.90	0.815	88.31	91.50	5.79
	Total	87.90	0.577	86.76	89.03	7.72
25-34	Female	84.91	0.701	83.54	86.29	10.95
	Male	86.95	0.695	85.59	88.32	9.24
	Total	85.93	0.493	84.96	86.89	10.15
35-44	Female	83.41	0.659	82.12	84.71	11.20
	Male	84.50	0.615	83.30	85.71	9.99
	Total	83.95	0.450	83.07	84.83	10.62
45-54	Female	81.60	0.696	80.23	82.96	12.74
	Male	82.69	0.845	81.03	84.35	13.03
	Total	82.14	0.546	81.06	83.21	12.93
55-64	Female	82.13	0.665	80.83	83.44	13.24
	Male	83.16	0.674	81.84	84.48	13.50
	Total	82.64	0.473	81.71	83.57	13.38
65-74	Female	82.04	0.741	80.59	83.50	14.35
	Male	83.73	0.679	82.40	85.07	14.42
	Total	82.87	0.502	81.89	83.86	14.46
Total	Male	89.76	0.363	89.05	90.47	13.33
	Female	89.79	0.311	89.18	90.40	13.29
	Total	84.37	0.221	83.94	84.81	11.53

Table 7 Unweighted AQoL-8D population norms by age and gender

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	80.97	1.037	78.93	83.00	11.46
	Male	86.89	1.049	84.83	88.95	7.04
	Total	83.99	0.749	82.52	85.46	9.57
25-34	Female	80.70	0.869	78.99	82.40	12.82
	Male	82.99	0.858	81.31	84.67	10.83
	Total	81.84	0.610	80.64	83.03	11.89
35-44	Female	79.42	0.783	77.88	80.95	12.77
	Male	80.16	0.720	78.75	81.57	11.05
	Total	79.78	0.531	78.74	80.82	11.93
45-54	Female	78.04	0.766	76.53	79.54	13.78
	Male	79.70	0.938	77.86	81.54	14.09
	Total	78.86	0.606	77.67	80.04	13.99
55-64	Female	79.46	0.700	78.09	80.83	13.44
	Male	80.93	0.734	79.49	82.37	14.31
	Total	80.19	0.509	79.19	81.18	13.90
65-74	Female	81.12	0.731	79.69	82.56	13.99
	Male	82.92	0.688	81.58	84.27	14.30
	Total	82.01	0.501	81.02	82.99	14.21
Total	Male	82.24	0.373	81.51	82.98	12.17
	Female	79.85	0.347	79.17	80.53	13.11
	Total	81.04	0.257	80.53	81.54	12.71

Table 8 Unweighted AQoL-8D Population norms: Independent Living

				95% Confidence Interval for Mean		Estimated Population Std. Dev.
Age	Gender	Mean	Std. Err.	LB	UB	
16-24	Female	95.04	0.572	93.92	96.16	7.49
	Male	95.83	0.685	94.48	97.17	5.49
	Total	95.44	0.447	94.56	96.32	6.62
25-34	Female	94.91	0.552	93.83	95.99	9.99
	Male	94.34	0.638	93.09	95.59	8.68
	Total	94.63	0.421	93.80	95.45	9.35
35-44	Female	93.02	0.639	91.76	94.27	11.43
	Male	93.11	0.654	91.83	94.39	10.61
	Total	93.06	0.456	92.17	93.95	11.03
45-54	Female	92.10	0.686	90.75	93.44	13.52
	Male	91.38	0.832	89.75	93.01	13.97
	Total	91.74	0.536	90.69	92.79	13.79
55-64	Female	89.43	0.817	87.82	91.03	16.61
	Male	89.86	0.833	88.22	91.49	17.05
	Total	89.64	0.582	88.50	90.78	16.83
65-74	Female	87.68	1.034	85.65	89.71	20.16
	Male	88.62	0.925	86.81	90.44	19.10
	Total	88.14	0.692	86.79	89.50	19.75
Total	Male	92.56	0.317	91.94	93.19	12.07
	Female	92.43	0.292	91.86	93.00	12.96
	Total	92.50	0.215	92.08	92.92	12.53

Table 9 Unweighted AQoL-8D Population norms: Happiness

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	72.12	1.641	68.90	75.33	17.46
	Male	79.23	1.852	75.60	82.86	11.42
	Total	75.75	1.247	73.30	78.19	14.81
25-34	Female	70.37	1.378	67.67	73.07	18.27
	Male	72.97	1.434	70.16	75.79	16.25
	Total	71.66	0.991	69.72	73.61	17.34
35-44	Female	69.84	1.298	67.29	72.38	18.41
	Male	67.05	1.173	64.75	69.35	15.96
	Total	68.47	0.881	66.74	70.20	17.27
45-54	Female	67.51	1.131	65.29	69.73	18.36
	Male	69.13	1.419	66.35	71.91	19.24
	Total	68.31	0.903	66.54	70.08	18.88
55-64	Female	70.08	1.162	67.80	72.36	18.69
	Male	71.08	1.221	68.68	73.47	21.09
	Total	70.57	0.842	68.92	72.22	19.91
65-74	Female	74.18	0.990	72.23	76.12	17.62
	Male	76.80	0.997	74.85	78.76	18.66
	Total	75.46	0.703	74.09	76.84	18.22
Total	Male	72.39	0.616	71.18	73.60	17.84
	Female	70.38	0.547	69.31	71.46	18.51
	Total	71.38	0.412	70.57	72.19	18.23

Table 10 Unweighted AQoL-8D Population norms: Mental Health

				95% Confidence Interval for Mean		Estimated Population Std. Dev.
Age	Gender	Mean	Std. Err.	LB	UB	
16-24	Female	74.10	1.441	71.27	76.92	15.40
	Male	82.70	1.473	79.81	85.59	9.10
	Total	78.49	1.042	76.44	80.53	12.72
25-34	Female	73.64	1.122	71.44	75.84	15.71
	Male	77.91	1.108	75.74	80.08	13.26
	Total	75.76	0.792	74.21	77.32	14.64
35-44	Female	72.57	1.028	70.56	74.59	15.50
	Male	75.41	0.959	73.53	77.29	13.22
	Total	73.96	0.702	72.59	75.34	14.45
45-54	Female	71.81	1.003	69.84	73.77	16.91
	Male	76.35	1.131	74.14	78.57	16.36
	Total	74.04	0.767	72.54	75.55	16.81
55-64	Female	75.14	0.857	73.46	76.82	15.13
	Male	77.99	0.930	76.16	79.81	16.58
	Total	76.54	0.636	75.30	77.79	15.94
65-74	Female	78.35	0.881	76.63	80.08	16.05
	Male	80.70	0.839	79.06	82.35	16.35
	Total	79.51	0.608	78.31	80.70	16.30
Total	Male	78.33	0.479	77.39	79.27	14.47
	Female	73.89	0.453	73.00	74.78	16.11
	Total	76.09	0.333	75.44	76.75	15.46

Table 11 Unweighted AQoL-8D Population norms: Coping

				95% Confidence Interval for Mean		Estimated Population Std. Dev.
Age	Gender	Mean	Std. Err.	LB	UB	
16-24	Female	73.43	1.630	70.24	76.63	17.69
	Male	84.13	1.581	81.03	87.23	10.12
	Total	78.90	1.162	76.62	81.18	14.51
25-34	Female	71.77	1.391	69.04	74.50	18.96
	Male	77.81	1.322	75.22	80.40	15.49
	Total	74.77	0.968	72.87	76.67	17.47
35-44	Female	71.12	1.216	68.73	73.50	17.69
	Male	72.71	1.084	70.59	74.84	15.27
	Total	71.90	0.812	70.31	73.49	16.52
45-54	Female	70.02	1.234	67.60	72.45	19.44
	Male	72.64	1.288	70.11	75.16	17.60
	Total	71.31	0.893	69.56	73.06	18.58
55-64	Female	73.64	1.047	71.59	75.69	17.85
	Male	75.85	1.144	73.61	78.10	19.45
	Total	74.73	0.776	73.21	76.25	18.70
65-74	Female	76.30	1.008	74.33	78.28	18.19
	Male	78.11	1.069	76.01	80.20	19.50
	Total	77.19	0.732	75.75	78.62	18.88
Total	Male	76.79	0.563	75.68	77.89	16.70
	Female	72.37	0.541	71.31	73.43	18.68
	Total	74.56	0.394	73.79	75.34	17.84

Table 12 Unweighted AQoL-8D Population norms: Relationships

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	83.66	1.045	81.61	85.71	12.11
	Male	88.00	1.106	85.83	90.17	7.62
	Total	85.88	0.767	84.37	87.38	10.05
25-34	Female	84.19	0.922	82.39	86.00	13.55
	Male	84.64	0.996	82.69	86.60	12.41
	Total	84.42	0.676	83.09	85.74	13.02
35-44	Female	82.15	0.881	80.42	83.88	14.46
	Male	82.20	0.823	80.59	83.82	12.87
	Total	82.18	0.602	81.00	83.36	13.68
45-54	Female	81.85	0.827	80.22	83.47	15.22
	Male	81.68	1.105	79.51	83.84	16.78
	Total	81.76	0.685	80.42	83.11	16.09
55-64	Female	83.47	0.840	81.83	85.12	15.33
	Male	83.59	0.864	81.89	85.28	16.85
	Total	83.53	0.601	82.35	84.71	16.09
65-74	Female	84.96	0.842	83.31	86.61	15.86
	Male	86.73	0.776	85.21	88.25	15.59
	Total	85.83	0.573	84.70	86.95	15.82
Total	Male	84.30	0.413	83.49	85.11	13.92
	Female	83.23	0.373	82.50	83.96	14.43
	Total	83.76	0.278	83.22	84.31	14.21

Table 13 Unweighted AQoL-8D Population norms: Self-Worth

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	72.46	1.886	68.76	76.15	19.77
	Male	83.83	1.713	80.47	87.19	11.10
	Total	78.26	1.305	75.70	80.82	16.04
25-34	Female	74.99	1.467	72.11	77.87	20.36
	Male	79.50	1.420	76.71	82.28	16.70
	Total	77.23	1.021	75.23	79.23	18.67
35-44	Female	76.65	1.201	74.30	79.01	18.76
	Male	77.87	1.289	75.34	80.39	16.61
	Total	77.25	0.875	75.53	78.96	17.71
45-54	Female	75.78	1.282	73.26	78.29	20.74
	Male	80.43	1.296	77.89	82.97	18.42
	Total	78.07	0.920	76.26	79.87	19.73
55-64	Female	79.52	1.070	77.42	81.62	18.46
	Male	83.66	1.006	81.69	85.64	18.67
	Total	81.56	0.743	80.11	83.02	18.71
65-74	Female	84.99	0.979	83.07	86.91	17.98
	Male	87.40	0.990	85.46	89.34	19.40
	Total	86.17	0.695	84.81	87.54	18.75
Total	Male	81.61	0.570	80.49	82.72	17.29
	Female	76.76	0.570	75.64	77.88	20.17
	Total	79.16	0.407	78.37	79.96	18.90

Table 14 Unweighted AQoL-8D Population norms: Pain

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	90.62	1.060	88.54	92.70	12.79
	Male	92.38	1.235	89.96	94.81	8.49
	Total	91.52	0.813	89.92	93.11	10.75
25-34	Female	89.07	1.056	86.99	91.14	17.18
	Male	89.71	1.070	87.61	91.81	13.52
	Total	89.39	0.748	87.92	90.85	15.37
35-44	Female	85.07	1.274	82.57	87.56	19.94
	Male	86.82	1.117	84.63	89.01	16.10
	Total	85.93	0.846	84.27	87.58	18.10
45-54	Female	82.97	1.222	80.57	85.36	22.41
	Male	82.49	1.376	79.79	85.18	21.13
	Total	82.73	0.915	80.94	84.52	21.80
55-64	Female	79.71	1.407	76.95	82.47	24.49
	Male	82.15	1.322	79.56	84.74	25.44
	Total	80.91	0.965	79.02	82.81	24.99
65-74	Female	76.34	1.513	73.37	79.30	27.47
	Male	79.93	1.355	77.28	82.59	26.38
	Total	78.10	1.016	76.11	80.09	27.14
Total	Male	86.17	0.529	85.13	87.21	18.25
	Female	84.64	0.531	83.60	85.68	20.82
	Total	85.40	0.375	84.66	86.13	19.56

Table 15 Unweighted AQoL-8D Population norms: Senses

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	91.59	0.814	89.99	93.18	9.40
	Male	93.42	0.826	91.80	95.04	5.46
	Total	92.52	0.577	91.39	93.65	7.45
25-34	Female	91.46	0.720	90.05	92.87	9.32
	Male	91.89	0.765	90.39	93.39	9.32
	Total	91.67	0.523	90.65	92.70	9.39
35-44	Female	89.96	0.703	88.58	91.34	9.43
	Male	90.06	0.710	88.67	91.45	9.61
	Total	90.01	0.498	89.03	90.98	9.54
45-54	Female	85.12	0.688	83.77	86.47	10.41
	Male	84.66	0.865	82.96	86.36	11.31
	Total	84.89	0.549	83.82	85.97	10.92
55-64	Female	84.96	0.588	83.80	86.11	9.84
	Male	83.89	0.712	82.49	85.29	11.95
	Total	84.43	0.459	83.53	85.33	10.94
65-74	Female	84.20	0.665	82.90	85.51	11.23
	Male	82.90	0.741	81.45	84.35	13.67
	Total	83.56	0.498	82.59	84.54	12.46
Total	Male	88.35	0.359	87.64	89.05	10.74
	Female	88.24	0.317	87.62	88.86	10.42
	Total	88.29	0.239	87.82	88.76	10.62

Table 16 Unweighted AQoL-8D Population norms: Mental Super Dimension (MSD)

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	76.09	1.314	73.51	78.66	14.34
	Male	83.88	1.301	81.33	86.43	8.47
	Total	80.07	0.940	78.22	81.91	11.81
25-34	Female	75.90	1.071	73.80	78.01	15.25
	Male	79.12	1.057	77.04	81.19	12.88
	Total	77.50	0.753	76.02	78.98	14.16
35-44	Female	75.04	0.951	73.17	76.90	14.96
	Male	75.88	0.873	74.16	77.59	12.83
	Total	75.45	0.644	74.19	76.71	13.92
45-54	Female	74.09	0.910	72.31	75.88	15.87
	Male	76.68	1.076	74.57	78.79	15.90
	Total	75.37	0.707	73.98	76.75	15.97
55-64	Female	76.93	0.820	75.32	78.53	14.81
	Male	78.82	0.857	77.14	80.50	16.00
	Total	77.86	0.596	76.69	79.03	15.44
65-74	Female	80.02	0.792	78.46	81.57	14.91
	Male	82.20	0.773	80.68	83.72	15.36
	Total	81.09	0.554	80.00	82.17	15.22
Total	Male	79.20	0.445	78.33	80.07	13.99
	Female	76.01	0.419	75.19	76.84	15.34
	Total	77.59	0.308	76.99	78.20	14.76

Table 17 Unweighted AQoL-8D Population norms: Physical Super Dimension (PSD)

				95% Confidence Interval for Mean		Estimated Population
Age	**Gender**	**Mean**	**Std. Err.**	**LB**	**UB**	**Std. Dev.**
16-24	Female	92.87	0.571	91.75	93.99	7.11
	Male	94.22	0.650	92.95	95.50	4.98
	Total	93.56	0.433	92.71	94.41	6.15
25-34	Female	92.39	0.542	91.33	93.45	9.56
	Male	92.43	0.578	91.30	93.57	8.16
	Total	92.41	0.394	91.64	93.18	8.87
35-44	Female	90.11	0.609	88.91	91.30	10.24
	Male	90.61	0.619	89.39	91.82	9.75
	Total	90.35	0.433	89.50	91.20	10.01
45-54	Female	87.66	0.651	86.38	88.93	12.25
	Male	87.08	0.793	85.52	88.63	12.56
	Total	87.37	0.510	86.37	88.37	12.44
55-64	Female	85.64	0.698	84.27	87.01	13.81
	Male	86.08	0.709	84.69	87.48	14.45
	Total	85.86	0.496	84.89	86.83	14.13
65-74	Female	83.81	0.826	82.19	85.43	15.92
	Male	84.69	0.739	83.24	86.14	15.66
	Total	84.24	0.553	83.16	85.33	15.85
Total	Male	82.24	0.373	81.51	82.98	12.17
	Female	79.85	0.347	79.17	80.53	13.11
	Total	89.43	0.208	89.03	89.84	11.31

Box 1 AQoL instruments

AQoL-4D Originally called 'AQoL'. Initially a 5 dimension 15 item instrument. Dimensions were illness, independent living, social relationships, physical senses, psychological wellbeing. Illness was subsequently deleted from the utility algorithm. Utilities were created from a multi level model using multiplicative models to combine items into dimensions and an overall multiplicative model to combine dimension scores into a single AQoL utility score [24]**.**

AQoL 8: An 8 item 'Brief' instrument observed by removing one item from each AQoL-4D dimension [20].

AQoL-6D: A 6 dimensional 20 item instrument. Pain and coping were added to AQoL-4D as separate dimensions. Mental health and Independent Living items were increased from 3 to 4 items. Utility weights were constructed as for AQoL-4D but with an econometric adjustment to the final algorithm [18].

AQoL-7D: A 7 dimension 26 item instrument which adds an explicit dimension for vision (VisQoL) to the AQoL-6D [25]. Scaling was carried out as for AQoL-6D [26].

AQoL-8D: An 8 dimensional 35 item instrument which adds explicit dimensions for self worth and happiness and expands the items in mental health. Utility weights were constructed as for AQoL-6D but with an econometric correction to each dimension before their combination to create AQoL-8D [27, 28].

Box 2 GMS Linear regression equations(1) n=8,022

AQoL-4D	= -0.27 + 1.23	AQoL-6D	R^2 = 0.69
AQoL-4D	= 0.16 + 1.18	AQoL-8D	R^2 = 0.72
AQoL-6D	= 0.07 + 0.95	AQoL-8D	R^2 = 0.95

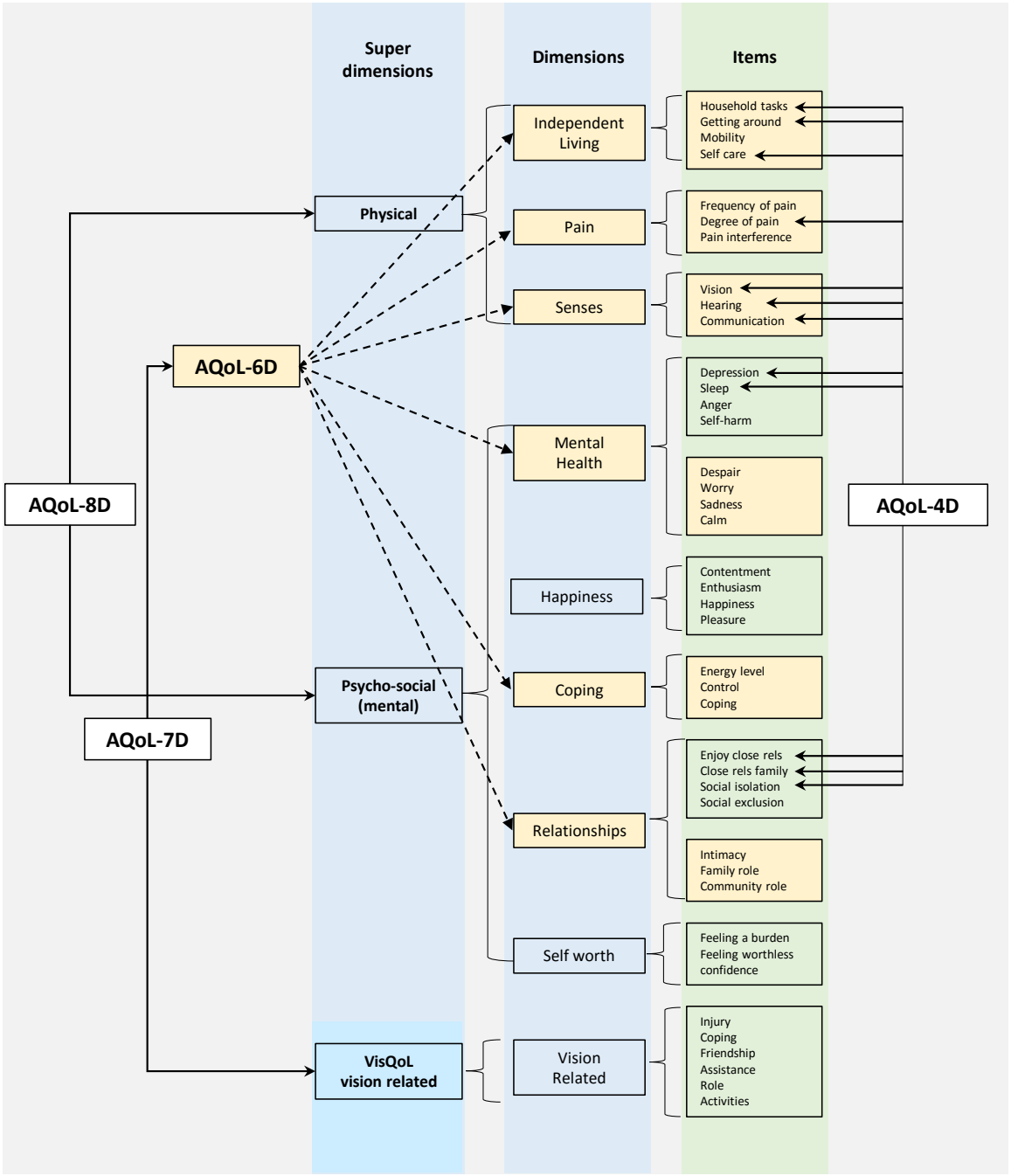
(1) GMS (Geometric Mean Squares) regressions give results which are not affected by the choice of dependent and independent variable. Therefore the first result above could be re-written as AQoL-6D = [0.27 + AQoL-4D]/1.23

Box 3 AQoL Self-Assessment

AQoL-8D may be self-completed using the online survey accessed via the homepage of the Monash Centre for Health Economics. Results are given for each dimension relative to population norms. Note that the instrument was constructed primarily for use in large projects. Individual results are subject to significant error. Scores also reflect the valuations of the sample of the Australian public which participated in the AQoL scaling survey and may differ from the values of a particular individual. As an extreme example, loss of hearing reduces AQoL-8D scores. However some members of the deaf community argue that it increases wellbeing (by including the person in a particular community and culture.)

Source: AQoL website [1]

Figure 1 AQoL-8D and AQoL-6D instruments*



*AQoL-6D is shown in (yellow) shaded items and dimensions. It does not map into psychometrically valid 'super dimensions' shown for AQoL-8D.

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Appendix 1 Editing

Screening responses for quality data from online surveys is best done using a mixture of methods [29]. The first exclusion criterion was that the answers provided to any of the three questions differed by more than one level on the four response level scale. This criterion was used as consistency of response to duplicate questions is an accepted indicator of respondent veracity. A one level difference in responses was deemed to be acceptable as the questions asked in between duplicates may have altered a person's perception (a 'priming' effect).

People whose utility scores differed by more than 0.5 on the two instruments were also excluded. Both instruments were calibrated using the time trade off (TTO) method. A reduction in the TTO of 0.5 is therefore equivalent to a preference to sacrifice 50 percent of life. If a person varies the evaluation of themselves by this amount the probable explanation is the unreliability of the response, not the difference in the instruments which correlate highly (see Appendix 4).

Respondents claiming an educational attainment of 'part primary school' were also excluded. This response category was included as an addendum to the ASCED levels used by the Australian Bureau of Statistics [30]. Putting an illegitimate response category in a survey is an accepted technique for identifying poor quality data [29].

Table A1.1 reports the number of cases deleted by criterion. Table A1.2 reports the total number of respondents by demographic and AQoL-4D cell and the distribution of the deletions, which are shown in brackets.

Table A1.1 Cases deleted by criterion

Criterion	Number	Action
1. Comparison of 3 questions reported in AQoL-4D, AQoL-8D (family role, communication, pain)		
All 3 answers inconsistent	53	Deleted
2 of 3 answers inconsistent	179	Deleted
1 answer inconsistent by more than 1 response level	189	Deleted
2. AQoL-8D and AQoL-4D differed more than 0.5	7	Deleted already by Criterion 1
3. Age and year of both inconsistent (more than +1 year)	69	Deleted
4. Stated education part primary (legally impossible)	7	Deleted
Total deletions	497	
Retained n	2731	
Percent deletions	15.4	

Note: 180 participants indicated they were aged over 75 and were not analysed for the norms - analysed n=2731

Table A1.2 Cell count by retained and deleted responses

		Aqol4D score Range					
		-0.04 thru <0.2	**0.2 thru <0.4**	**0.4 thru < 0.6**	**0.6 thru <0.8**	**0.8 thru <1**	**1**
Male	<18	1 (1)	2 (3)	4	3 (1)	2	4 (2)
	18-24	6 (16)	6 (6)	11 (7)	15 (12)	31 (6)	20 (6)
	25-34	10 (17)	32 (19)	22 (17)	41 (9)	45 (6)	45 (5)
	35-44	24 (7)	37 (8)	27 (9)	41 (9)	48 (3)	45 (5)
	45-54	35 (15)	27 (10)	41 (9)	43 (7)	48 (2)	35 (2)
	55-64	42 (8)	46 (4)	41 (9)	45 (5)	50	47 (3)
	65-74	19 (17)	35 (9)	40 (10)	45 (5)	48 (2)	49
Female	<18	3	4 (1)	1	17	11	1
	18-24	16 (5)	15 (3)	36 (8)	43 (7)	46 (6)	15 (3)
	25-34	33 (15)	37 (13)	42 (9)	50	46 (4)	42 (8)
	35-44	29 (10)	46 (4)	44 (6)	46 (4)	47 (3)	48 (2)
	45-54	40 (9)	45 (5)	40 (10)	47 (3)	49 (1)	48 (2)
	55-64	41 (9)	46 (5)	47 (4)	46 (3)	48	45 (1)
	65-74	12 (4)	33 (2)	46 (4)	47 (3)	50	25 (1)

Note: numbers in brackets are deleted cases

Appendix 2 Relationship between AQoL-4D, 6D and 8D

A more detailed description of the relationship between the three AQoL instruments is given in Iezzi, Richardson [21]. Statistics below were based upon 6,848 observations collected in the Multi Instrument Comparison (MIC) survey of patients and the public in 6 countries. The methods and data are described in Richardson et al. [16].

Correlation between the three instruments is given in Table A2.1 and geometric mean squares (GMS) regressions reported in Table A4.2. GMS regressions do not differ with the choice of dependent and independent variables, X and Y. They are derived from the geometric mean of coefficients derived from the OLS regressions of Y on X and X on Y.

Correlations are high. With two exceptions R^2 statistics in Table A2.2 exceed the R^2 from the regression of every pairwise combination of the EQ-5D-5L, SF-6D, HUI 3, 15D, QWB and AQoL-8D multi attribute utility instruments using the same data. The two exceptions are the R^2 coefficients from the regression of the 15D upon the EQ-5D-5L and upon the AQoL-8D where the R^2 of 0.69 equals the lowest R^2 in Table A2.2. Table A2.3 indicates that, despite similarities, AQoL-6D and AQoL-8D have greater psycho-social content than AQoL-4D.

Table A2.1 Pearson correlation coefficients

AQoL	4D	6D	8D	PSD (1)	MSD (2)
4D		0.83	0.85	0.77	0.73
6D			0.97	0.76	0.86
8D				0.76	0.92

(1) Physical super dimension of the AQoL-8D

(2) Mental (psycho-social) super dimension of the AQoL-8D

Table A2.2 GMS Regressions (n=6,848)

AQoL-6D	= 0.22+0.81 AQoL-4D	R^2 = 0.69
AQoL-8D	= 0.14+0.85 AQoL-4D	R^2 = 0.72
AQoL-6D	-= 0.69+0.95 AQoL-8D	R^2 = 0.94

Table A2.3 Regression upon AQoL-8D dimensions* (n=6,848) Beta coefficients

Dimensions	AQoL-8D	AQoL-6D	AQoL-4D
Physical			
Independent living	0.09	0.10	0.19
Pain	0.20	0.19	0.23
Senses	0.09	0.12	0.19
Psycho-social			
Mental health	0.20	0.18	0.05
Happiness	0.14	0.08	0.13
Coping	0.15	0.40	0.03
Relationships	0.19	0.05	0.28
Self worth	0.20	0.10	0.05
R^2 (Adj)	0.99	0.96	0.77

* All coefficients are significant at 0.00 level

Appendix 3 Bar charts for dimension norms

Figure A3 1(a) Psycho-social Super Dimension

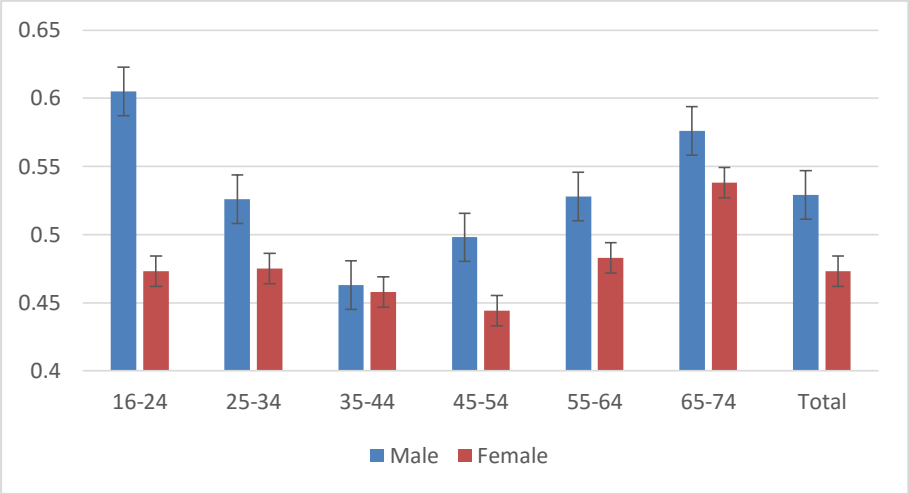


Figure A3 1(b) Mental Health

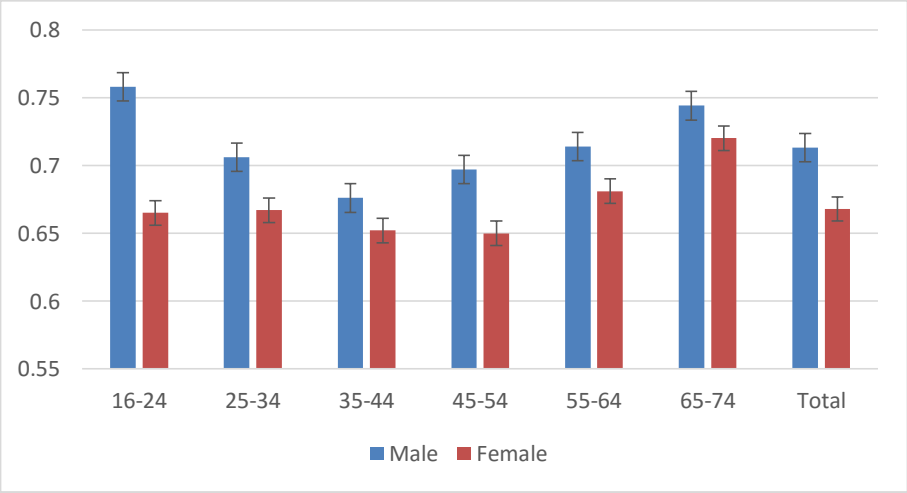
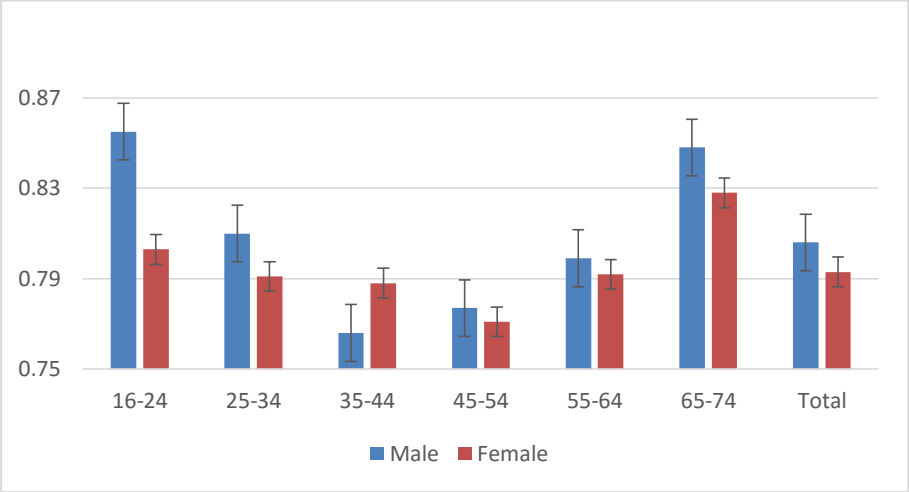


Figure A3 1(c) Happiness



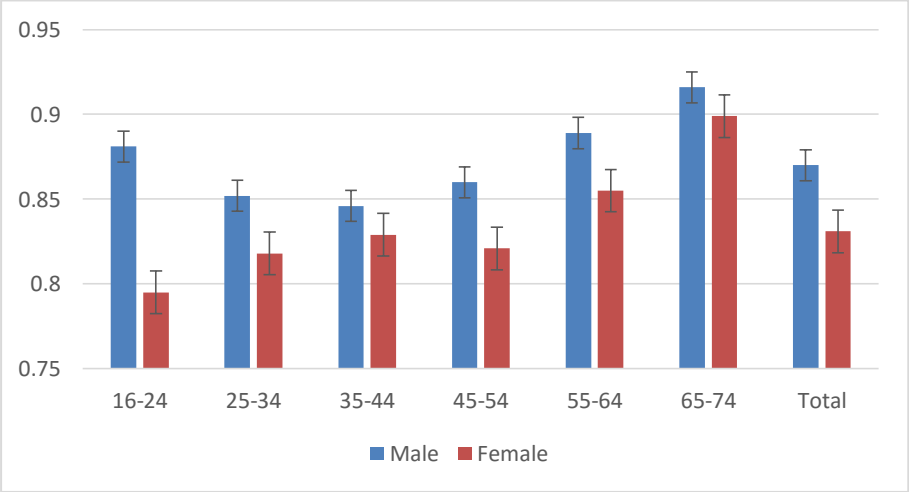
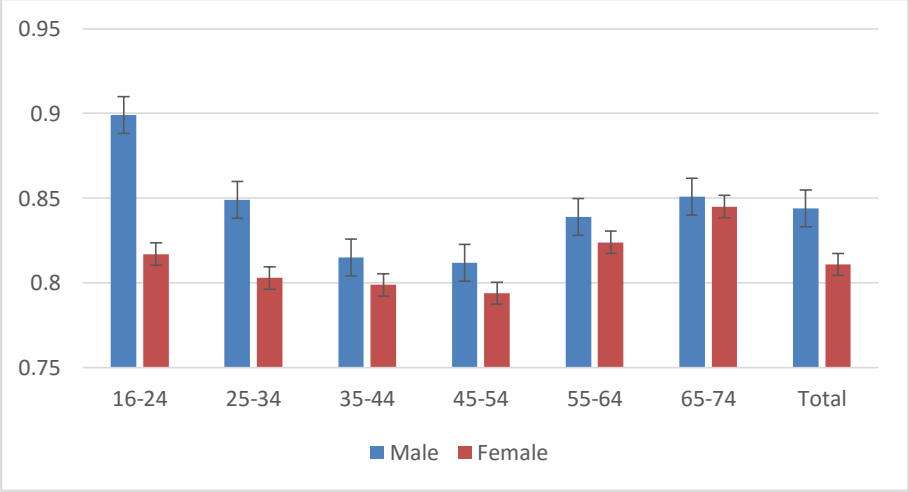


Figure A3 1(d) Self Worth

Figure A3 1(e) Coping



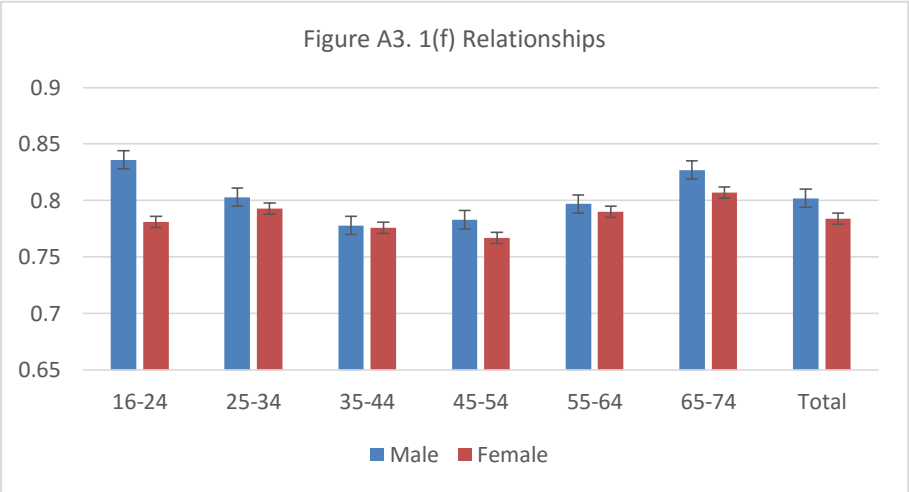


Figure A3 1(f) Relationships

Figure A3 1(g) Physical Super Dimension

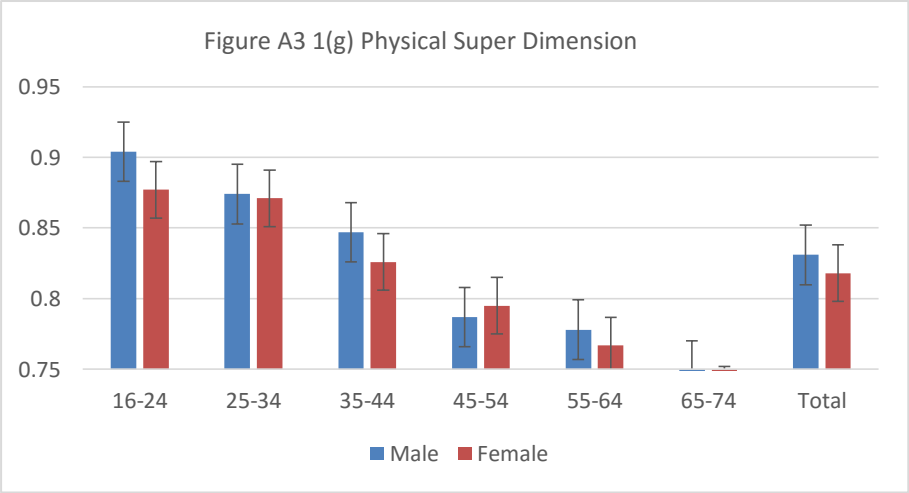


Figure A3 1(h) Independent Living

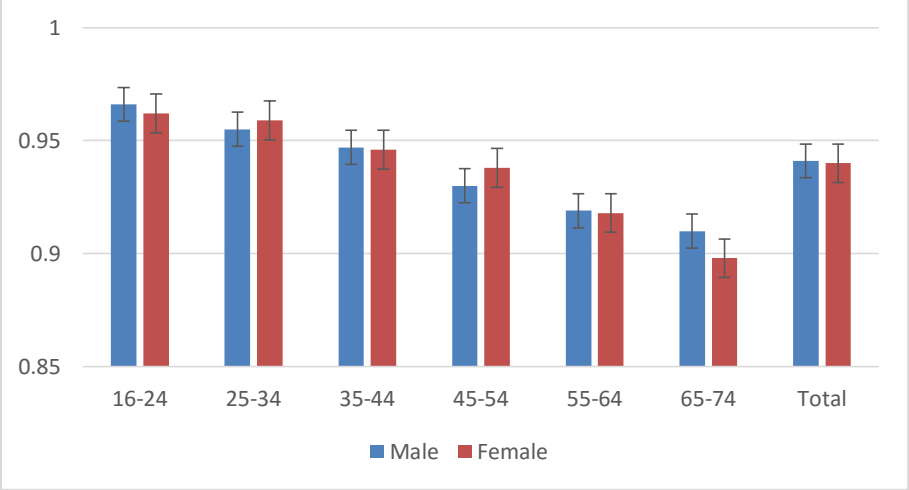


Figure A3 1(i) Pain

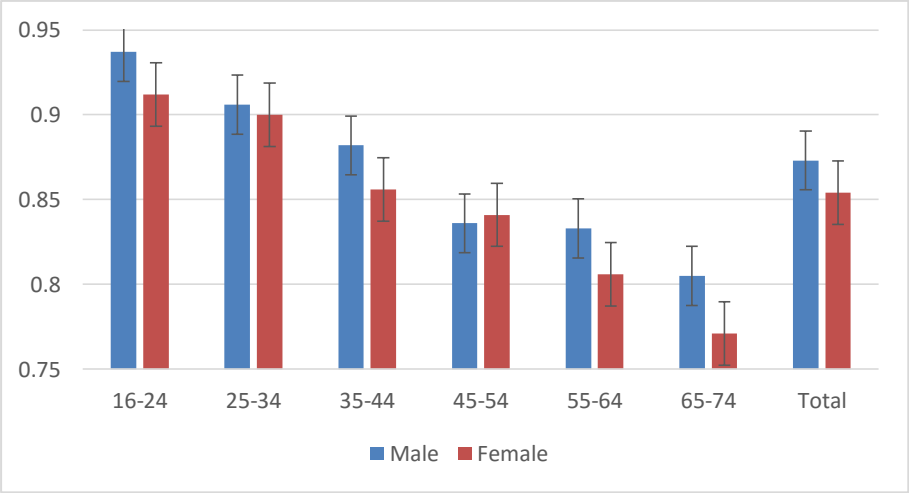


Figure A3 1(j) Senses