Measuring Health-Related Quality of Life

German Patient Preferences for Generic Health States –

Research based on the Multi-Instrument Comparison (MIC) Study

Michael Schlander

Presentation to IQWiG

Cologne / Germany, July 09, 2018

Overview

1. **Health Economics at DKFZ**
2. **Multi-Attribute Utility (MAU) Instruments**
3. **The Multi-Instrument Comparison (MIC) Project**
4. **First German Results**
   - ¬ Respondents
   - ¬ Summary Statistics
   - ¬ Correlations and Linear Relationships between MAU Instruments
   - ¬ Instrument Content
5. **Outlook: Elements of a Research Program**
   - ¬ Invitation to Cooperate

Health Economics at the DKFZ: Background in Brief

Michael Schlander (Foundation Head of Division, since 2017)

[Academic]

- Professor of Health Economics – U of Heidelberg (since 2017)
  [on leave of absence to lead Division of Health Economics at German Cancer Research Center, DKFZ]
- Professor of Health Care & Innovation Management (2002-2016)
- Chairman & Scientific Director – InnoVal^{HC} / Wiesbaden (since 2005)

[Professional]

- CEO – industry [*turn-around management*] (in D; 1999-2002)
- Director of Strategic Business Unit – industry [including *pantoprazole*] (Byk Gulden; Johnson & Johnson; in D, B, USA; 1993-1999)
- European Clinical Development – industry (Sandoz; in D, CH; 1987-1993)

[Academic]

- Exp. Brain Research [& Clinical Neurology] – U of Frankfurt (1982-1987)

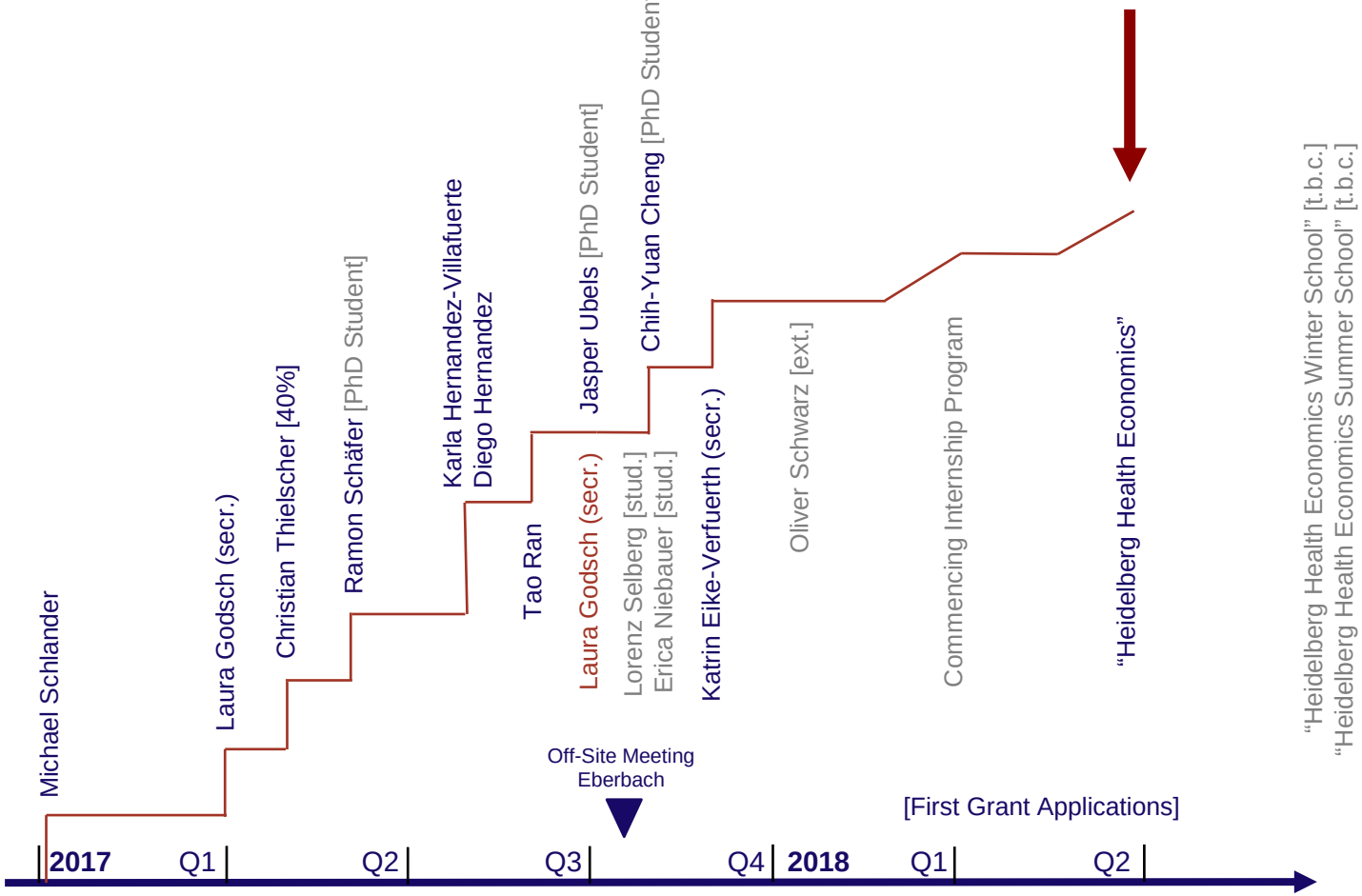
[Education]

- PhD Equivalent (*Habilitation*) – Health Economics, U of Heidelberg (2007)
- Diploma – Health Economics, Stockholm School of Economics (2002)
- MBA (*valedictorian*) – Management, City U of Seattle, Washington (1994)
- MD (*summa cum laude*) – Exp. Brain Research, U of Frankfurt (1985/87)

Health Economics at the DKFZ : Foundations

[Off-Site Meeting, Eberbach Monastery, October 2017]

Health Economics at the DKFZ: Development



Health Economics at the DKFZ: Ambition

- To firmly establish the DKFZ, on a worldwide scale, among the top-10 centers of excellence for the economics of cancer care;
- To become the undisputed top (number one) center of excellence for the economics of cancer care in Germany,
  - and as such, the primary national point of reference for information on the **cost of cancer** and the **cost effectiveness of interventions** aimed at improving cancer-related morbidity and mortality, including prevention, diagnostics, and treatment;
- To make the new DKFZ unit a respected member of the international health economics community,
  - and as such, an important contributor to the further development of **health economic evaluation methods** (better) reflecting the social objectives of collectively financed health schemes.

Health Economics at the DKFZ: Charter

- Science-Driven
- Policy-Relevant
- Politically Aware… *but not a political player*

- Multidisciplinary and Inclusive Approach
- Plurality of Thought and Method
- Openness and Transparency… *adopting the Chatham House Rule*

- Culture of Mutual Support and Mentoring Young Scientists
- Ethical Conduct… *including adherence to best practice standards*
- Internal Quality Assurance Process

hereby

- Contributing to the Advancement of Applied Health Economics
  and to our Understanding of the Economics of Cancer Care

Health Economics at the DKFZ: Basics

Positive versus Normative Health Economics

Cost Analysis

- **Burden of Disease (BoD)**
  - Duration and quality of life lost
  - Measures: HALYs (DALYs, QALYs…; LYG …)
- **Cost of Illness (CoI)**
  - Total (direct / indirect / ?) cost to society due to a disorder
- **Budget Impact Analysis (BIA)**
  - Predicted impact of adopting a technology on a health care budget (payers' perspective)

Comparative Analysis

- **Cost Benefit Analysis (CBA)**
- **Cost-Effectiveness Analysis (CEA)**
  - Cost Utility Analysis (CUA)
  - Cost Consequence Analysis (CCA)
- **Cost Minimization Analysis (CMA)**

Health Economics at the DKFZ: Basics and Beyond

Positive versus Normative Health Economics

Cost Analysis

- **Burden of Disease (BoD)**
  - Duration and quality of life lost
  - Measures: HALYs (DALYs, QALYs…; LYG *unweighted*)
- **Cost of Illness (CoI)**
  - Total (direct / indirect / ?) cost to society due to a disorder
- **Budget Impact Analysis (BIA)**
  - Predicted impact of adopting a technology on a health care budget (payers' perspective)
- **Socioeconomic Impact Analysis (SIA)**
  - Impact of cancer on patients and families

New -> (in preparation)

New -> (underway)

Comparative Analysis

- **Cost Benefit Analysis (CBA)**
- **Cost-Effectiveness Analysis (CEA)**
  - Cost Utility Analysis (CUA)
  - Cost Consequence Analysis (CCA)
- **Cost Minimization Analysis (CMA)**
- **Social Cost Value Analysis (SCVA)**

Health Economics at the DKFZ: Research Priorities

[following Off-Site Meeting, Eberbach, October 2017]

- **Burden of Disease Studies**
  Cost of Illness
  and [planned] Socioeconomic Impact Analyses

- **Cost Benefit Analyses**
  Cost Value Analyses

- **Economic Evaluation Methods**
  within *and beyond* the conventional paradigm

- **Education, Training & Outreach**
  [*planned*:] Heidelberg Health Economic Summer & Winter Schools

Health Economics at the DKFZ: Research Priorities

[following Off-Site Meeting, Eberbach, October 2017]

- **Burden of Disease Studies**
  Cost of Illness
  and [planned] Socioeconomic Impact Analyses

- **Cost Benefit Analyses**
  Cost Value Analyses

- **Economic Evaluation Methods**
  within *and beyond* the conventional paradigm

Today -> (ongoing)

- **Education, Training & Outreach**
  [*planned*:] Heidelberg Health Economic Summer & Winter Schools

Research into Foundations of Discipline

Measuring Health-Related Quality of Life

Multi-Instrument Comparison (MIC): Rationale

Generic "MAU" Instruments:

- **15-D** (Sintonen and Pekurin 1993; ff.)
- **AQoL** (Hawthorne et al. 1997; ff.)
- **EQ-5D** (Dolan 1997; Shaw et al 2005; ff.)
- **HUI-3** (Torrance 1982; Torrance et al. 1996; Feeny et al. 2002; ff.)
- **SF-12 (/SF-6D)** (Brazier et al. 2002; Brazier and Roberts 2004; ff.)
- **QWB** (Kaplan and Anderson 1988; ff.)

… not all the same …

- coverage of descriptive system
- sensitivity of dimensions
- model used to combine the dimensions / items
- valuation method

Research into Foundations of Discipline

Measuring Health-Related Quality of Life (HRQoL)

Multi-Instrument Comparison (MIC): Rationale

RS, Rating Scale (Visual Analogue Scale, VAS); SG, Standard Gamble; TTO, Time-Trade Off

Instrument	15D	AQoL8D	EQ-5D	HUI-3	QWB	SF12 (SF-6D)
Scaling	RS	TTO	TTO	SG	RS	SG
Dimensions	15	8	5	8	5	2
Levels	4-5	4	5	5-6	2-3	4-6
No. of Health States	31bn	16.8m	3,127	972,000	945	18,000

Some early observations:

generally low correspondence between instruments, i.e.,

- comparison "warrants **caution**" (McDonough et al., 2005);
- instruments are "**not equivalent**" (Mook and Kohlmann, 2008);
- instruments are "**imprecisely related**" (Fryback et al., 2010).

Research into Foundations of Discipline

Descriptive Systems of Generic HRQoL Instruments

	EQ-5D-5L	SF-6D	HUI 3	15D	QWB[a]	AQoL-8D
Dimensions of physical health[b]						
Physical ability/mobility/vitality/coping/control	1	1	2	2	8	3
Bodily function/self-care	1			3	13	1
Pain/discomfort	1	1	1	1	14	2
Senses			2	2	5	2
Usual activities/work	1	1		1	12	4
Communication			1	1	2	1
Dimensions of psychosocial health[b]						
Sleeping				1	1	1
Depression/anxiety/anger	1	1	1	3	4	7
General satisfaction						4
Self-esteem						2
Cognition/memory ability			1			
Social function/relationships		1				6
(Family) role		1				1
Intimacy/sexual relationships				1	1	1
Total no. of items (or symptoms, for QWB[a])	5	6	8	15	68[a]	35
No. of health states described	3125	18,000	972,000	3.1×10^{10}	945	24×10^{23}

a. QWB has 3 items plus 27 symptom/problem clusters.
b. For the physical and psychosocial dimensions of health, the values in the table are numbers of items (or symptoms, for QWB[a]).

From: J. Richardson et al., *Med Decis Making* 2015;35:276–291

Measuring Health-Related Quality of Life

Multi-Instrument Comparisons *prior to MIC Study* (1)

Convergent Validity of Generic HRQoL Instruments

Proportion of variance explained by another instrument (R^2):

	AQoL-4D	EQ5D	HUI 3	15D	SF-6D
AQoL-4D	1				
EQ-5D	0.53	1			
HUI 3	0.55	0.41	1		
15D	0.64	0.58	0.55	1	
SF6D	0.55	0.56	0.44	0.59	1
Mean	0.57	0.52	0.49	0.59	0.53

[1]**Graeme Hawthorne et al. (2001)** p. 365, Tab. 6; R^2 = correlation coefficient squared

"HRQoL instruments were administered to a stratified **sample of residents in Victoria, Australia**, selected to cover a very broad range of health conditions from those who were healthy through to those who were terminally ill. The strata were: 1) randomly selected community members weighted by socioeconomic status to achieve representativeness of the Australian population; 2) outpatients attending two of Melbourne's largest public hospitals (the method used was random sampling within selected timeframes); and 3) inpatients from three Melbourne hospitals. […] The response rates to the validation study were **58%** *(n* = **396)** for the community sample, **43%** *(n* = **334)** for outpatients and **68%** *(n* = **266)** for inpatients." Hawthorne et al., l.c., pp. 362, 364

Measuring Health-Related Quality of Life

Multi-Instrument Comparisons *prior to MIC Study* (2)

Convergent Validity of Generic HRQoL Instruments

Proportion of variance explained by another instrument (R^2):

	EQ5D	HUI 3	QWB SA	SF6D
EQ5D	1			
HUI 3	0.49	1		
QWB SA	0.41	0.45	1	
SF6D	0.50	0.52	0.43	1
Mean	0.47	0.49	0.43	0.48

[2]**Dennis G. Fryback et al. (2010)** p. 8, Tab. 2; R^2 = correlation coefficient squared

The "NHMS was a cross-sectional, random digit-dialed, computer-assisted telephone interview survey of community-dwelling **US adults aged 35 to 89 years**. The NHMS survey was conducted in 2005–2006 and employed a sampling procedure designed to oversample people aged 65 and older and telephone exchanges with high proportions of African American households. The response rate was 56%. The final sample contained 3844 individuals, 43% men and 57% women, with mean age of 60.2 years (SD 14.0 years)." Fryback et al., l.c., p. 6

Research into Foundations of Discipline

Measuring Health-Related Quality of Life

Multi-Instrument Comparison (MIC) Study: Objectives

Five Generic HRQoL MAU Instruments**:**

EQ-5D-5L; SF-6D, HUI-3, 15D, AQoL-4D/-8D

[German analysis, available]

- Psychometric properties and internal reliability
- Assessing convergence and predictive consistency
  - Pearson and intraclass correlations with other instruments
  - Linear relationships, i.e., relative performance of instruments wrt “utility” differences
- Exploring the sensitivity of instruments
  - to summary physical and psychosocial dimensions (SF-36)

[German analyses, planned]

  - pairwise comparisons of sensitivity
  - disease-specific assessments of sensitivity
- Cross-walks and mapping with disease-specific HRQoL instruments
- Cross-walks and mapping with capability instrument (ICECAP-A)
  - employing advanced analytical techniques (Item Response Theory)

First German results were presented by M. Schlander, M.A. Khan, A. Iezzi, A. Maxwell, O. Schwarz, J. Richardson:
“Multi-Attribute Utility (MAU) Instruments as Tools to Value Health-Related Quality of Life (HRQoL)”
at the EuHEA Annual Conference in Hamburg / Germany, July 16, 2016.

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Principal Investigators

- **Australia (Lead)**:

  Jeff Richardson (Monash University, Melbourne, Australia)

  Robert Cummins (Deakin University, Melbourne, Australia)

- **Canada / United States of America**:

  Robert Kaplan (University of California Los Angeles, USA)

- **Germany**:

  Michael Schlander (University of Heidelberg, Germany)

- **Norway**:

  Jan Abel Olsen (University of Tromsø, Norway)

- **United Kingdom**:

  Joanna Coast (University of Bristol [/Birmingham], England)

The MIC Study was funded by an Australian **National Health and Medical Research Council (NHMRC)** project grant (ID 1006334); the German arm was further supported by the German Cancer Research Center (DKFZ, Heidelberg / Germany) and conducted with the Institute for Innovation & Valuation in Health Care (Wiesbaden / Germany) prior to Michael Schlander joining the DKFZ; the Norwegian arm was facilitated by a grant from the University of Tromsø.

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

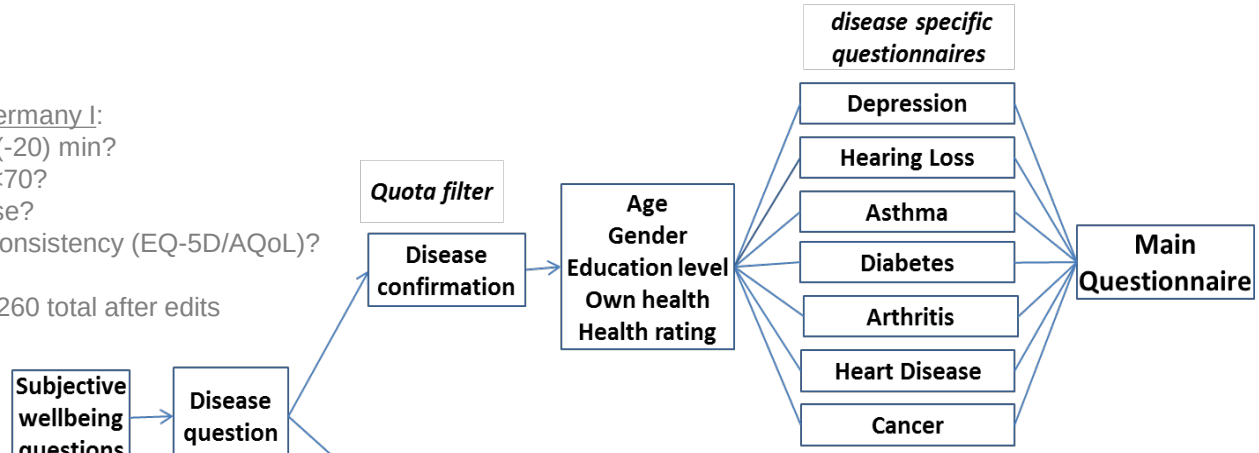
Respondents

- Australia, Canada, **Germany**, Norway, UK, USA
  - net sample size: **N=8,022**; hereof, Germany (D), **n=1,269**
- Samples of the healthy public (net, N=1,760; hereof D, **n=260**)
  - designed to produce a representative sample
    in terms of age group, gender, education
- Patient samples (N=6,262; hereof D, **n=1,009**):
  - no quota; resulting sample highly skewed with respect to age
    - asthma (N=856; D, **n=147**)
    - cancer (N=772; D, **n=115**)
    - depression (N=917; D, **n=160**)
    - diabetes (N924; =D, **n=140**)
    - hearing problems (N= 852; D, **n=136**)
    - arthritis (N=929; D, **n=159**)
    - chronic heart disease (N= 943; D, **n=152**)

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

German Analyses (n = 1,269)



Edits Germany I:
1 t <15 (-20) min?
2 VAS <70?
3 disease?
4 pain consistency (EQ-5D/AQoL)?
5 …
344 => 260 total after edits

Edits Germany II:
1 t <15 (-20) min?
2 EQ-5D mobility duplicated
3 SF-36 Q1 duplicated
…
6 pain consistency (EQ-5D/AQoL)?
7,8: anyone with more than 2 issues excluded
1,216 => 1,009 total after edits

M. Schlander, M.A. Khan, A. Iezzi, A. Maxwell, Oliver Schwarz, J. Richardson:
Multi-Attribute Utility (MAU) Instruments as Tools to Value Health-Related Quality of Life (HRQoL),
Presentation to EuHEA Annual Conference, Hamburg / Germany, July 16, 2016.

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Distribution of German Sample by Age and Gender

Disease	Distribution of diseases by age group and gender												Total		
	18-24		25-34		35-44		45-54		55-64		65+				
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	T
Asthma	10	10	7	14	28	20	15	17	8	9	7	2	75	72	147
Cancer	0	0	3	7	11	9	9	19	16	10	24	7	63	52	115
Depression	4	12	10	20	16	26	21	28	11	9	1	2	63	97	160
Diabetes	3	3	4	4	8	6	32	15	21	16	21	7	89	51	140
Hearing problems	3	3	1	5	12	10	28	23	21	13	17	0	82	54	136
Arthritis	0	0	2	4	11	8	33	44	20	22	9	6	75	84	159
Heart problems	2	3	2	2	9	3	19	17	45	23	23	4	100	52	152
No disease-Healthy public	6	11	22	30	24	24	28	33	25	20	26	11	131	129	260
Total	28	42	51	86	119	106	185	196	167	122	128	39	678	591	1269

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Internal Reliability

Reliability of instruments (tests carried out with public data, using Cronbach's alpha):

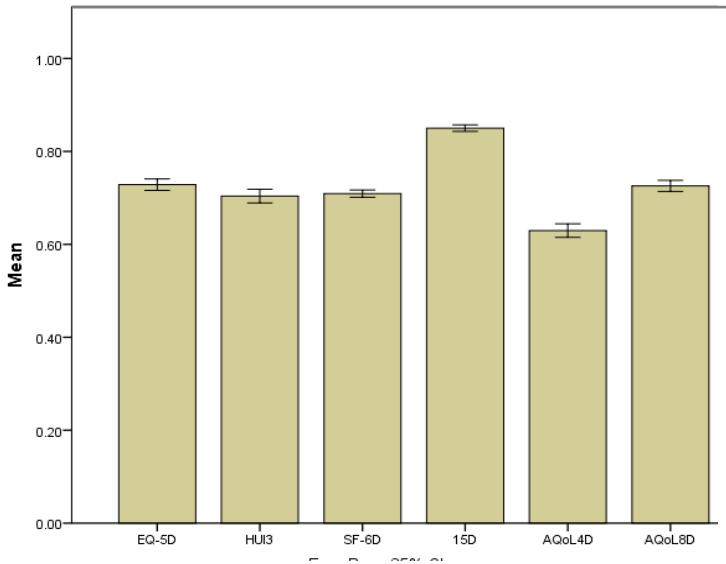
Instrument	No of items	Cronbach's Alpha
AQoL-4D	12	0.82
AQoL-8D	35	0.96
HUI3	8	0.74
EQ-5D	5	0.82
15D	15	0.88
ICECAP	5	0.84
SF-36	36	0.68*
IHS	4	0.47*
SWLS	5	0.92

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

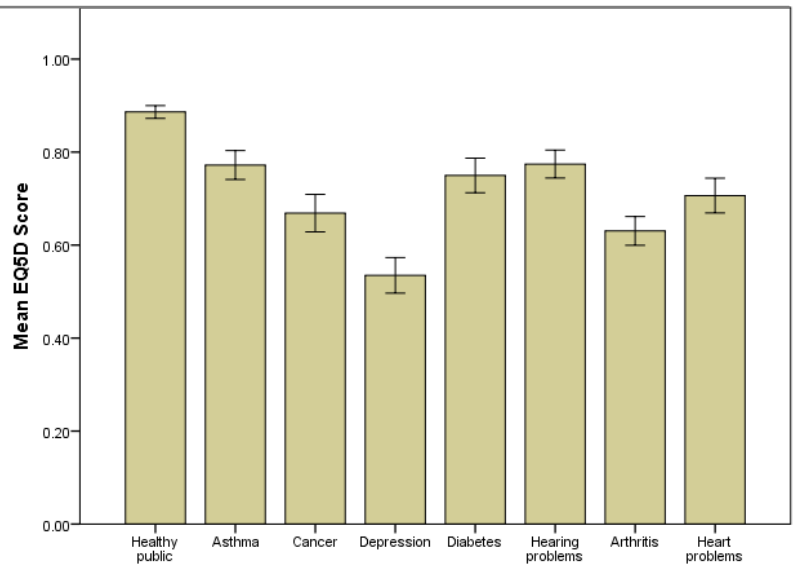
Summary Statistics (n = 1,269)

Mean values by instrument



Instruments
[Error Bars, 95% CI]

Mean EQ-5D values by disease group



Diseases
[Error Bars, 95% CI]

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Correlations between Instruments

Pearson correlations between MAU Instruments (public sample, n=260):

	EQ-5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D
EQ-5D	1	.649**	.595**	.654**	.530**	.514**
HUI3	.649**	1	.515**	.649**	.540**	.522**
SF-6D	.595**	.515**	1	.569**	.450**	.648**
15D	.654**	.649**	.569**	1	.558**	.597**
AQoL-4D	.530**	.540**	.450**	.558**	1	.623**
AQoL-8D	.514**	.522**	.648**	.597**	.623**	1
Ave	**0.59**	**0.58**	**0.56**	**0.61**	**0.54**	**0.58**

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

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Correlations between Instruments

Pearson correlations between MAU Instruments (total sample, n=1,269):

	EQ-5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D
EQ-5D	1	.805**	.774**	.817**	.767**	.789**
HUI3	.805**	1	.720**	.837**	.784**	.816**
SF-6D	.774**	.720**	1	.783**	.749**	.806**
15D	.817**	.837**	.783**	1	.788**	.846**
AQoL-4D	.767**	.784**	.749**	.788**	1	.842**
AQoL-8D	.789**	.816**	.806**	.846**	.842**	1
Ave	**0.79**	**0.79**	**0.77**	**0.81**	**0.79**	**0.82**

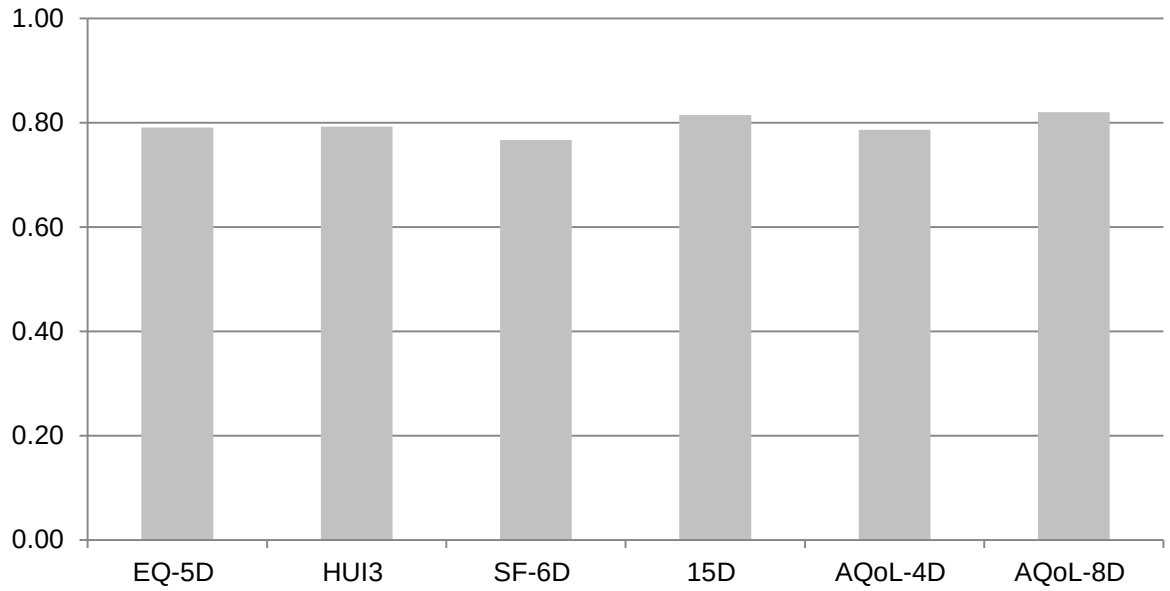
**. Correlation is significant at the 0.01 level (2-tailed).

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Average Pearson Correlations

Pearson correlation with other MAU Instruments (total sample, n=1,269):

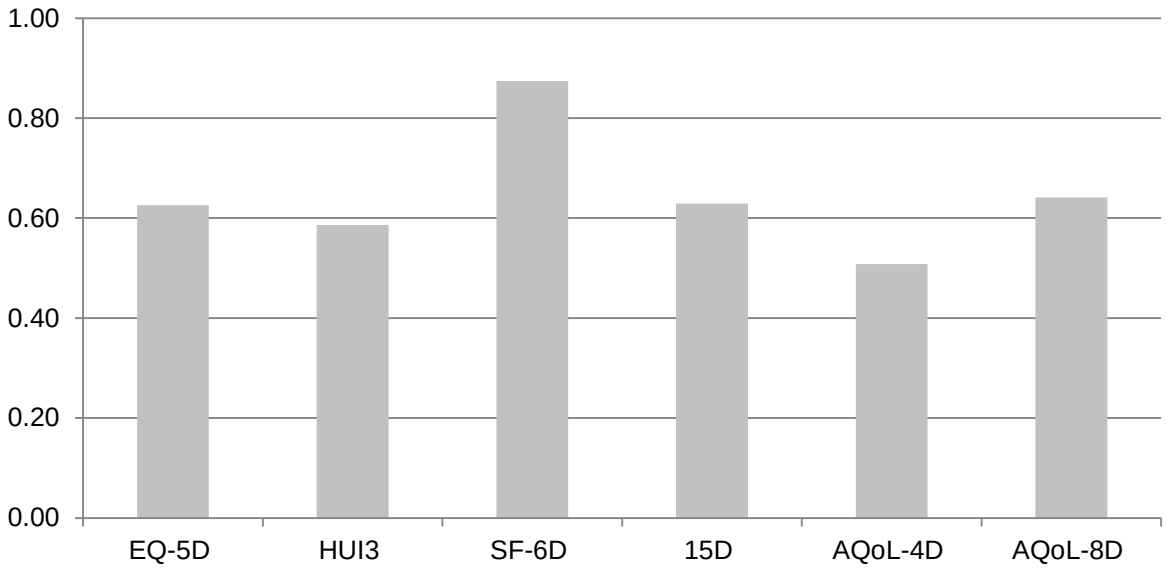


Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Pearson Correlations with SF-36

Pearson correlation of MAU Instruments with SF-36 (public sample, n=260):

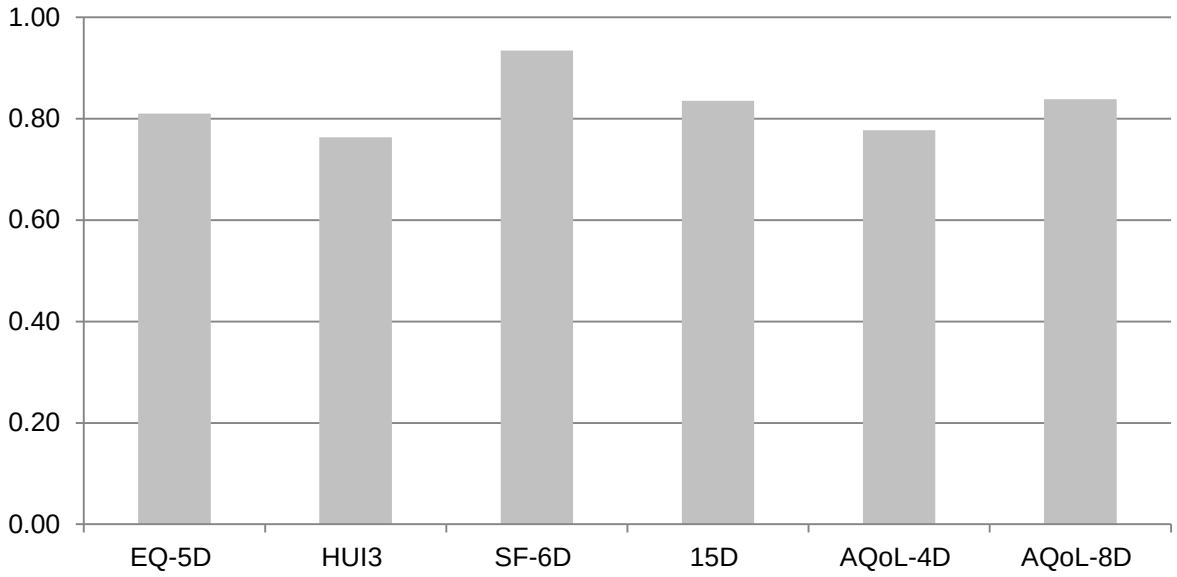


Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Pearson Correlations with SF-36

Pearson correlation of MAU Instruments with SF-36 (total sample, n=1,269):



Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Intraclass Correlations

Intraclass correlations with other MAU Instruments (total, n=1,269):

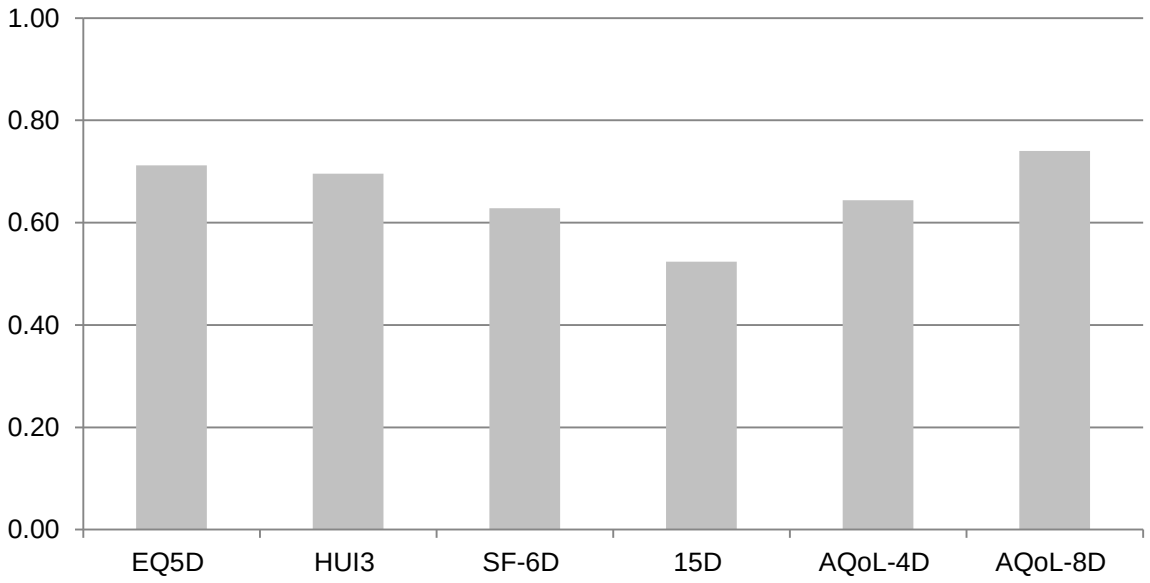
Instrument	EQ5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D
EQ5D		0.79	0.70	0.58	0.7	0.79
HUI3	0.79		0.60	0.53	0.76	0.80
SF-6D	0.70	0.60		0.51	0.59	0.74
15D	0.58	0.53	0.51		0.40	0.60
AQoL-4D	0.70	0.76	0.59	0.40		0.77
AQoL-8D	0.79	0.80	0.74	0.60	0.77	
Ave	**0.71**	**0.70**	**0.63**	**0.52**	**0.64**	**0.74**

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Intraclass Correlations

Average intraclass correlation with other MAU Instruments (total, n=1,269):

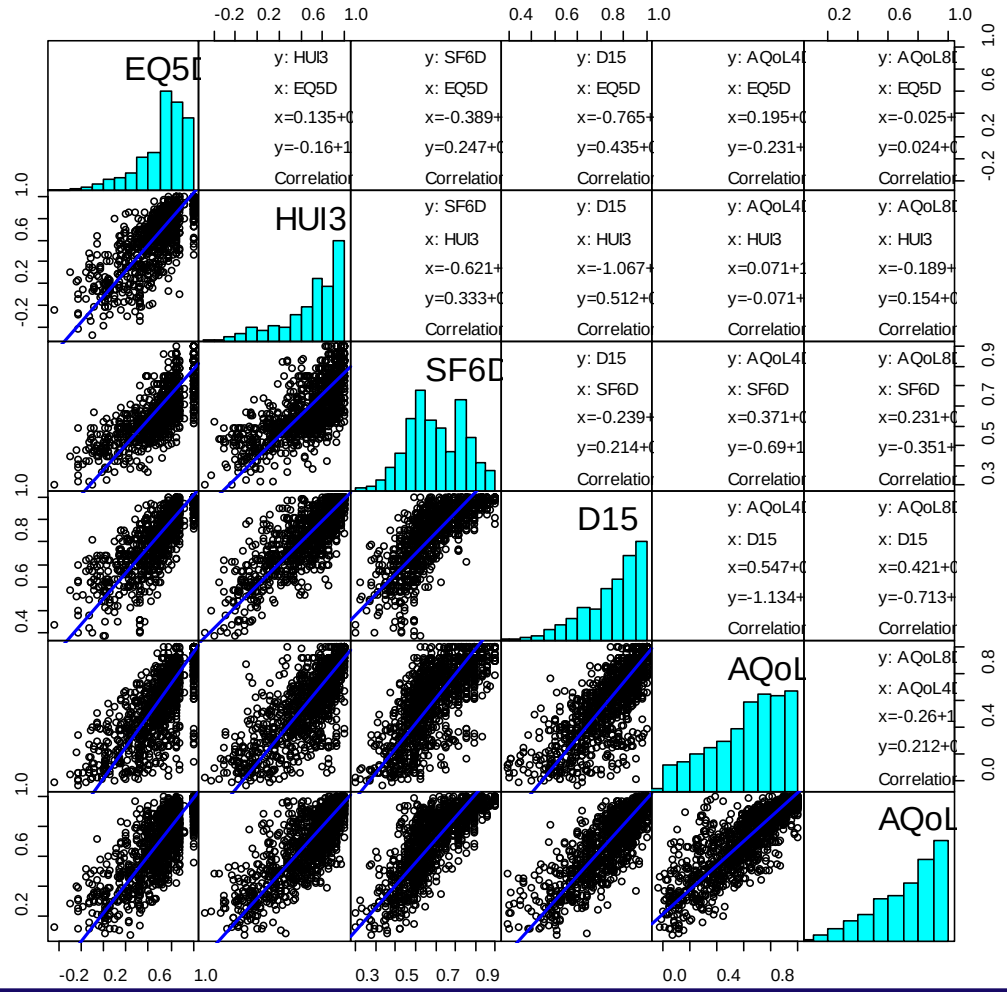


Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Linear Relationships

Pairwise geometric mean regression results (total, n=1,269):



Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Linear Relationships

Discrepancies in marginal change between instruments

based on pairwise geometric mean regression results (total population, n=1,269):

(coefficients b for "instrument A = a + b instrument B")

Instrument	EQ-5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D
EQ-5D (EQ)	1.00					
HUI3 (H)	H=1.19(EQ)	1.00				
SF-6D (SF)	EQ=1.58(SF)	H=1.87(SF)	1.00			
15D (D)	EQ=1.76(D)	H=2.08(D)	SF=1.12(D)	1.00		
AQoL-4D (A4)	A4=1.18(EQ)	H=1.00(A4)	A4=1.86(SF)	A4=2.08(D)	1.00	
AQoL-8D (A8)	EQ=1.04(A8)	H=1.23(A8)	A8=1.51(SF)	A8=1.69(D)	A4=1.23(A8)	1.00
Ave % Diff	**35.0**	**47.4**	**58.8**	**74.6**	**47.0**	**34.0**

Note that constant terms in equations have been dropped. Equations are arranged to obtain b>1 as a consistent index of deviation, which is permitted due to the use of geometric mean regressions.

M. Schlander, M.A. Khan, A. Iezzi, A. Maxwell, Oliver Schwarz, J. Richardson:
Multi-Attribute Utility (MAU) Instruments as Tools to Value Health-Related Quality of Life (HRQoL),
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The Multi-Instrument Comparison (MIC) Study

Instrument Content

Ceiling Effects (for Healthy Sample)

Average value of other MAU instruments when an MAU = 1 (n=260):

(n and percentage indicate number of respondents with an MAU score of 1)

MAU =1	Average value							
	EQ5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D	n	(%)
EQ5D	..	0.95	0.88	0.98	0.9	0.94	111	42.7
HUI3	0.99	..	0.88	0.99	0.95	0.95	42	16.2
SF-6D	0.99	0.95	..	0.98	0.95	0.98	14	5.4
15D	0.98	0.97	0.89	..	0.95	0.96	51	19.6
AQoL-4D	0.98	0.97	0.89	0.99	..	0.96	42	16.2
AQoL-8D	1	0.98	0.94	0.99	0.91	..	14	5.4

The Multi-Instrument Comparison (MIC) Study

Instrument Content

Ceiling Effects

Average value of other MAU instruments when an MAU = 1 (n=1,269):

(n and percentage indicate number of respondents with an MAU score of 1)

MAU =1	Average value							
	EQ5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D	n	(%)
EQ5D	..	0.95	0.88	0.98	0.9	0.94	234	18.4
HUI3	0.98	..	0.87	0.98	0.93	0.95	79	6.2
SF-6D	0.99	0.96	..	0.98	0.95	0.98	23	1.8
15D	0.98	0.95	0.88	..	0.94	0.95	87	6.9
AQoL-4D	0.98	0.96	0.88	0.98	..	0.96	76	6
AQoL-8D	0.98	0.97	0.92	0.99	0.93	..	25	2

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Content

Floor Effects

Average value of other MAU instruments when an MAU <0.4 (n=1,269):

(n and percentage indicate number of respondents with an MAU score <0.4)

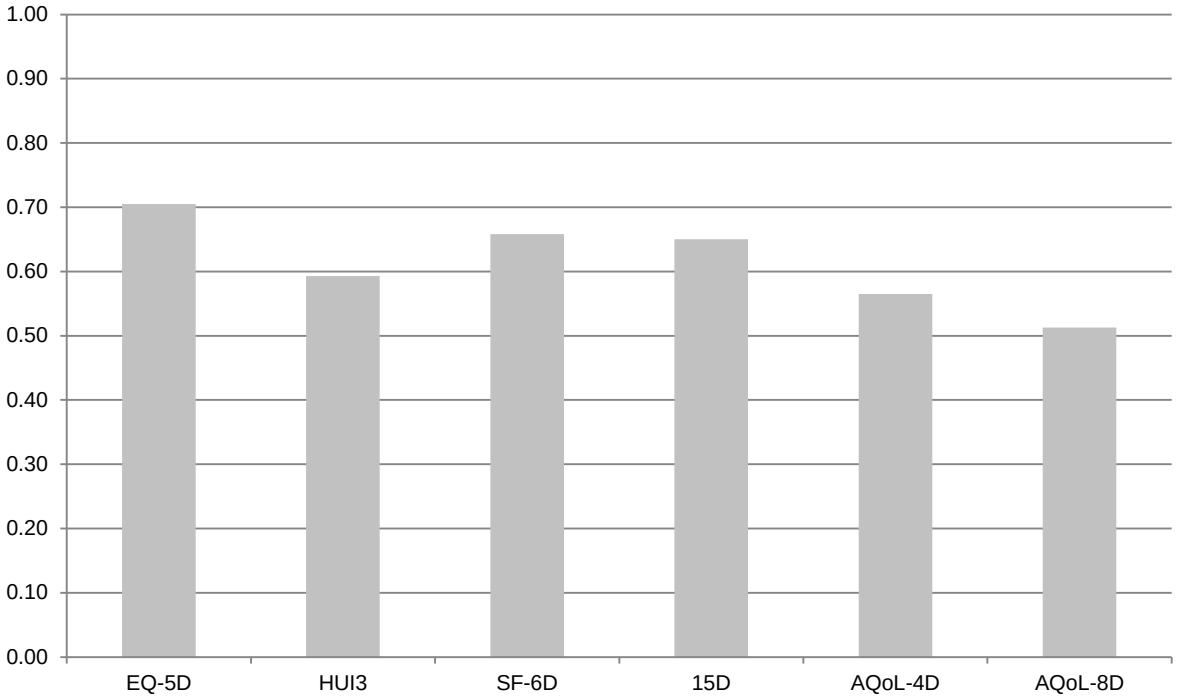
MAU <.40	Average value							
	EQ5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D	n	(%)
EQ5D	0.22	0.23	0.50	0.64	0.21	0.36	120	9.5
HUI3	0.39	0.19	0.53	0.65	0.25	0.40	194	15.3
SF-6D	0.23	0.14	0.36	0.59	0.10	0.26	17	1.3
15D	0.26	-0.11	0.51	0.40	0.09	0.28	4	0.3
AQoL-4D	0.47	0.38	0.57	0.70	0.22	0.45	278	21.9
AQoL-8D	0.31	0.19	0.50	0.62	0.18	0.29	130	10.2

The Multi-Instrument Comparison (MIC) Study

Instrument Content

Correlation with SF-36 Physical Component Summary (PCS)
(total, n=1,269):

EQ-5D (particularly), SF6D and 15D are relatively more sensitive to physical health.

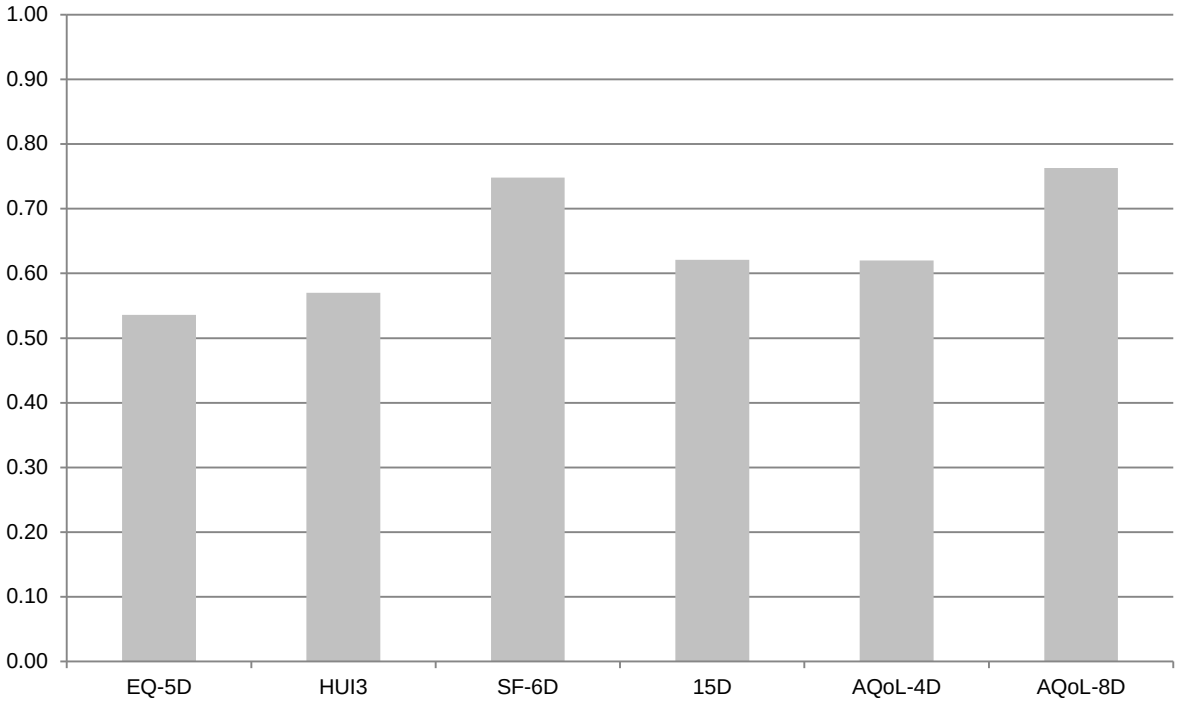


The Multi-Instrument Comparison (MIC) Study

Instrument Content

Correlation with SF-36 Mental Component Summary (MCS)
(total, n=1,269):

SF-6D and AQoL-8 are relatively more sensitive to psychosocial health.



The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Split Half Analysis (total, n=1,269):
Comparison of two split halves of the full sample.

Each MAU was used, in turn, to rank observations on the basis of which they were divided into a top and bottom half. Scores were calculated for both halves. The table reports the ratio of these scores.
Higher ratios indicate greater sensitivity of an instrument to a dimension.

Ranking MAUI	SF-36 dimensions									
	GH	PF	RP	BP	VT	SF	RE	MH	PCS	MCS
EQ5D	1.64	1.52	3.16	1.78	1.68	1.46	2.41	1.41	1.38	1.31
HUI3	1.57	1.44	2.67	1.62	1.65	1.47	2.19	1.43	1.31	1.33
SF-6D	1.62	1.46	3.94	1.70	1.85	1.68	3.68	1.53	1.32	1.49
15D	1.69	1.50	3.21	1.66	1.80	1.50	2.53	1.45	1.35	1.36
AQoL-4D	1.63	1.44	2.77	1.61	1.70	1.51	2.35	1.45	1.31	1.36
AQoL-8D	1.63	1.38	2.59	1.56	1.86	1.55	2.63	1.56	1.25	1.46

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health; PCS =physical component summary; MCS = mental component summary.

Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Simple Regressions
(total, n=1,269)

Sensitivity to SF-36 dimensions:
Beta coefficients and R^2
from regression of MAU-I
on single dimensions of the **SF-36**.

[MAU = a + b Dim]

(SF-36 dimension)	EQ-5D	HUI3	SF-6D	15D	AQoL-4D	AQoL-8D
(GH) Beta	0.65	0.59	0.69	0.68	0.61	0.65
R^2	0.42	0.35	0.47	0.46	0.38	0.42
(PF) Beta	0.73	0.66	0.67	0.72	0.62	0.59
R^2	0.53	0.44	0.45	0.52	0.39	0.35
(RP) Beta	0.62	0.57	0.75	0.64	0.57	0.57
R^2	0.39	0.33	0.56	0.41	0.33	0.33
(BP) Beta	0.76	0.65	0.75	0.66	0.62	0.63
R^2	0.58	0.42	0.56	0.43	0.38	0.40
(VT) Beta	0.65	0.61	0.78	0.71	0.65	0.77
R^2	0.43	0.37	0.61	0.50	0.43	0.60
(SF) Beta	0.64	0.63	0.80	0.67	0.69	0.73
R^2	0.41	0.40	0.64	0.46	0.47	0.54
(RE) Beta	0.56	0.56	0.74	0.62	0.58	0.66
R^2	0.31	0.31	0.55	0.39	0.33	0.44
(MH) Beta	0.62	0.65	0.77	0.68	0.67	0.82
R^2	0.39	0.42	0.59	0.47	0.45	0.66
(PCS) Beta	**0.71**	**0.59**	**0.66**	**0.65**	**0.57**	**0.51**
R^2	0.50	0.35	0.43	0.42	0.32	0.26
(MCS) Beta	**0.54**	**0.57**	**0.75**	**0.62**	**0.62**	**0.76**
R^2	0.29	0.33	0.56	0.39	0.38	0.58

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health; PCS =physical component summary; MCS = mental component summary.

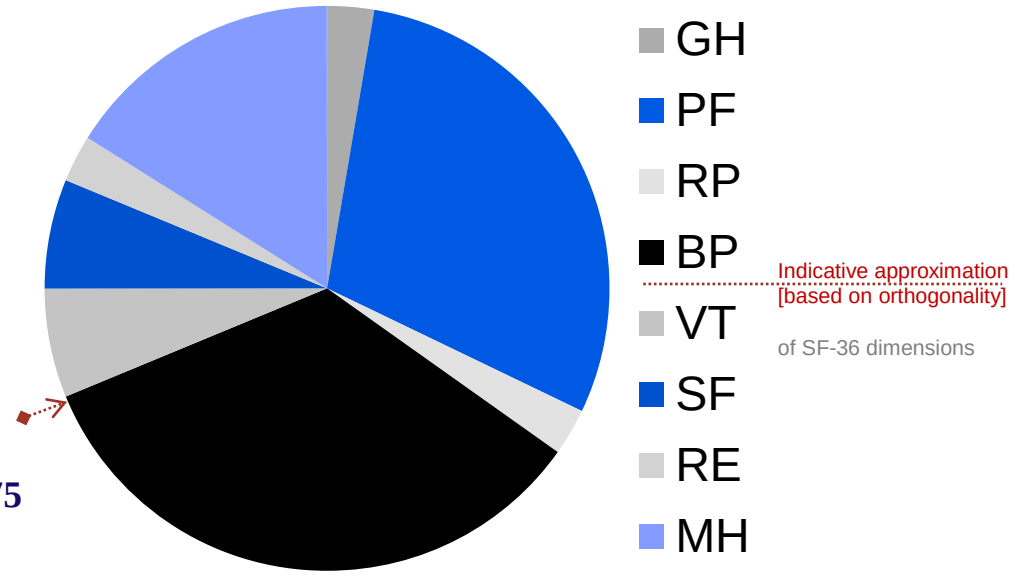
Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Multiple Regression (total, n=1,269):

EQ-5D content disaggregated by SF-36 dimensions.



Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health

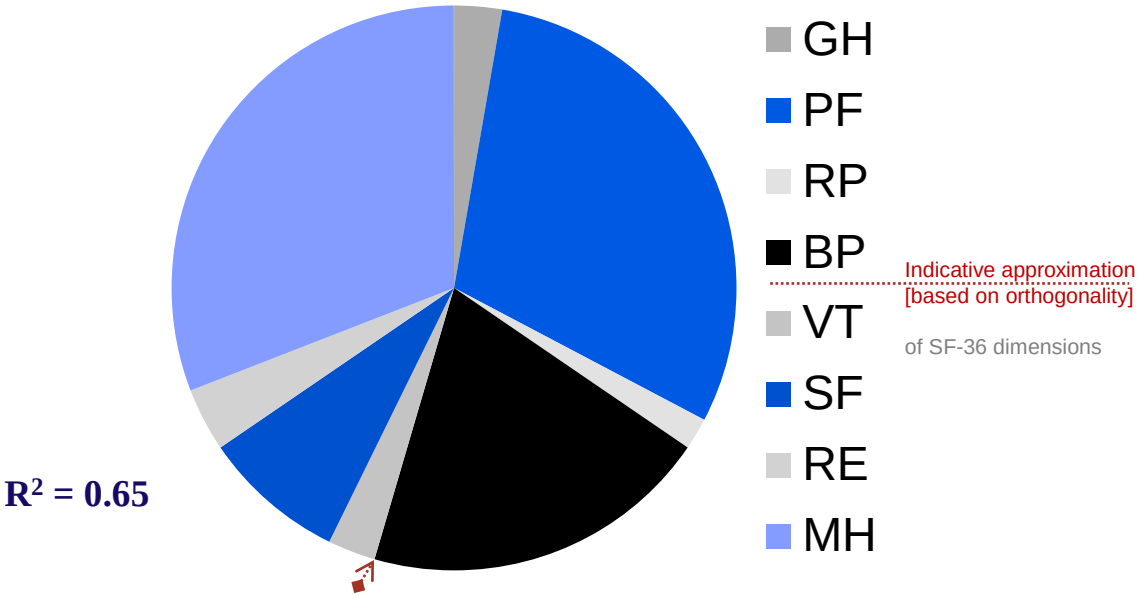
Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Multiple Regression (total, n=1,269):

HUI 3 content disaggregated by SF-36 dimensions.



$R^2 = 0.65$

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health

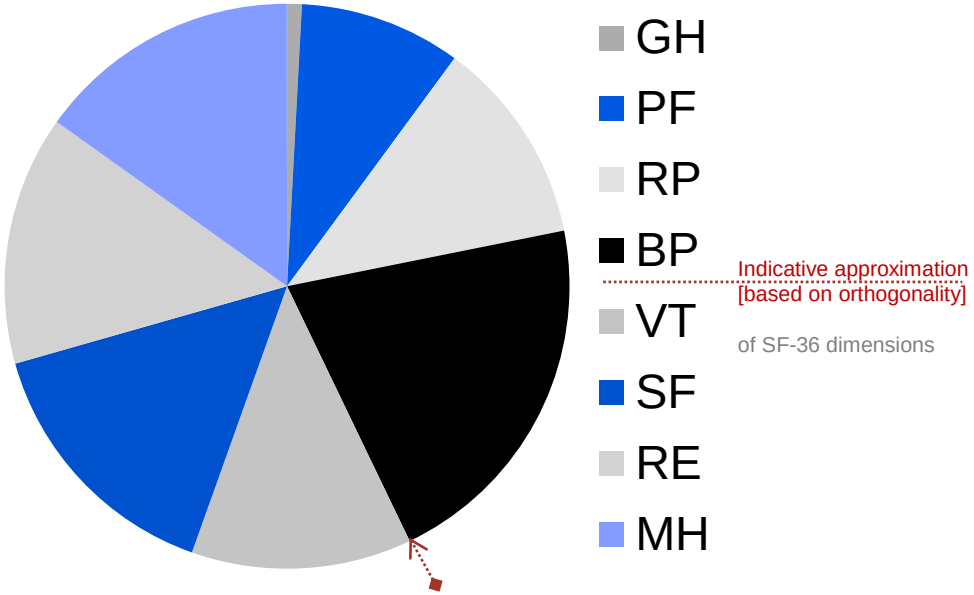
Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Multiple Regression (total, n=1,269):

SF-6D content disaggregated by SF-36 dimensions.



$R^2 = 0.89$

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health

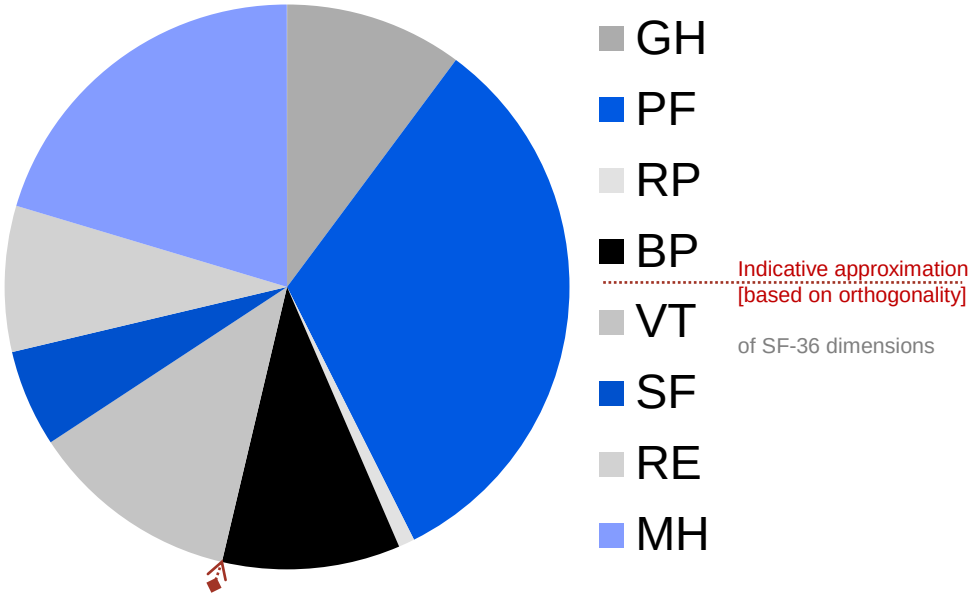
Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Multiple Regression (total, n=1,269):

15D content disaggregated by SF-36 dimensions.



$R^2 = 0.75$

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health

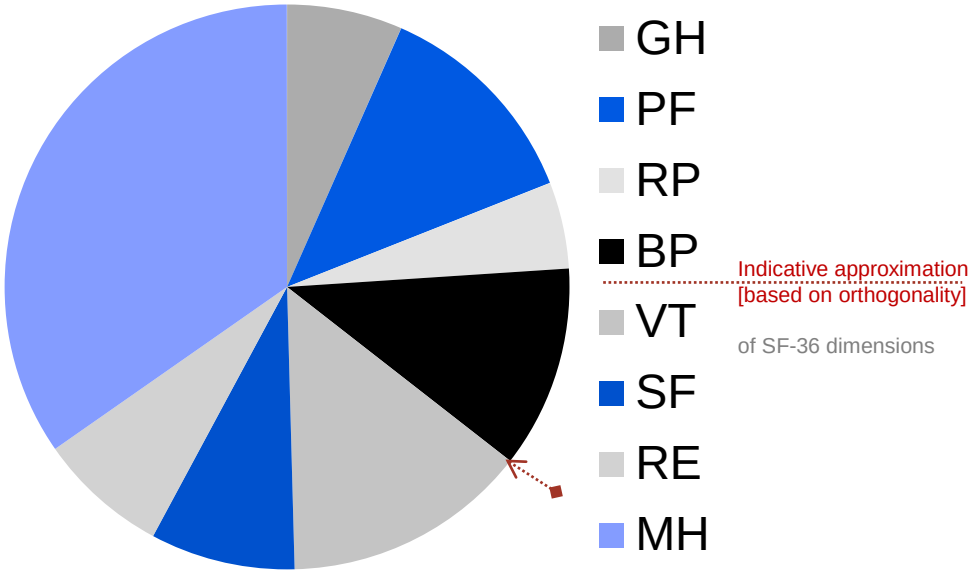
Measuring Health-Related Quality of Life

The Multi-Instrument Comparison (MIC) Study

Instrument Sensitivity

Multiple Regression (total, n=1,269):

AQoL-8D content disaggregated by SF-36 dimensions.



$R^2 = 0.79$

Legend: GH=general health; PF = physical functioning; RP = role limit physical; BP = bodily pain; VT = vitality; SF = social functioning; RE = role limit emotional; MH = mental health

The Multi-Instrument Comparison (MIC) Study

Some Implications

- To the best of our knowledge, the MIC Study probably offers the most comprehensive comparison of MAU instruments done in Germany to date.
- **Differences between MAU instruments**
  - in constructs and descriptive systems
  - necessarily lead to differences in utility values.
- **Particularly large differences between MAU instruments**
  - are related to their psychosocial content
  - may have a strong differential impact on health economic evaluations of services by therapeutic area / dimensions of impairment.
- **Incremental utilities differ between MAU instruments**
  - form the basis of conventional cost effectiveness (“utility”) analysis
  - but may vary by up to 100 percent between MAU instruments
  - according to our geometric mean regression analyses.
- **Further analyses**, cross-walks and disease-specific mapping studies as well as comparisons with other instruments (ICECAP, social well-being), will be undertaken.

M. Schlander, M.A. Khan, A. Iezzi, A. Maxwell, Oliver Schwarz, J. Richardson: *Multi-Attribute Utility (MAU) Instruments as Tools to Value Health-Related Quality of Life (HRQoL)*, Hamburg, July 16, 2016.

Elements of a Research Program

German Patient Preferences for Health States: Multi-Instrument Comparison (MIC)

- **Cross-walks between generic preference-based HRQoL instruments**:
  - 15D
  - AQoL
  - EQ-5D-5L
  - HUI-3
  - SF-6D
- **Mapping of disease-specific to preference-based generic HRQoL instruments:**
  - Arthritis: AIMS2-SF
  - Asthma: AQLQ
  - Cancer: QLQ C-30
  - Depression: K10
  - Diabetes: Diabetes-39
  - Hearing Loss: APHAB
  - Cardiovascular / Heart Disease: MacNew Instrument
- **Relationship between HRQoL and social well-being & capability instruments**
- **Using Item-Response Theory (IRT) as an analytical tool**

Elements of a Research Program

German Patient Preferences for Health States: Multi-Instrument Comparison (MIC)

- **Grant Application to German Innovation Fund** (February 2018):
  - Cross-walk and mapping studies
  - Health economics research team at DKFZ
  - International expert panel:
    - Prof. Paula Lorgelly (Office of Health Economics, London, England)
    - Prof. Jan Abel Olsen (University of Tromsø, Norway)
    - Prof. Jeffrey Richardson (Monash University, Melbourne, Australia)
  - Stakeholder involvement (three workshops with policy makers)
- **Plan 2019-2021**:

	Projektphase I								Projektphase II			
	Jahr 1				Jahr 2				Jahr 3			
	Q 01	Q 02	Q 03	Q 04	Q 05	Q 06	Q 07	Q 08	Q 09	Q 10	Q 11	Q 12
Analysen 1	Cross-Walk-Analysen (EQ-5D, SF-6D. AQoL, HUI-3. 15-D sowie SF-36 und TTO)											
Reporting												
Analysen 2	Mapping-Analysen (krankheitsspezifische LQ-Instrumente und MAU-I's)											
Reporting												
Expert Panel	Δ (F2F)		Δ (TC)		Δ (F2F)		Δ (TC)	Δ (F2F)		Δ	Δ	Δ
Stakeholder-Workshops										Δ	Δ	Δ
Meilensteine				Δ				Δ				Δ
				Status Bericht / Interim Report				Abschlussbericht (Entwurf)				Abschlussbericht (final)

Thank You for Your Attention!

For further information, please refer to www.dkfz.de

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