MONASH University

SUBJECTIVE WELLBEING, UTILITY AND QUALITY OF LIFE

Results from The Multi Instrument Comparison (MIC) Project

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The purpose of this brochure is to summarise some interim results from a large multi instrument comparison (MIC) project which analyses different ways in which the quality of life (QoL) has been measured by economists and psychologists.

The project was designed to provide information which may help research teams and evaluators select a QoL instrument which is suitable for the health states in which they are interested. To this end, the brochure compares the 'content' of the major instruments used for economic evaluations and provides a pairwise comparison of their sensitivity to different dimensions of health—pain, vitality, mental health, happiness, etc.

The MIC project is the most comprehensive comparison of multi attribute utility (MAU) and subjective wellbeing (SWB) instruments to date. Its database, described overleaf, combines results from 7 MAU, 3 SWB instruments, the ICECAP measure of capabilities, the SF-36, three measures of self evaluated health and personal and demographic data. Data are currently available on request. From mid 2014 the database will be universally available on the AQoL website.

Motivation for MIC Study

Problem 1 Unreliable Measurement

Economic evaluations of health services use multi attribute utility (MAU) 'instruments' to measure the quality of life (QoL). Each instrument is a set of questions about health, the responses to which are weighted to produce a numerical estimate of the strength of people's preference for the health state, ie the health state 'utility'. However, there are significant structural dissimilarities between instruments (Table 1) and a large body of research demonstrates that they produce different values for the same health state [1]. This implies that the result of an economic evaluation can depend upon the choice of MAU instrument (Box 1).

Table 1 Items per dimension in MAU instruments[1]

Dimension	EQ-5D	HUI 3	SF-6D (36)	AQoL-8D
Physical				
Physical Ability/Mobility	*	**	*	**
Vitality			*	*
Bodily Function/ Self Care	*			*
Pain/Discomfort	*	*	*	**
Senses/communication		***		***
Usual activities/role	*		*	****
Psycho-Social				
Depression/Anxiety/Anger	*	**	*	********
Cognition/Memory/Ability		*		
Satisfaction/Happiness				****
Self Esteem				**
Social Function/Family			*	********
[1] *=1 item (question, response)	5 items	8 items	6 items	35 items

Box 1: Choice of Instrument and Outcome of an Evaluation

If the pairwise linear relationships found in the MIC study apply generally then:

- **Replacing HUI 3 with EQ-5D will raise cost/QALY* by 17.9%**
- **Replacing SF-6D with EQ-5D will reduce cost/QALY by 39.2%**
- **Replacing SF-6D with HUI 3 will reduce cost/QALY by 48.4%**
- **Replacing HUI 3 with AQoL-8D will raise cost/QALY by 18.9%**
- **Replacing SF-6D with AQoL-8D will reduce cost/QALY by 38.7%**

*QALY: Quality Adjusted Life Year

Problem 2
Incompatibility of Utility and Subjective Wellbeing (SWB)

If people have a preference (utility) for happiness (or more generally, SWB) then utility (i.e. the strength of preference) and SWB should correlate highly. However the correlation between the most commonly used measure of utility-EQ-5D—and a validated measure of SWB—PWI– is only 0.2 for the 'public' (n=1,760) and 0.45 across the entire MIC sample (Box 2 and scatterplot).

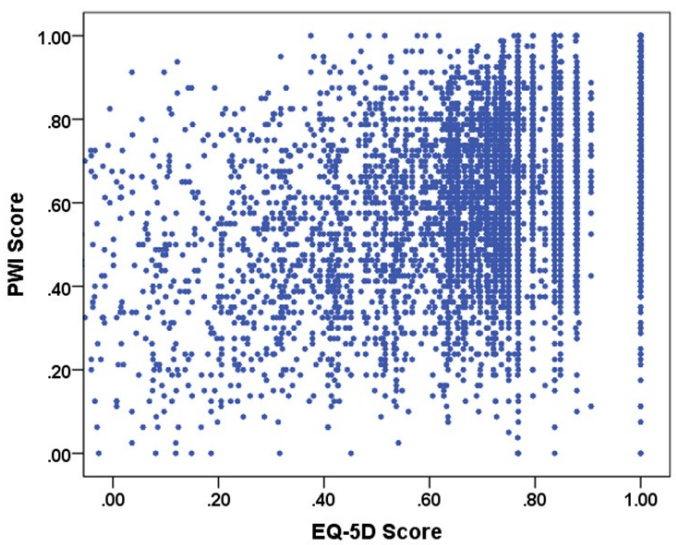
Box 2
Correlation of SWB[1] with selected measures

Amongst the 'public', SWB's correlation with utility is lower than with the SF-36, or the ICECAP measure of capabilities

Correlation of SWB with:		Correlation of SWB with:	
Utility[2]	= 0.26	EQ-5D	= 0.20
SF-36	= 0.36	SF-6D	= 0.31
Capabilities[3]	= 0.44	AQoL-8D	= 0.49

[1] Personal Wellbeing Index (PWI);
[2] Average of 6 MAU instruments; [3] ICECAP

Scatterplot: EQ-5D vs PWI



The MIC Database

The MIC project database is summarised in Tables 2 and 3. Each respondent completed 15 instruments. Those with a chronic disease also completed a disease specific instrument. The instruments are described in [1, 2] available on the AQoL website. Respondents were from 6 countries and included people in 7 chronic disease areas. The project involved collaboration with QoL researchers in Australia (Richardson, Cummins), the USA (Kaplan), UK (Coast), Norway (Olsen), Germany (Schlander) and Canada. This resulted in a database of approximately 2.8 million items of information from 8,022 respondents. Results for each of the 6 countries are available online [3].

Table 2 Summary of MIC Database*		
Countries	Australia, USA, UK, Norway, Germany, Canada	
Disease areas	Healthy (no disease), Asthma, Arthritis, Cancer, Depression, Diabetes, Hearing loss, Heart disease	
Instruments	Subjective wellbeing (happiness)	PWI, IHS, SWLS
	Multi attribute utility (MAU)	EQ-5D-5L, SF-6D, HUI 3, 15D, QWB, AQoL-4D, AQoL-8D
	Multi attribute (MA) (non utility)	SF-36
	Capabilities	ICECAP-A
	Self assessment	VAS, Self TTO, Categorical
	Other	SELF TTO, Demographics, SES
*See Glossary on last page		

Table 3 MIC Sample by Disease and Country

Disease	Arthritis	Asthma	Cancer	Depression	Diabetes	Hearing loss	Heart disease	Healthy	Total
Australia	163	141	154	146	168	155	149	265	1341
Canada	139	138	138	145	144	144	154	328	1330
Germany	159	147	115	160	140	136	152	260	1269
Norway	130	130	80	140	143	115	151	288	1177
UK	159	150	137	158	161	126	167	298	1356
USA	179	150	148	168	168	156	170	321	1460
Total	929	856	772	917	924	832	943	1760	7933

Correlation

There is a very low correlation between the MAU scores from the 'public' respondents. It is greater in the total sample where the range of scores is greater (Figure 1).

The average correlation between SWB (measured by the PWI) and utility in the public sample is 0.26 (ie 7% of the variation in SWB is 'explained' by the MAU instruments). The EQ-5D has the lowest explanatory power (4% of variation). The MAU instruments explain less of the variation than either the capabilities instrument or the SF-36 (Box 2). In the full sample the correlation with the MAU instruments rises to an average of 0.51 (an average R^2 of 0.26) (Figure 2). The correlation between all instrument scores is reported on the back page (Table 6).

Figure 1 Percent of variation in the other 4 MAU instruments explained by each MAU instrument (Ave R^2 .100)

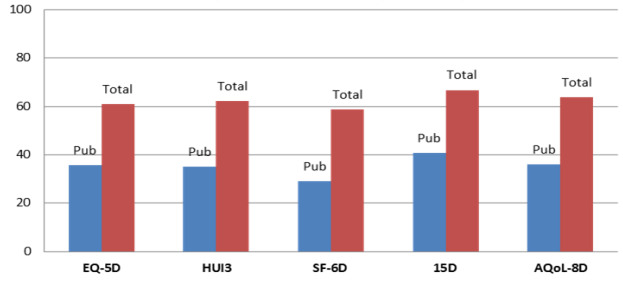
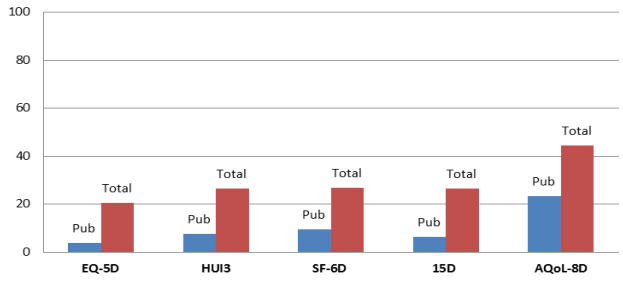


Figure 2 Percent of variation in SWB explained by MAU instrument (R^2 .100)



Country Comparisons

The scores from different countries are surprisingly consistent (Table 4). This is true for almost all of the relationships examined in the 6 country reports [3].

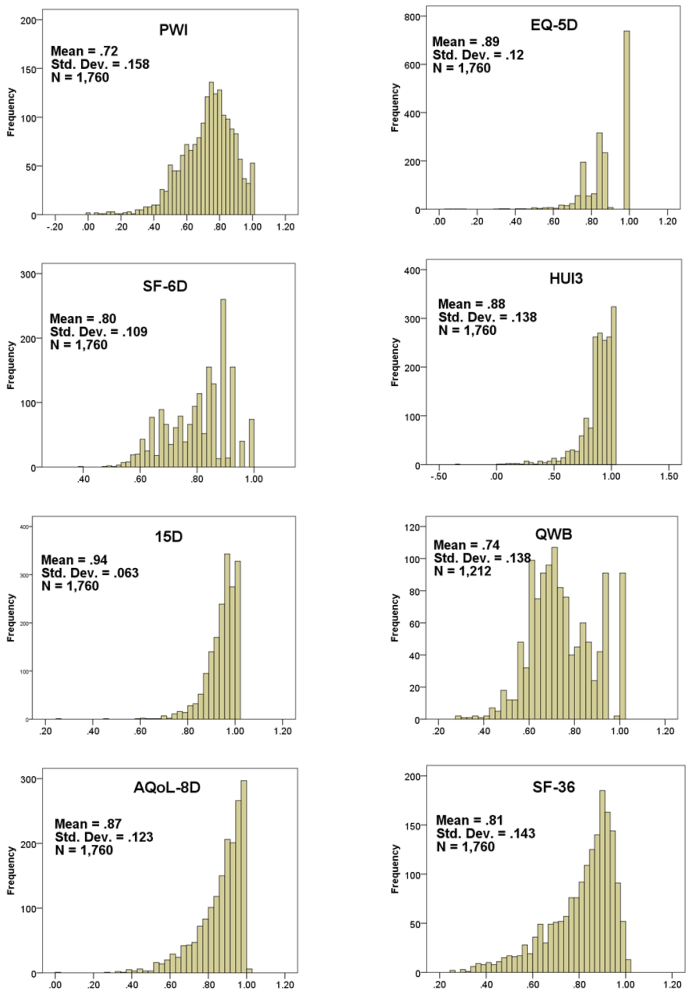
Table 4 Mean score by country (public n=1,760)

	PWI	EQ-5D	SF-6D	HUI 3	15D	QWB	AQoL-8D
Australia	0.73	0.87	0.77	0.88	0.94	0.74	0.82
Canada	0.72	0.88	0.80	0.88	0.94	0.75	0.81
Germany	0.68	0.88	0.82	0.88	0.95	n/a	0.83
Norway	0.78	0.90	0.83	0.91	.096	n/a	0.85
UK	0.71	0.87	0.79	0.88	0.94	0.73	0.80
USA	0.71	0.88	0.80	0.89	0.94	0.76	0.83
Total	0.72	0.88	0.80	0.88	0.94	0.74	0.83

Distribution of Scores

Casual perusal of the frequency distributions for the 'healthy' public below indicates that the study instruments differ significantly (Figure 3). This is confirmed by the low correlation between them.

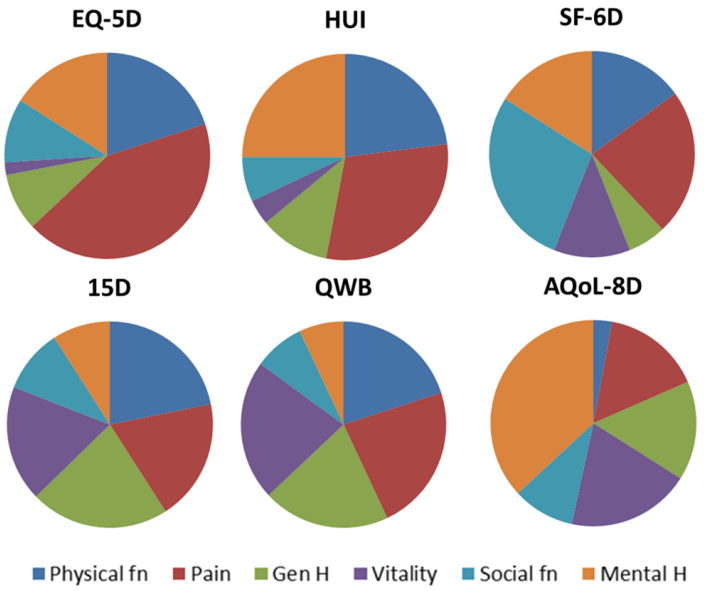
Figure 3 Frequency Distribution: MIC Public



Content of MAU Instruments

Figure 4 shows the importance of different health dimensions in 'explaining' variation in utility as measured by different instruments. Results were derived from the multiple regression of utility upon the dimension scores of the SF-36. They indicate that the EQ-5D is primarily 'explained' by pain and 'physical function'. AQoL-8D is primarily explained by mental health, general health and vitality.

Figure 4 Relative increase in utility with a 1 standard deviation increase in each dimension of the SF-36



Pairwise Comparison

Pairwise linear equations between instruments (MAU_i=a+b MAU_j) are shown in Figure 5. The slope coefficient, b, indicates the change in utility between health states measures by the LHS instrument relative to the change measured by the RHS instrument. If 'b' is not 1.00 then, on average, the apparent change in utility between health states will differ when it is measured by the two instruments. This will affect the results of economic evaluations (Box 1).

Sensitivity of Instruments

If the residual, res, from the regression MAU_i = a+b MAU_j + res has a positive (negative) correlation with a dimension, X, it means that MAU_i varies with X more than MAU_j. The correlation coefficient is therefore a measure of the relative sensitivity of MAU_i and MAU_j to dimension X. These correlations were used to construct Table 5. Country specific results are found in [3].

Table 5 Pairwise comparison of instrument sensitivity to the dimensions of the SF-36 and AQoL-8D

MAU with less sensitivity	MAU with greater sensitivity				
	EQ-5D	SF-6D[1]	HUI 3	15D	AQoL-8D[2]
EQ-5D		(1) Cope Worth Hap Relation MH	**SENSE** Hap	Gen Vital Relation Worth MH RoleE Cope Hap **SENSE**	(2) **VITAL** RoleE Social **MH**
SF-6D	Pain Ind		(1) Sense	(1) Ind **SENSE**	(1) (2)
HUI3	Pain	(1) MH		Gen Vital Role P MH Role E Cope	(2) Gen **VITAL** Social RoleE **MH**
15D	Pain	(1) **SENSE**			(2) Vital RoleE **MH**
AQoL-8D	Pain **PHYS**	(1)	(2) Phys	(2) RoleP Pain **PHYS**	

± 0.1 = light text; ± 0.2 = **BOLD** text

Key

[1] Comparisons with SF-36 dimensions are omitted

[2] Comparisons with AQoL-8D dimensions are omitted

SF-36 dimensions: Gen= general health; Phys= physical functioning; RoleP= role limit physical; Pain=bodily pain; Vital= vitality; Social=social functioning; RoleE=role limit emotional; MH=mental health

AQoL-8D dimensions: Ind= independent living; Pain=pain; Sense=senses; Hap=happiness; MH=mental health; Cope=coping; Rel=relationships; Worth=self-worth.

Figure 5 Geometric Mean Squares Regression MAU_i on MAU_j

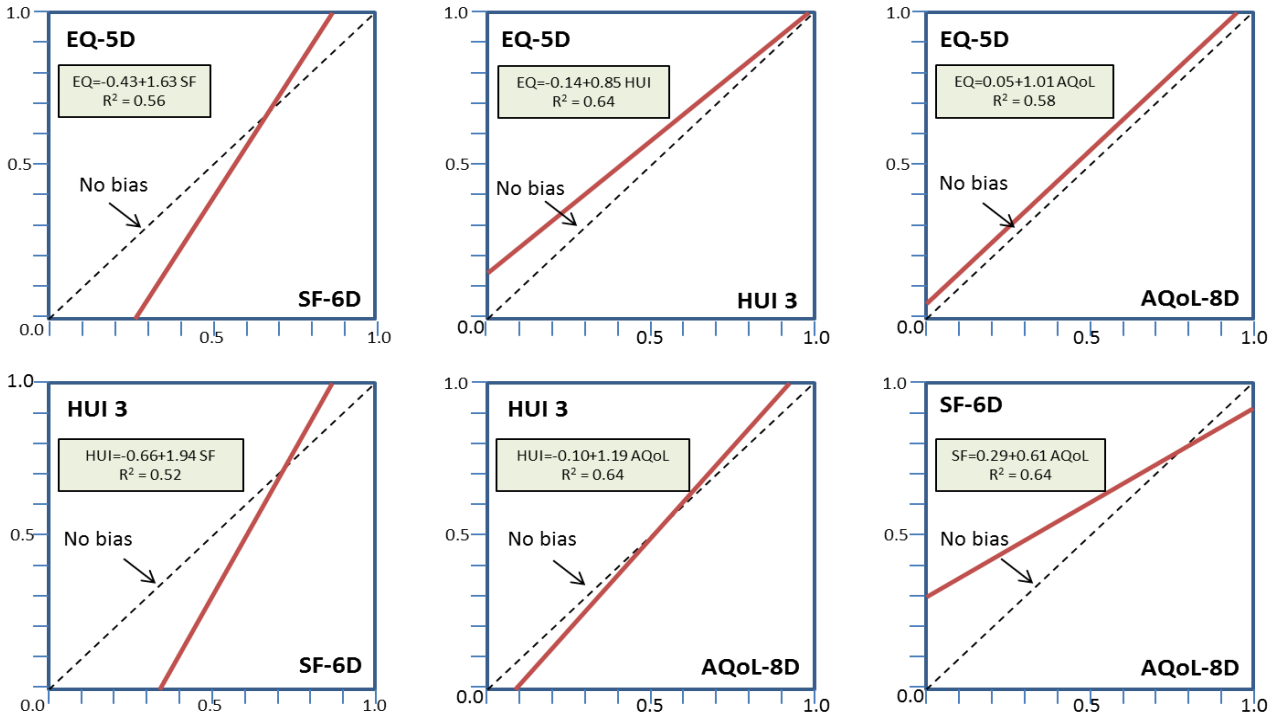


Table 6 Correlation between 12 Instruments												
	PWI	SWLS	IHS	EQ-5D	HUI3	SF-6D	15D	QWB	AQoL-8D	ICECAP	SF-36	Self TTO
PWI	1	.792**	.779**	.453**	.515**	.519**	.516**	.402**	.667**	.664**	.549**	.304**
SWLS	.792**	1	.806**	.428**	.497**	.488**	.493**	.393**	.658**	.670**	.513**	.316**
IHS	.779**	.806**	1	.458**	.522**	.559**	.519**	.404**	.698**	.691**	.571**	.330**
EQ-5D	.453**	.428**	.458**	1	.800**	.752**	.817**	.653**	.756**	.602**	.777**	.354**
HUI3	.515**	.497**	.522**	.800**	1	.725**	.834**	.659**	.798**	.668**	.766**	.363**
SF-6D	.519**	.488**	.559**	.752**	.725**	1	.784**	.681**	.806**	.630**	.930**	.378**
15D	.516**	.493**	.519**	.817**	.834**	.784**	1	.730**	.835**	.667**	.839**	.381**
QWB	.402**	.393**	.404**	.653**	.659**	.681**	.730**	1	.687**	.524**	.695**	.331**
AQoL-	.667**	.658**	.698**	.756**	.798**	.806**	.835**	.687**	1	.799**	.839**	.419**
ICECAP	.664**	.670**	.691**	.602**	.668**	.630**	.667**	.524**	.799**	1	.653**	.368**
SF-36	.549**	.513**	.571**	.777**	.766**	.930**	.839**	.695**	.839**	.653**	1	.393**
Self	.304**	.316**	.330**	.354**	.363**	.378**	.381**	.331**	.419**	.368**	.393**	1
** Correlation is significant at the 0.01 level (2-tailed)												

Endnote

The information in this brochure does not indicate which instrument should be used for economic evaluation. This depends, *inter alia*, upon judgements concerning what should be measured: SWB or utility, and which dimensions of QoL should be included in the measurement of utility.

The results indicate that at present there is no 'best' instrument and that the sensitivity to different dimensions of health varies between instruments. This implies that the use of an instrument which is insensitive to the dimensions most affected by a health service will result in the under-valuation of that health service.

The results also indicate that the utility weights in the MAU instruments differ. The pairwise regressions in Figure 7 do not fall on the 45° line. This implies a further source of bias which must be overcome through the use of transformations between the instruments. This research is underway as part of the MIC project.

References

1. Richardson, J, J McKie, and E Bariola. 2011. *Review and Critique of Health Related Multi Attribute Utility Instruments,* Research Paper 64, (Forthcoming in A Culyer (ed), *Encyclopedia of Health Economics*, Elsevier Science San Diego). Melbourne: Centre for Health Economics, Monash University.

2. Richardson J, Iezzi A, Maxwell A 2012 *Cross-National Comparison of Twelve Quality of Life Instruments. MIC Paper 1: Background, Questions, Instruments,* Research Paper 76, Centre for Health Economics, Monash University, Melbourne.

3. Richardson, J, M A Khan, A Iezzi, and A Maxwell. 2012a-e. *Cross-national comparison of twelve quality of life instruments, MIC Research Papers 2-7 Australia, UK, USA, Canada, Norway, Germany*. Centre for Health Economics, Monash University.

Glossary			
Subjective Wellbeing Instruments/other		**Multi Attribute Utility Instrument (MAUI)** *'utility': the strength of preference*	
SWB	Subjective wellbeing	EQ-5D-5L	5 level EQ-5D
PWI	Personal Wellbeing Index	SF-6D	Derived from SF-36
SWLS	Satisfaction with life Scale	HUI 3	Health Utility Index
IHS	Integrated household Survey	15D	15 Dimension (Sintonen)
SF-36	Short form 36	QWB	Quality of Wellbeing (US)
'Public'	Overall health rating ≥ 70 (100 pt scale)	AQoL-8D	Assessment of QoL 8D

MIC Research Papers are available on the *AQoL* website

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