Population norms for the AQoL derived from the 2007 Australian National Survey of Mental Health and Wellbeing

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Abstract

***Objective*:** To provide Australian health-related quality of life (HRQoL) population norms, based on utility scores from the Assessment of Quality of Life (AQoL) measure, a participant-reported outcomes (PRO) instrument.

Methods: The data were from the 2007 National Survey of Mental Health and Wellbeing. AQoL scores were analysed by age cohorts, gender, other demographic characteristics, and mental and physical health variables.

Results: The AQoL utility score mean was 0.81 (95%CI 0.81-0.82), and 47% obtained scores indicating a very high HRQoL (>0.90). HRQoL gently declined by age group, with older adults' scores indicating lower HRQoL. Based on effect sizes (ESs), there were small losses in HRQoL associated with other demographic variables (e.g. by lack of labour force participation, ES_{median}: 0.27). Those with current mental health syndromes reported moderate losses in HRQoL (ES_{median}: 0.64), while those with physical health conditions generally also reported moderate losses in HRQoL (ES_{median}: 0.41).

Conclusions: This study has provided contemporary Australian population norms for HRQoL that may be used by researchers as indicators allowing interpretation and estimation of population health (e.g. estimation of the burden of disease), cross comparison between studies, the identification of health inequalities, and to provide benchmarks for health care interventions.

Key words: AQoL, Assessment of Quality of Life, benchmarks, evaluation, health-related quality of life, population norm, utility

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Population-normed scores for participant reported health outcome (PROs) measures are important. They provide a benchmark which allows the interpretation and estimation of population health (e.g. of the burden of disease); they permit cross comparison between studies; the identification of health inequalities; and they provide benchmarks for health care interventions. Benchmarks have uses in both public health (e.g. evaluation of public health programs) and in the evaluation of clinical treatments (e.g. the proportion of cases with an illness who are returned to population health norms).[1-3]

Australian population norms have been published for PROs in health (SF-36, versions 1 and 2,[4,5] and K10),[6] generic quality of life (the WHOQOL-BREF), [7] personal wellbeing (the Personal Wellbeing Index)[8] and health-related utility (AQoL, the Assessment of Quality of Life measure),[9] where utility refers to the value people place on their health-related quality of life (HRQoL).

Hawthorne and Osborne's norms for the AQoL, based on 1998 data from South Australia only,[9] may be biased. It is possible that South Australians in 1998 were systematically different to contemporary Australians. Further, changes in the demographic and socio-economic profile of the Australian population since 1998 may have affected norms. A recent paper[10] reported that between 1998 and 2008 there were changes in the socio-demographic and health profiles of South Australians, including a decline of 0.04 utility points on the AQoL, suggesting that the use of historical norms may mislead researchers.

This study presents contemporary Australian population norms for the AQoL using data from the 2007 National Survey of Mental Health and Wellbeing (NSMHWB).[11] This addresses both issues above. The NSMHWB collected data from a random sample of the entire Australian population, thereby overcoming any bias due to single-state data, and it provides norms that reflect the Australian situation more recently than the Hawthorne and Osborne estimates (by nine years). The paper also reports norms by common health syndromes.

Methods

To provide population norms, we analysed data from the 2007 NSMHWB conducted by the Australian Bureau of Statistics (ABS).[11] Importantly, the NSMHWB was weighted to achieve representativeness of the Australian resident population.

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Participant details

The 2007 NSMHWB was a nationally representative, cross-sectional household survey. Sampling was based on random selection from a stratified, multistage area probability sample of private dwellings[11] with state sample allocations based on Estimated Resident Population (ERP) data. One resident was randomly selected for each household. This was adjusted to increase the odds of selecting participants aged 16-24 and 65-85 years, to ensure sufficient sample sizes for these age groups. Initially,17,352 dwellings were selected, but this was reduced to 14,805 once households that were out of scope or vacant were excluded. There were 8,841 participants. Data were weighted by the inverse of probability of selection and by demographic benchmarks based on the ERP (excluding those living in non-private dwellings), education attainment, and labour force participation.[12]

Measures

Demographic variables used in this study were: country of birth (Australian-born/Other English-speaking country/Non-English speaking country); age (in 10-year cohorts); gender (female/male); relationship status (never married/married/separated/divorced/widowed); education attainment (primary school [Year 8 or below]/high school [Years 9-12]/vocational certificate/diploma, including advanced diploma/university degree or higher); labour force participation (working full time/working part time/unemployed/not in the labour force/studying [not working]/ retired); and Australian Defence Force (ADF) veteran status (yes/no).

Health measures were PROs for overall mental and physical health (excellent/very good/good/ fair/poor). Mental health delineations of alcohol abuse, anxiety, depression, post-traumatic stress disorder (PTSD) and suicidal ideation were made using the Composite International Diagnostic Interview, Version 3 (CIDI).[11,13,14] Classifications were: those without the condition/who had ever experienced it in their lifetime/and those who had experienced it in the previous 12 months. In addition, psychological distress (PD) was assessed with the K10;[15] the cut points were: 10-15 represented a low level of PD/16-21 moderate/22-29 high/and 30-50 very high PD.[16]

For physical conditions, participants reported whether they had ever been told by a doctor or nurse that they suffered from arthritis (and/or rheumatism), asthma, cancer, cardiovascular disease (CVD), diabetes and stroke. Each was triaged into those without the condition; who had ever experienced the condition; and who had experienced the condition in the past 12 months (defined as those who reported receiving treatment for the condition in the previous 12 months). Body mass index (BMI) was reported; the classifications were underweight (BMI<18.50), normal (18.50-24.99), overweight (25.00-29.99) and obese (≥30.00).[17]

HRQoL was assessed with the AQoL (also known as the AQoL-4D). This is a generic multi-attribute utility (MAU) instrument designed for the evaluation of public health and acute care interventions. It comprises 15 items, each with four levels. There are five scales, each of three items, measuring Illness, Independent Living, Social Relationships, Physical Senses and Psychological Wellbeing. For scoring purposes, the Illness sub-scale is not used and these data were not collected in the NSMHWB.

The AQoL can be found in Hawthorne and Osborne[9] or can be downloaded from: www.psychiatry.unimelb.edu.au/centres-units/cpro/index.html or www.aqol.com.au. Construction of the descriptive system is described in Hawthorne et al.[18] The AQoL items were derived *de novo* from a review of existing HRQOL instruments and the descriptive system was developed within the framework of the World Health Organization's classification of impairments, disabilities and handicaps.[19] The preference weights used in scoring the AQoL were derived from a stratified sample of the Australian population using the time trade-off technique (which elicits the value that people place on given health states).[20] The scoring algorithm, based on MAU theory, [21] weights the items, then applies a multiplicative function to obtain an index which is transformed onto a life-death utility scale. The endpoint scores are bounded at 1.00 (representative of best possible HRQoL), 0.00 (death equivalent HRQoL) and -0.04 (representative of worse-than-death states).[20]

The AQoL's psychometric properties have been widely reported (the range of reliability estimates is 0.73-0.84.[18, 22-26] In the NSMHWB the Cronbach $\alpha = 0.76$. Additionally, based on clinical samples, the minimum important difference (MID) was reported at 0.06 utilities.[9]

Statistics

As described above, the 2007 NSMHWB sampled the Australian population and the data were weighted by the ABS.[12] The analyses reported in this study use these weighted data. Under these conditions, where the sample is large and constitutes >5% of the population or where the finite population correction (FPC) is considerably <1.00, a correction is needed for the estimates.[27] In the NSMHWB the sample was <1% of the eligible Australian population and the FPC = 1.00, so no further adjustment was made.

Categorical variables are reported as frequencies.

AQoL scores were calculated as described.[28] The utility score was skewed and a square-root transformation was used and parametric tests applied (independent t-tests for two groups and analysis of variance [ANOVA] for three or more groups). In the interests of readability, the original untransformed scores are presented in the tables.

Reliability was assessed using Cronbach α. To represent the magnitude of difference between groups a modified form of Cohen's d was used,[29] where the population standard deviation (SD) was replaced by the pooled study sample SD. The reason was to overcome the restriction in the SD of the reference categories (i.e. those with the highest HRQoL) due to ceiling effects. The interpretation of the effect size (ES) was that 0.20 represented a small effect, 0.50 a moderate effect and ≥0.80 a large effect [29].

The data were analysed using SPSS Version 20.0.0.[30]

Results

The participation rate was 60%[12]; 74% were Australian-born, 12% were from another English-speaking country and 14% from a non-English-speaking country. Females comprised 55%; and the mean age was 46.4 years (SD=19.0). Forty-five per cent of participants were married, 33% had never married, 4% were separated, 10% divorced and 8% widowed. Regarding education attainment, 7% had completed primary school, 39% high school, 24% held a vocational certificate, 9% a diploma and 21% a university degree.

Most participants were in the labour force (40% full-time, 23% part-time), 10% were not in the labour force (for unknown reasons), 4% were studying, 3% unemployed and 22% retired. Six per cent were ADF veterans.

Table 1 provides AQoL population norms, by age group and gender. The mean AQoL utility was 0.81 (95%CI: 0.81-0.82). For both genders there was a monotonic decline in AQOL scores with increasing age (other than for males aged 60-69 years). For both genders, the decline between 16-19 years and 70-79 years was very small (ESs: 0.05-0.18) whereas between 70-79 and 80-85 years the utility decline was greater ($ES_{female} = 0.36$, $ES_{male} = 0.27$). Age groups for which there were statistically significant gender differences were 20-29 and 80-85 years. In both cases males obtained higher HRQoL scores.

Table 2 shows the population proportion within each HRQoL utility decile. As expected, most people (47%) reported an excellent HRQoL (>0.90 AQoL utilities) and <2% reported that they were 'in the pits'[31] (i.e. an extremely poor HRQoL, -0.04-0.10). Females were significantly less likely than males to obtain scores in the ceiling decile (0.91-1.00) and were more likely to obtain scores between 0.41-0.50 and 0.61-0.80.

There were statistically significant differences in utility by country of birth, education attainment, relationship status, labour force participation and veteran status. For most variables the absolute differences were small, as the ESs show (e.g. for country of birth the difference between those born in Australia and born in a non-English-speaking country was just 0.02 utilities; ES = -0.14); for other variables they were somewhat larger (e.g. education, where the difference was 0.12 utilities between those who had completed primary school only and those with a university degree; ES = 0.55). As shown, for some characteristics there were differences by category by gender. For country of birth, males from a non-English-speaking country obtained worse scores than did females; this was also the case for labour force participation (e.g. there was a large difference in the ES of studying by gender). For other demographic characteristics the ESs were similar by gender. The details are given in Table 3.

Table 4 estimates the impact of common mental health syndromes on HRQoL. There was a monotonic relationship between self-reported general mental health and HRQoL (i.e. as general mental health declined so did HRQoL). Apart from the classifications Excellent/ Very good (where there was a small ES), all other differences represented moderate or large ESs suggesting these differences in general mental health were important. The impact of alcohol abuse, both lifetime and current, was represented by small ESs. For anxiety, depression, PD and suicidal ideation, the utility losses were represented by small or moderate ESs for those with lifetime syndromes, whereas for those with current (12 month) symptoms the ES utility losses were large.

The impact of lifetime PTSD was represented by a small ES, whereas for those with current PTSD the ES was moderate. When compared with the other conditions in Table 4 (except alcohol abuse), current PTSD was associated with the smallest impact on HRQoL. Other than for alcohol abuse, those with current mental health syndromes obtained scores indicating the greater loss of HRQoL. PTSD was examined by veteran status; there was no statistically significant difference in PTSD prevalence (both lifetime and current) between veterans and non-veterans ($\chi^2 = 4.96$, df = 2, p=0.08) and there was no statistically significant difference in AQoL scores between veterans and non-veterans by lifetime PTSD (0.71 (SD: 0.31) versus 0.76 (SD: 0.24), respectively, $t_{transformed} = 0.10$, df = 531, p=0.92) or current PTSD (0.66 (SD: 0.26) versus 0.70 (SD: 0.27), respectively, $t_{transformed} = -1.27$, df = 1024, p=0.21), although veterans without PTSD obtained scores indicating a worse HRQoL than their civilian counterparts (0.79 (SD: 0.24) versus 0.84 (SD: 0.20), respectively, $t_{transformed} = -4.65$, df = 7278, p<0.01).

Finally, there was a monotonic decline in HRQoL by the number of current mental health conditions, particularly for those with two or three mental health syndromes where large ESs were observed. Gender effects were not entirely clear cut. For some mental health syndromes there appeared to be a greater effect on males (e.g. anxiety), but this was not consistent. For example, for psychological distress there was a greater effect on females among those suffering moderate distress, yet for those with very high distress there was a greater effect on males.

Physical health conditions and HRQoL are reported in Table 5. Importantly, these disease classifications are not comparable with those in Table 4 because different methods of delineation were used. Table 5 reports participants who endorsed that they had ever been told by a doctor or nurse that they had a condition (lifetime) or who reported they had received treatment for the condition in the past 12 months (current). For all conditions, other than BMI and stroke, there were monotonic declines by lifetime and current health condition, although for several conditions the differences were marginal (e.g. those with lifetime or current cancer). For BMI, the reference category was the normal range; and for stroke, lifetime and current condition were non-monotonic. Conditions where the loss of HRQoL was moderate (ES~0.50) were experiencing good health, suffering current asthma, CVD, diabetes or suffering from two physical health conditions. Conditions which were associated with large ESs (~0.80) were being in fair/poor health, suffering current arthritis, stroke or living with three or more health conditions. There were differences by gender for most of the physical health conditions, but these differences were largely confined to those who reported current health conditions (the exceptions were stroke, diabetes and CVD where lifetime experiences had a greater effect on females).

Table 1: AQoL norms by age group and gender.

Age group (years)	Gender	n	AQoL utility scores					
			Mean	SD	95% CI	Statistics[a]	Median	IQR
16-19	Female	354	0.87	0.17	0.85-0.89		0.93	0.18
	Male	352	0.88	0.16	0.86-0.89		0.93	0.18
	All	705	0.87	0.17	0.86-0.88		0.93	0.18
20-29	Female	775	0.84	0.20	0.83-0.85		0.92	0.20
	Male	550	0.88	0.18	0.86-0.89	***	0.95	0.16
	All	1325	0.86	0.19	0.85-0.87		0.93	0.20
30-39	Female	916	0.84	0.21	0.83-0.85		0.91	0.20
	Male	702	0.84	0.21	0.82-0.86		0.92	0.22
	All	1681	0.84	0.21	0.83-0.85		0.91	0.23
40-49	Female	738	0.81	0.22	0.79-0.82		0.88	0.25
	Male	644	0.81	0.23	0.79-0.83		0.89	0.22
	All	1382	0.81	0.23	0.80-0.82		0.89	0.24
50-59	Female	736	0.80	0.23	0.78-0.81		0.89	0.27
	Male	559	0.79	0.25	0.77-0.82		0.89	0.26
	All	1295	0.80	0.24	0.78-0.81		0.89	0.27
60-69	Female	597	0.79	0.22	0.78-0.81		0.87	0.27
	Male	649	0.80	0.23	0.78-0.81		0.89	0.26
	All	1245	0.80	0.22	0.78-0.81		0.89	0.27
70-79	Female	473	0.76	0.24	0.74-0.78		0.84	0.28
	Male	439	0.79	0.22	0.77-0.81		0.86	0.22
	All	912	0.76	0.23	0.76-0.79		0.85	0.23
80-85	Female	225	0.68	0.26	0.65-0.72		0.73	0.37
	Male	132	0.73	0.27	0.68-0.78	*	0.81	0.37
	All	357	0.70	0.26	0.67-0.73		0.77	0.37
Total	Female	4814	0.81	0.22	0.80-0.81		0.89	0.25
	Male	4025	0.82	0.22	0.81-0.83		0.90	0.25
	All	8839	0.81	0.22	0.81-0.82		0.89	0.24

Notes:
N = number; SD = Standard deviation; 95%CI – Ninety-five percent confidence interval; IQR = interquartile range
*a = Independent t-test on transformed data. * p≤0.05; **p≤0.01; ***p≤0.001*

Table 2: Proportion of population within AQoL deciles by gender.

AQoL score range[a]	Gender					All	
	Male		Female		Statistics[c]		
	n	%	n	%		n	%
- 0.04-0.10[b]	53	1.3%	74	1.5%		127	1.4%
0.11-0.20	61	1.5%	57	1.2%		118	1.3%
0.21-0.30	95	2.4%	99	2.1%		194	2.2%
0.31-0.40	117	2.9%	142	2.9%		259	2.9%
0.41-0.50	79	2.0%	129	2.7%	*	208	2.4%
0.51-0.60	162	4.0%	197	4.1%		359	4.1%
0.61-0.70	221	5.5%	357	7.4%	*	578	6.5%
0.71-0.80	424	10.5%	609	12.7%	*	1033	11.7%
0.81-0.90	818	20.3%	977	20.3%		1795	20.3%
0.91-1.00	1995	49.6%	2173	45.1%	*	4168	47.2%

Notes:
Data missing from 2 cases.
a = AQoL deciles: the first decile is the worst HRQoL state (-0.04-0.10) and the best HRQoL decile is 0.91-1.00
b = The numbers classified with negative utilities (i.e. health states worse than death) were: males = 10 , females = 21.
*c = χ^2, * p≤0.05; **p≤0.01; ***p≤0.001*

Table 3: AQOL utility scores by demographic characteristics.

Categories	Male							Female							Total						
	n	Mean	SD	95%CI	Median	IQR	ES[a]	n	Mean	SD	95%CI	Median	IQR	ES[a]	n	Mean	SD	95%CI	Median	IQR	ES[a]
Country of birth[b]																					
Australian born	2,958	0.82	0.23	0.81-0.82	0.89	0.22		3,570	0.81	0.22	0.80-0.81	0.89	0.25		6,528	0.81	0.22	0.81-0.82	0.89	0.24	
Other English	497	0.82	0.22	0.80-0.84	0.89	0.24	0.00	535	0.81	0.23	0.79-0.83	0.89	0.25	0.00	1,032	0.82	0.22	0.80-0.83	0.89	0.23	-0.05
Non-English	570	0.85	0.20	0.83-0.87	0.91	0.20	-0.14	709	0.82	0.22	0.80-0.84	0.89	0.26	-0.05	1,279	0.83	0.21	0.82-0.85	0.91	0.24	-0.05
Education attainment[c]																					
Degree	798	0.86	0.18	0.85-0.87	0.92	0.19		1,076	0.84	0.19	0.82-0.85	0.91	0.21		1,874	0.85	0.19	0.84-0.86	0.91	0.21	
Diploma	317	0.83	0.21	0.80-0.85	0.89	0.23	0.14	483	0.81	0.23	0.78-0.83	0.89	0.25	0.14	800	0.81	0.22	0.80-0.83	0.89	0.24	0.18
Vocational certificate	1,176	0.81	0.23	0.80-0.82	0.89	0.22	0.23	957	0.82	0.21	0.80-0.83	0.89	0.23	0.09	2,133	0.81	0.22	0.80-0.82	0.89	0.22	0.18
High school	1,477	0.82	0.23	0.81-0.83	0.91	0.25	0.18	1,925	0.81	0.22	0.80-0.82	0.89	0.25	0.14	3,404	0.81	0.23	0.81-0.82	0.89	0.24	0.81
Primary only	257	0.74	0.26	0.71-0.78	0.82	0.28	0.55	373	0.72	0.26	0.69-0.75	0.79	0.32	0.55	630	0.73	0.26	0.71-0.75	0.81	0.31	0.55
Relationship status[d]																					
Married	1,934	0.85	0.18	0.84-0.86	0.91	0.19		2,067	0.83	0.20	0.83-0.84	0.89	0.21		4,001	0.84	0.19	0.83-0.95	0.90	0.20	
Never married	1,429	0.83	0.23	0.82-0.84	0.91	0.23	0.09	1,464	0.82	0.21	0.82-0.84	0.90	0.22	0.05	2,893	0.83	0.22	0.82-0.84	0.91	0.23	0.05
Separated	154	0.70	0.30	0.65-0.74	0.80	0.42	0.68	182	0.73	0.26	0.70-0.77	0.83	0.37	0.45	336	0.72	0.28	0.69-0.75	0.83	0.40	0.55
Divorced	364	0.74	0.28	0.71-0.77	0.87	0.32	0.50	551	0.76	0.26	0.74-0.78	0.85	0.33	0.32	915	0.75	0.27	0.74-0.77	0.87	0.34	0.41
Widowed	144	0.72	0.27	0.68-0.77	0.81	0.32	0.59	550	0.74	0.24	0.72-0.76	0.80	0.30	0.41	694	0.74	0.25	0.72-0.76	0.80	0.30	0.45
Labourforce participation[e]																					
Full-time work	2,121	0.86	0.18	0.85-0.87	0.92	0.19		1,378	0.85	0.19	0.84-0.86	0.91	0.19		3,499	0.86	0.19	0.85-0.86	0.91	0.20	
Part-time work	571	0.84	0.19	0.82-0.85	0.91	0.20	0.09	1,415	0.83	0.20	0.82-0.84	0.89	0.22	0.09	1,986	0.83	0.20	0.83-0.84	0.90	0.22	0.14
Unemployed	103	0.76	0.26	0.71-0.81	0.87	0.37	0.45	126	0.81	0.21	0.77-0.84	0.87	0.25	0.18	229	0.79	0.24	0.76-0.82	0.87	0.28	0.32
Not in labour force	232	0.62	0.34	0.57-0.66	0.72	0.59	1.09	638	0.76	0.26	0.74-0.78	0.86	0.35	0.41	870	0.72	0.29	0.70-0.74	0.84	0.38	0.64
Studying	140	0.86	0.21	0.82-0.89	0.95	0.18	0.00	198	0.82	0.22	0.79-0.86	0.91	0.22	0.14	338	0.84	0.22	0.82-0.86	0.92	0.21	0.09
Retired	858	0.77	0.24	0.75-0.79	0.85	0.27	0.41	1,059	0.75	0.25	0.74-0.77	0.82	0.30	0.45	1,917	0.76	0.24	0.75-0.77	0.84	0.28	0.45
Veteran status[f]																					
No	3,579	0.83	0.23	0.82-0.83	0.91	0.23		4,741	0.81	0.22	0.80-0.82	0.89	0.25		8,320	0.82	0.22	0.81-0.82	0.89	0.23	
Yes	446	0.77	0.25	0.75-0.80	0.87	0.31	0.27	73	0.76	0.25	0.70-0.82	0.86	0.34	0.23	519	0.77	0.25	0.75-0.79	0.86	0.32	0.22

Notes:

a = Effect size. Modified Cohen's d. See text for an explanation. For each category of interest, the reference category is the first category.

b = ABS classification. Other English refers to countries where the main language was English; Non-English refers to countries where the main language was a language other than English. ANOVA, Ftransformed = 7.19, df = 2,8836, p=0.001.

c = Primary ≤Year 8; High school Years 9-12; Vocational certificate Certificates I, II, III, IV; Diploma includes advanced diploma; Degree refers to university degree or higher. ANOVA, Ftransformed = 30.38, df = 4,8834, p<0.001.

d = Registered marital status. ANOVA, Ftransformed = 56.06, df = 4,8834, p<0.001.

e = Not in labourforce refers to those who were not working for undefined reasons; Retired refers to those who were aged ≤60 years, who were not working or unemployed, who reported no occupation and who were in receipt of a pension or other monies; Studying refers to those who were studying and who were not employed. ANOVA, Ftransformed = 71.77, df = 5,8833, p<0.001.

f = Yes refers to participants who reported that they had ever served in the Austalian Defence Force. T-test, ttransformed = 4.16, df = 8837, p<0.001 .

Table 4: Mean AQOL utility scores by mental health status by gender.

Classification	Male					Female					All				
	N	Mean	SD	95%CI	ES[a]	N	Mean	SD	95%CI	ES[a]	N	Mean	SD	95%CI	ES[a]
General mental health[b]															
Excellent	1,203	0.90	0.15	0.90-0.91		1,292	0.90	0.15	0.89-0.91		2,495	0.90	0.15	0.89-0.91	
Very good	1,470	0.86	0.19	0.85-0.86	0.18	1,906	0.85	0.18	0.84-0.86	0.23	3,376	0.85	0.18	0.85-0.86	0.23
Good	983	0.77	0.23	0.75-0.78	0.59	1,166	0.75	0.22	0.73-0.76	0.68	2,149	0.76	0.23	0.75-0.77	0.64
Fair	321	0.59	0.28	0.56-0.62	1.41	371	0.58	0.26	0.55-0.61	1.45	692	0.58	0.27	0.56-0.60	1.45
Poor	47	0.38	0.31	0.29-0.47	2.36	79	0.34	0.29	0.27-0.40	2.55	126	0.35	0.30	0.30-0.41	2.50
Alcohol[c]															
No	2,742	0.84	0.21	0.83-0.85		4,236	0.82	0.22	0.81-0.82		6,978	0.83	0.21	0.82-0.83	
Lifetime	1,135	0.78	0.25	0.76-0.79	0.27	492	0.75	0.25	0.73-0.78	0.32	1627	0.77	0.25	0.76-0.78	0.27
Current	148	0.81	0.19	0.78-0.84	0.14	86	0.78	0.20	0.74-0.83	0.18	234	0.80	0.19	0.77-0.82	0.14
Anxiety[d]															
No	3,749	0.84	0.21	0.83-0.84		4,275	0.83	0.20	0.82-0.84		8,024	0.83	0.20	0.83-0.84	
Lifetime	106	0.69	0.24	0.65-0.74	0.68	204	0.70	0.23	0.67-0.73	0.59	310	0.70	0.23	0.67-0.72	0.59
Current	170	0.54	0.30	0.50-0.59	1.36	335	0.59	0.30	0.56-0.62	1.09	505	0.57	0.30	0.55-0.60	1.18
Depression[e]															
No	3,551	0.84	0.20	0.84-0.85		3,941	0.84	0.20	0.83-0.84		7,492	0.84	0.20	0.84-0.85	
Lifetime	231	0.77	0.22	0.74-0.80	0.32	453	0.77	0.22	0.75-0.79	0.32	684	0.77	0.22	0.75-0.78	0.32
Current	243	0.54	0.30	0.50-0.57	1.36	420	0.58	0.29	0.55-0.60	1.18	663	0.56	0.29	0.54-0.58	1.27
Psychological distress (K10)[f]															
No/Low distress	3,023	0.87	0.17	0.86-0.88		3,257	0.88	0.16	0.87-0.88		6,280	0.87	0.17	0.87-0.88	
Moderate distress	695	0.75	0.23	0.73-0.76	0.55	1,014	0.74	0.22	0.73-0.76	0.64	1709	0.74	0.23	0.73-0.75	0.59
High distress	222	0.56	0.26	0.53-0.60	1.41	399	0.59	0.25	0.57-0.62	1.32	621	0.58	0.25	0.56-0.60	1.32
Very high distress	84	0.29	0.25	0.23-0.34	2.64	143	0.37	0.28	0.32-0.42	2.32	227	0.34	0.27	0.30-0.37	2.41
Posttraumatic stress disorder[g]															
No	3,530	0.84	0.21	0.83-0.84		3,750	0.83	0.20	0.83-0.84		7,280	0.84	0.21	0.83-0.84	
Lifetime	171	0.76	0.24	0.73-0.80	0.36	362	0.75	0.24	0.73-0.80	0.36	533	0.76	0.24	0.74-0.78	0.36
Current	324	0.68	0.27	0.65-0.71	0.73	702	0.70	0.27	0.68-0.72	0.59	1026	0.70	0.27	0.68-0.71	0.64
Suicidal ideation[h]															
No	3,513	0.84	0.20	0.84-0.85		4,074	0.83	0.20	0.83-0.84		7,587	0.84	0.20	0.83-0.84	
Lifetime	415	0.71	0.26	0.69-0.74	0.59	598	0.70	0.25	0.68-0.72	0.59	1,013	0.71	0.26	0.69-0.72	0.59
Current	97	0.52	0.32	0.45-0.58	1.45	142	0.55	0.30	0.50-0.60	1.27	239	0.53	0.31	0.50-0.57	1.41
N. current mental health conditions[i]															
None	3,324	0.85	0.19	0.85-0.86		3,678	0.84	0.19	0.84-0.85		7,002	0.85	0.19	0.84-0.85	
1	495	0.73	0.25	0.71-0.75	0.55	763	0.75	0.23	0.74-0.77	0.41	1,258	0.74	0.24	0.73-0.76	0.50
2	142	0.58	0.29	0.53-0.63	1.23	237	0.60	0.27	0.57-0.64	1.09	379	0.59	0.28	0.56-0.62	1.18
3+	64	0.44	0.30	0.37-0.52	1.86	136	0.49	0.31	0.44-0.54	1.59	200	0.47	0.31	0.43-0.42	1.73

Notes:

a = Effect size. Modified Cohen's d. See text for an explanation. For each category of interest, the reference category is the first category; b = ANOVA, Ftransformed = 502.47, df=4, 8833, p<0.001; c = Based on CIDI delineation for lifetime and 12-month classifications. ANOVA, Ftransformed = 46.29, df=2, 8836, p<0.001; d = Based on CIDI delineation for lifetime and 12-month classifications. ANOVA, Ftransformed = 298.71, df=2, 8836, p<0.001; e = Based on CIDI delineation for lifetime and 12-month classifications. ANOVA, Ftransformed = 392.36, df=2, 8655, p<0.001; f = Based on ABS K10 cutpoints. ANOVA, Ftransformed = 732.86, df=3, 8833, p<0.001; g = Based on CIDI delineation for lifetime and 12-month classifications. ANOVA, Ftransformed = 205.09, df=2, 8836, p<0.001; h = Based on CIDI delineation for lifetime and 12-month classifications. ANOVA, Ftransformed = 285.54, df=2, 8836, p<0.001; i = Summed number of current CIDI delineations. ANOVA, Ftransformed = 316.80, df=3, 8836, p<0.001

Table 5: AQOL utility scores by physical health status by gender.

Classification[a]	Male					Female					All					
	N	Mean	SD	95%CI	ES[b]	N	Mean	SD	95%CI	ES[b]	N	Mean	SD	95%CI	ES[b]	*p*[c]
General physical health																
Excellent	582	0.91	0.15	0.90-0.93		695	0.91	0.14	0.90-0.92		1,277	0.91	0.14	0.90-0.92		
Very good	1,440	0.88	0.17	0.87-0.89	0.14	1,879	0.87	0.16	0.86-0.88	0.18	3,319	0.87	0.16	0.87-0.88	0.18	
Good	1,341	0.82	0.20	0.80-0.83	0.41	1,519	0.79	0.21	0.78-0.80	0.55	2,860	0.80	0.21	0.79-0.81	0.50	
Fair	512	0.69	0.26	0.67-0.71	1.00	567	0.64	0.25	0.62-0.66	1.23	1,079	0.66	0.26	0.65-0.68	1.14	
Poor	150	0.43	0.30	0.38-0.48	2.18	154	0.40	0.27	0.35-0.44	2.32	304	0.41	0.29	0.38-0.45	2.27	***
Arthritis																
No	3,218	0.85	0.20	0.84-0.85		3,624	0.84	0.20	0.83-0.85		6,842	0.84	0.20	0.84-0.85		
Lifetime	302	0.78	0.25	0.75-0.81	0.32	402	0.77	0.23	0.75-0.79	0.32	704	0.77	0.24	0.76-0.79	0.32	
Current	505	0.70	0.26	0.67-0.72	0.68	788	0.69	0.26	0.67-0.70	0.68	1,293	0.69	0.26	0.68-0.71	0.68	***
Asthma																
No	3,279	0.83	0.22	0.82-0.83		3,772	0.82	0.21	0.82-0.83		7,051	0.82	0.21	0.82-0.83		
Lifetime	451	0.83	0.22	0.81-0.85	0.00	543	0.79	0.23	0.77-0.81	0.14	994	0.81	0.22	0.79-0.82	0.05	
Current	295	0.75	0.26	0.72-0.78	0.36	499	0.72	0.27	0.70-0.75	0.45	794	0.73	0.27	0.72-0.75	0.41	***
BMI																
Underweight	59	0.81	0.26	0.74-0.88	0.14	195	0.80	0.25	0.76-0.83	0.14	254	0.80	0.25	0.77-0.83	0.18	
Normal range	1,446	0.84	0.21	0.83-0.85	(d)	2,262	0.83	0.20	0.82-0.84	(d)	3,708	0.84	0.21	0.83-0.84	(d)	
Overweight	1,698	0.82	0.22	0.81-0.84	0.09	1,270	0.81	0.22	0.80-0.82	0.09	2,968	0.82	0.22	0.81-0.83	0.09	
Obese	765	0.78	0.25	0.76-0.80	0.27	964	0.76	0.24	0.74-0.77	0.32	1,729	0.77	0.25	0.76-0.78	0.32	***
Cancer																
No	3,639	0.83	0.22	0.82-0.84		4,315	0.81	0.22	0.81-0.82		7,954	0.82	0.22	0.82-0.83		
Lifetime	228	0.76	0.23	0.73-0.80	0.32	373	0.76	0.23	0.74-0.78	0.23	601	0.76	0.23	0.75-0.78	0.27	
Current	158	0.74	0.26	0.70-0.78	0.41	126	0.73	0.26	0.69-0.78	0.36	284	0.74	0.26	0.71-0.77	0.37	***
Cardiovascular																
No	3,027	0.84	0.21	0.83-0.85		3,749	0.83	0.21	0.82-0.84		6,776	0.84	0.21	0.83-0.84		
Lifetime	332	0.76	0.25	0.74-0.79	0.36	295	0.74	0.24	0.71-0.77	0.41	627	0.75	0.25	0.73-0.77	0.41	
Current	666	0.76	0.25	0.74-0.78	0.36	770	0.72	0.26	0.71-0.74	0.50	1,436	0.74	0.26	0.73-0.75	0.45	***
Diabetes																
No	3,703	0.83	0.22	0.82-0.84		4,435	0.82	0.21	0.81-0.82		8,138	0.82	0.22	0.82-0.83		
Lifetime	77	0.79	0.25	0.73-0.84	0.18	140	0.75	0.23	0.72-0.79	0.32	217	0.77	0.24	0.73-0.80	0.23	
Current	245	0.73	0.26	0.70-0.76	0.45	239	0.69	0.28	0.65-0.73	0.59	484	0.71	0.27	0.69-0.73	0.50	***
Stroke																
No	3,899	0.83	0.22	0.82-0.83		4,706	0.81	0.22	0.81-0.82		8,605	0.82	0.22	0.82-0.82		
Lifetime	83	0.66	0.30	0.60-0.73	0.77	82	0.56	0.30	0.49-0.62	1.14	165	0.61	0.30	0.56-0.66	0.95	
Current	43	0.64	0.28	0.55-0.73	0.86	26	0.57	0.27	0.46-0.68	1.09	69	0.62	0.28	0.55-0.68	0.91	***
N. current health conditions																
None	2,676	0.85	0.20	0.85-0.86		3,086	0.85	0.19	0.84-0.86		5,762	0.85	0.19	0.85-0.86		
1	905	0.78	0.23	0.77-0.80	0.32	1,173	0.77	0.23	0.76-0.78	0.36	2,078	0.78	0.23	0.77-0.79	0.32	
2	344	0.72	0.26	0.70-0.75	0.59	421	0.70	0.25	0.67-0.72	0.68	765	0.71	0.25	0.69-0.73	0.64	
3+	100	0.61	0.28	0.56-0.67	1.09	134	0.57	0.30	0.52-0.62	1.27	234	0.59	0.30	0.55-0.62	1.18	***

*Notes: a = No = did not meet report the condition; Lifetime = ever told by a doctor or nurse that they had the condition; Current = had received treatment for the condition in the previous 12-months; b = Effect size. Modified Cohen's d. See text for an explanation. For each category of interest, the reference category is the first category (except for BMI; see note d); c = p=value. ANOVA, transfornmed data, * ≤ 0.05; ** ≤ 0.01, *** ≤ 0.001; d = Normal is the reference category for both underweight and overweight*

Discussion

This study presented AQoL Australian population norms, drawing the 2007 NSMHWB.[12] Unlike earlier norms, which were based on South Australian data,[9] the norms presented here represent the Australian population. Recently published South Australian data, collected in 2008, shows that the mean AQoL utility score was 0.79 (95%CI: 0.79-0.80).[10] When compared with the mean AQoL utility score of 0.81 (95%CI: 0.81-0.82) reported in this study, it is likely that continued use of the historic South Australian norms from 1998 is not warranted and that the norms presented in this paper are to be preferred.

In the current study, mean AQoL scores varied from 0.87 for those aged 15-19 years to 0.70 for those aged 80+. This gentle decline (based on the small ESs between age cohorts) is consistent with population norms published for other quality of life and health measures, including the EQ5D, SF-36 and WHOQOL-BREF.[3,5,7,32-37] It is also similar to the range found in the South Australian data.[9] The best health decile included 49% of respondents, which was also similar (45%). This is consistent with the literature which suggests that most people from a population random sample should have high quality of life.[3,7,32-34,36,38-40] The absence of apparent floor effects might be an artefact of the ABS NSMHWB sampling strategy. For instance, those with severe illness may be under-represented in random community sampling due to high rates of refusal and the increased likelihood of living in residential accommodation.

In addition to these age differences, there were also some gender differences. As shown in Table 2, although males reported higher HRQoL than females, this was confined to scores in the upper AQoL ranges. The findings in Tables 3, 4 and 5, however, suggest differential impact of various demographic and health conditions. In general, the findings suggested there was a larger effect on males by demographic characteristics (e.g. education attainment, relationship status and labour force participation; Table 3) – a finding consistent with Australian norms for the WHOQOL-BREF .[7]

Males also appear to be more affected by mental health syndromes, e.g. anxiety, depression (Table 4); whereas physical health conditions had a greater effect on females, e.g. asthma, CVD and diabetes (Table 5). Generally these differences were small, yet they operated in the opposite way to those reported earlier by Hawthorne and Osborne.[9] The reason for this difference is unknown, but may be an artefact of the earlier study sampling from a single Australian state.

In contrast, for those with common mental and physical health conditions, there were important and (for some conditions) large losses of utility (Tables 4 and 5). Caution, however, should be exercised when interpreting these losses. With worsening health status there was also increased variation (i.e. larger SDs) around the estimates of HRQoL, suggesting the impact of health conditions varied considerably between individuals. While the most likely cause of this phenomenon is that the AQoL may be more sensitive at the lower end of the HRQoL spectrum – an explanation that would be consistent with other studies into Australian population norms[7,9] – it is possible that this may be, at least in part, a function of differential item functioning. That is, sub-population groups may interpret items differently and therefore provide different responses. Two such possibilities relate to differences in demographic characteristics (e.g. that older adults may interpret items probing health status quite differently to how younger adults may interpret such items) and to illness (e.g. people with mobility problems may place greater emphasis in their lives on social relationships than people with unrestricted mobility). Further research is needed to investigate these matters.

MIDs are regarded as a measure of the importance of differences between HRQoL levels, and Hawthorne and Osborne[9] suggested that a difference of 0.06 (95%CI: 0.03-0.08) is the AQoL MID. This, however, was calculated from four clinical studies, of which three involved older adults. Whether the 0.06 MID estimate is applicable to population samples and across the adult lifespan is unknown. Given this uncertainty, we used the effect size instead.

For mental health, the ESs suggested that current mental health syndromes had a far greater impact on HRQoL than did lifetime syndromes (except for alcohol abuse) and exceeded the ES criterion for large effects (except for alcohol abuse and PTSD; Table 4). Although the limited effect of alcohol abuse may be explained in part by its prevalence in the community, it is difficult to explain why PTSD had the second smallest impact of any mental health syndrome on people's lives. Certainly the results for PTSD and veteran status were very different to those published elsewhere among Australian veterans with PTSD, where AQoL utility scores around 0.30 have been reported.[41,42] In this study, the mean AQoL for veterans with current PTSD was not statistically different to non-veterans with PTSD.

Regarding the association of physical health with HRQoL, the ESs suggested that for arthritis, asthma, BMI (underweight/ overweight/ obese), cancer, CVD, and diabetes lifetime conditions had a small effect. Large effect sizes were reported for those in fair or poor health, those with lifetime or current stroke, and for those with three or more physical health conditions. Comparison with utility norms published elsewhere suggest that for current physical conditions the AQoL scores represented worse HRQoL scores when compared with Canadians using the Health Utilities Index.[43]

Since publication of the AQoL, two other generic measures have been derived from it (AQoL Mark 2 or AQoL-6D, and the AQoL-8.[24,44,45] Importantly, due to differences in the descriptive systems, weights and scoring algorithms, the norms presented in this paper are not applicable to these other measures.

Limitations

The discussion of PTSD and veterans above raises an important point in relation to the interpretation of the AQoL norms. As explained in the Methods section, the NSMHWB relied upon PROs; that is, all the health conditions presented in the tables are self-reports. For mental health reports these were delineated with the CIDI (or the K10) which relies entirely upon self-reported symptoms and the recall of symptoms across the lifespan. All physical conditions, other than BMI, were self-reports of whether the

participant had ever been told by a doctor or nurse that they had the condition or if they were receiving treatment for the condition. The report of these conditions and their impact on HRQoL, then, does not reflect clinical diagnoses or the impact of a clinically diagnosed illness or disorder on HRQoL. As a mental health example, the difference in PTSD impact on HRQoL may be due to this difference of PRO versus clinical diagnosis; the veterans reported in Hawthorne et al.'s study had been clinically diagnosed with PTSD.[42] A physical health example is stroke; Sturm et al.[46] reported that the mean AQoL among stroke survivors at two years post-stroke was 0.47, compared with 0.61 for lifetime stroke in this study.

This study's estimates will be slight underestimates of mental health and physical condition prevalences, and slight overestimates of HRQoL, due to the sampling and weighting procedures followed by the ABS in the NSMHWB. This excluded those living in non-private dwellings, which would systematically exclude those with poor mental or physical health living in boarding rooms or residential care facilities. The response rate of 60% and high refusal rate may be closely related to this issue. The extent to which participants were representative of the underlying Australian population is uncertain, although the weights applied by the ABS statistically adjusted the data.

Conclusion

The findings show that most Australians (47%) enjoyed a high HRQoL, as defined by the highest AQoL decile, and that there were gentle declines in HRQoL by age group and gender. The effect of other socio-demographic background variables was generally small, with only one variable meeting the criterion for a large effect on HRQoL. These findings suggest that researchers should carefully consider their options when conducting studies where HRQoL is assessed as an intervention outcome.

The study also examined HRQoL by common mental and physical health conditions. Generally, large effect sizes were obtained where participants reported current mental health conditions, whereas moderate effect sizes were obtained for physical health conditions. These differences, however, may be a function of the methods used in the NSMHWB to delineate mental and physical health conditions.

Based on a search of PubMed (May 2012), the AQoL is a commonly reported PRO outcome measure used in Australia. This study has provided contemporary Australian population norms for HRQoL which may help researchers to interpret and estimate population HRQoL and health. It is also of relevance for studies of the burden of disease, cross comparisons between outcome studies, the identification and analysis of health inequalities, and it provides benchmarks for health care interventions.

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