Psychometric performance of EQ-HWB for Japanese populations

Shinichi Noto [a], Shinya Saito[b], Takeru Shiroiwa[c]

a. Department of Rehabilitation, Niigata University of Health and Welfare, Niigata, Japan
b. Okayama University, Okayama, Japan
c. National Institute of Public Health, Wako, Saitama,Japan

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BACKGROUND:

The EQ-5D-5L is recommended as a health-related QOL assessment tool in cost-effectiveness analyses of health technologies conducted in many countries. However, as noted in a paper by Brazier et al. (2017), the EQ-5D-5L does not possess sufficient discriminative sensitivity for all diseases. Specifically, regarding respiratory diseases, the paper raises questions about the performance of the EQ-5D-5L, categorizing them as “problematic conditions.”

OBJECTIVE:

To evaluate the psychometric performance of the EQ-HWB and its short version, EQ-HWB-9, developed for use in economic evaluations across health, welfare, and public health, in a Japanese population.

METHODS:

Using EQ-HWB, we conducted an internet survey targeting general residents nationwide in Japan using resident registration data. We examined EQ-HWB for ceiling effects, convergence, and discriminant validity. Additionally, for EQ-HWB-9, we calculated utility values using the hybrid Tobit model proposed by Mukuria et al. (2023) and investigated known-population validity based on the presence or absence of comorbidities.

Statistical Analysis:

We examined the level distribution for each EQ-HWB item. Furthermore, we calculated utility values using the hybrid model developed by Mukuria et al. (2023). Additionally, after adjusting for socio-demographic characteristics, we investigated the impact of comorbidities using multiple regression analysis. Statistical analyses were performed using STATA 19.0.

RESULTS:

After excluding responses with incomplete data, 5,177 participants were included in the analysis. For the EQ-HWB single-level summary score, the reverse-scored items “Accepted,” “Feeling good,” and “Do things wanted to do” had higher means of 2.77, 2.84, and 3.04, respectively, and were negatively correlated with the other items. In the EQ-HWB-9, 909 respondents reported the health state “111111111,” yielding a ceiling effect of 17.6 %. The mean utility score was 0.868 ± 0.159. As shown in Table 4, the results of the multiple regression analysis indicate that obesity, depression, dementia, COPD, arthritis, and a history of fractures significantly reduced utility values.

DISCUSSIONS:

This study is significant as it verified the utility and discriminant validity of the EQ-HWB using a large-scale sample of Japanese individuals. The EQ-HWB-9 ceiling effect was 17.6%, which, while not high, represented a certain proportion. Regarding individual items, it appears that respondents' confusion was reflected in the results for reverse-scored items. Furthermore, regarding utility values, a history of major illnesses was indicated as a factor contributing to their decline, suggesting that the objective of measuring Wellbeing was achieved.

Table1. Socio-demographic characteristics of respondents

	N	%
Age		
20-29	656	12.7
30-39	748	14.4
40-49	977	18.8
50-59	987	19.1
60-69	857	16.6
≥70	952	18.4
Sex		
Male	2559	49.4
Female	2618	50.6
Region		
Hokkaido	224	4.3
Tohoku	355	6.8
Kanto	312	6.0
Keihin	1544	29.8
Hokuriku	288	5.6
Tokai	606	11.7
Keihanshin	835	16.2
Chugoku	288	5.6
Shikoku	160	3.1
Kyushu	565	11.0
Education		
Elementary or junior hige school	121	2.4
High school	1719	33.3
College	622	12.0
Junior college	521	9.9
University	1999	38.7
Graduate	188	3.6
Others	7	0.1
Employment		
Full-time worker	2012	32.2
Part-time worker	346	6.7
Self-employed or manager	794	15.3
Housemaker	336	6.5
Retired	1066	20.6
Student	770	14.9
Others	114	2.2
Marital status		
Unmarried	1705	31.8
Married	3096	57.7
Divorced/bereaved	567	10.6
Household Income (JPY 10,000)		
<100	199	4.0
100-200	386	7.6
200-300	569	11.0
300-400	619	11.9
400-500	591	11.4
500-700	780	15.2
700-1000	636	12.1
1000-1500	322	6.2
1500-2000	46	0.9
>2000	37	0.7

Table 2. Distribution of EQ-HWB responses by levels

	N (%)	N (%)	N (%)	N (%)	N (%)
	No difficulty	Slight difficulty	Some difficulty	Much difficulty	Unable
See	3192 (61.7)	1264 (24.4)	721 (13.9)	0 (0.0)	0 (0.0)
Hear	4432 (85.6)	486 (9.4)	231 (4.5)	22 (0.4)	6 (0.1)
Getting around inside and outside*	4604 (88.9)	349 (6.7)	167 (3.2)	48 (0.9)	9 (0.2)
Day-to-day activities*	4426 (85.5)	477 (9.2)	199 (3.8)	57 (1.1)	18 (0.4)
Personal care	4702 (90.8)	288 (5.6)	139 (2.7)	36 (0.7)	12 (0.2)
	None of the time	Only occasionally	Sometimes	Often	Most of the time
Sleep	2647 (51.1)	1455 (28.1)	660 (12.8)	287 (5.5)	128 (2.5)
Exhausted*	2394 (46.2)	1571 (30.3)	691 (13.4)	380 (7.3)	141 (2.7)
Lonely*	3478 (67.8)	918 (17.7)	475 (9.2)	195 (3.8)	111 (2.1)
Unsupported	3830 (74.0)	697 (13.5)	340 (6.6)	188 (3.6)	122 (2.4)
Remembering	3228 (62.4)	1236 (23.9)	454 (8.8)	173 (3.3)	86 (1.7)
Concentrating/thinking clearly*	3784 (73.1)	857 (16.6)	361 (7.0)	124 (2.4)	51 (1.0)
Anxious*	2980 (57.6)	1190 (23.0)	518 (10.0)	311 (6.0)	178 (3.4)
Unsafe	4316 (83.4)	566 (11.0)	187 (3.6)	62 (1.2)	46 (0.9)
Frustrated	2372 (45.8)	1591 (30.7)	708 (16.7)	342 (6.6)	164 (3.2)
Depressed*	2997 (57.9)	1269 (24.5)	520 (10.0)	246 (4.8)	145 (2.8)
Look Forward	3408 (65.8)	966 (18.7)	413 (8.0)	229 (4.4)	161 (3.1)
Control*	3169 (61.2)	1169 (22.6)	470(9.1)	226 (4.4)	143 (2.8)
Cope	3608 (70.0)	891 (17.2)	387 (7.5)	181 (3.5)	110 (2.1)
Accepted †	766 (14.8)	1120 (21.6)	989 (19.1)	802 (15.5)	1500 (29.0)
Feel good †	638 (12.3)	1196 (23.1)	1264 (24.4)	933 (18.0)	1146 (22.1)
Do things wanted to do †	665 (12.9)	1399 (27.0)	1395 (27.0)	969 (18.7)	749 (14.5)
Pain (frequency)	1792 (34.6)	1737 (33.6)	986 (19.1)	420 (8.1)	242 (4.7)
	No	Mild	Moderate	Severe	Very severe
Pain (severity)*	1852 (35.8)	2528 (48.8)	671 (13.0)	101 (2.0)	25 (0.5)
	None of the time	Only occasionally	Sometimes	Often	Most of the time
Discomfort (frequency)	2475 (47.8)	1724 (33.3)	643 (12.4)	239 (4.6)	96 (1.9)
	No	Mild	Moderate	Severe	Very severe
Discomfort (severity)	2389 (46.2)	2163 (41.8)	514 (10.0)	82 (1.6)	29 (0.6)

EQ-HWB indicates EQ Health and Well-being; EQ-HWB-S, EQ Health and Well-being Short.
*Part of the E-HWB-9. † Reverse coded for summary score.

Fig 1. Distribution of Disutility by Dimension

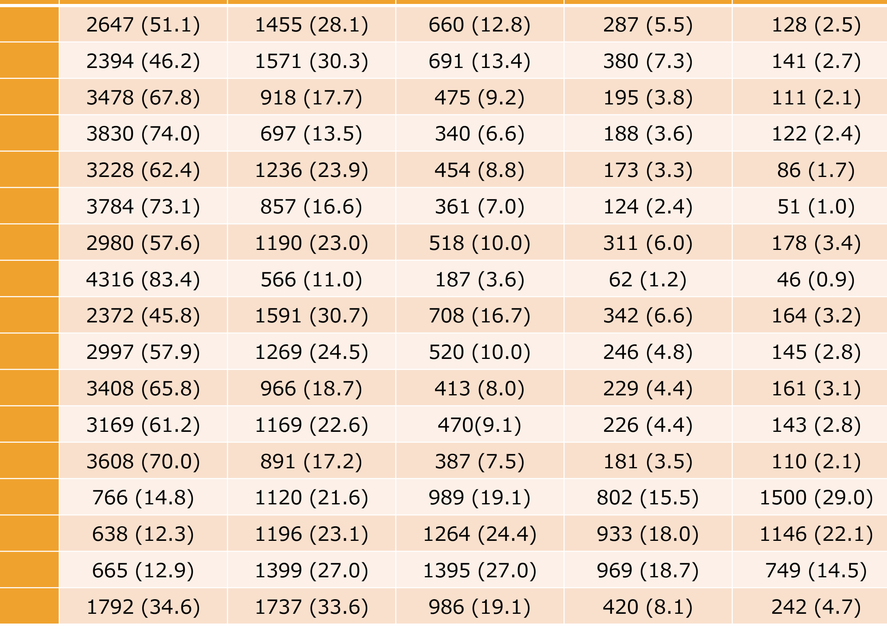

Table 3. Disutility by dimension and overall utility value

	Mean	Std. dev.
Mobility	-0.0075	0.0231
Activity	-0.0085	0.0249
Exhausted	-0.0164	0.0209
Lonely	-0.0148	0.0282
Cognition	-0.0035	0.0108
Anxiety	-0.0145	0.0229
Saddness	-0.0212	0.0366
Control	-0.0100	0.0213
Pain	-0.0357	0.0474
Utility	**0.8675**	**0.1591**

Table 4. Relation between utilities and diseases and symptoms

	Coefficient	P	95% conf. interval	
Sex	-0.2216	**0.000**	-0.2573	-0.1859
Age	0.0324	**0.000**	0.0271	0.0377
Dibetes (n=224)	-0.0213	0.068	-0.0442	0.0015
Obesity (n=33)	-0.0894	0.002	-0.1458	-0.0329
Dyslipidemia (n=301)	0.0138	0.185	-0.0066	0.0342
Thyroid disease (n=77)	-0.0178	0.345	-0.0548	0.0192
Depression (n=248)	-0.1265	**0.000**	-0.1489	-0.1040
Dementia (n=5)	-0.1473	**0.048**	-0.2934	-0.0012
Parkinsons disease (n=6)	-0.1682	**0.012**	-0.2995	-0.0369
Eye diseases (n=280)	0.0046	0.658	-0.0160	0.0253
Ear diseases (n=36)	-0.0322	0.236	-0.0854	0.0210
Hypertension (n=538)	-0.0044	0.605	-0.0213	0.0124
Stroke (n=32)	-0.0456	0.118	-0.1030	0.0116
Angina, Myocardial infarction (n=67)	-0.0406	**0.045**	-0.0804	-0.0008
Allergic rhinitis (n=111)	-0.0350	**0.030**	-0.0666	-0.0033
COPD (n=11)	-0.1556	**0.001**	-0.2515	-0.0598
Asthma (n=73)	-0.0375	0.052	-0.0753	0.0002
Stomach and duodenal diseases (n=65)	-0.0213	0.294	-0.0611	0.0185
Liver and gallbladder diseases (n=21)	-0.0830	**0.020**	-0.1528	-0.0132
Dental diseases (n=353)	-0.0054	0.564	-0.0240	0.0130
Atopic dermatitis (n=83)	0.0264	0.151	-0.0096	0.0625
Gout (n=57)	-0.0283	0.194	-0.0711	0.0144
Rheumatoid arthritis (n=28)	-0.0098	0.748	-0.0699	0.0502
Arthritis (n=86)	-0.0745	**0.000**	-0.1095	-0.0394
Shoulder stiffness (n=103)	-0.0237	0.176	-0.0581	0.0106
Lower backpain (n=177)	-0.0840	**0.000**	-0.1106	-0.0574
Osteoporosis (n=90)	-0.0374	**0.037**	-0.0726	-0.0022
Kidney disease (n=39)	-0.0092	0.725	-0.0606	0.0421
Benign prostatic hyperplasia (48)	0.0078	0.746	-0.0394	0.0550
Fractures (n=30)	-0.1686	**0.000**	-0.2265	-0.1107
Anemia and blood disorders (n=28)	-0.0569	0.065	-0.1174	0.0036
Cancer (n=60)	-0.0306	0.149	-0.0722	0.0110