Determination of the Ideal Number of Response Levels for the EQ-5D as a US Population Health Measure

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Objectives

- The expansion in descriptive system from the EQ-5D-3L (3L) to the EQ-5D-5L (5L) was largely motivated by an interest in greater discriminative ability as a measure of health[1]. However, the adequacy of the 5L descriptive system in the context of a population health measure has received limited attention.
- The primary aim of this study is **to examine the usefulness of 5 - levels as a measure of population health and evaluate other variations in the number of response levels in terms of scale efficiency.**

Methods

- We analyzed data from the 2017 US EQ-5D-5L valuation study[2].
- In addition to valuation tasks, respondents self-reported their health using the 5L, 3L, and dimension specific VAS rating scales with 101 response levels (101L), where 0 represents extreme problems and 100 represents no problems).
- For each level of each EQ-5D dimension, mean VAS ratings were calculated to gain insight into how respondents self-calibrated their dimension-specific health on a more granular scale. Mean differences in VAS ratings were calculated between adjacent levels, including a level comprised of combined level 4 and 5 responses (4L).
- Descriptive richness was characterized by Shannon's index (H'; a measure of informativity) and Shannon's evenness index (J'; a measure of descriptive efficiency, controlling for number of levels)[3-5] across variations on the number of EQ-5D response levels, including the 101L, 5L, 4L, and 3L.

* Combined level 4 and 5 responses of the EQ-5D-5L

Results

Figure 1: Example Dimension-Specific VAS Rating Task

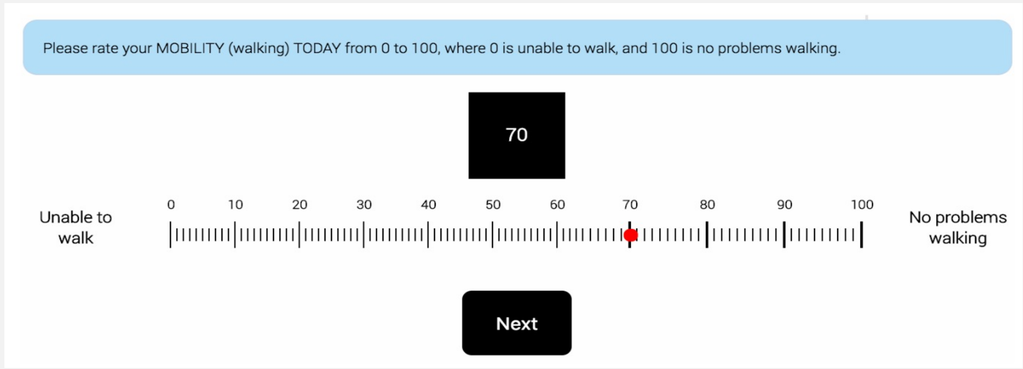
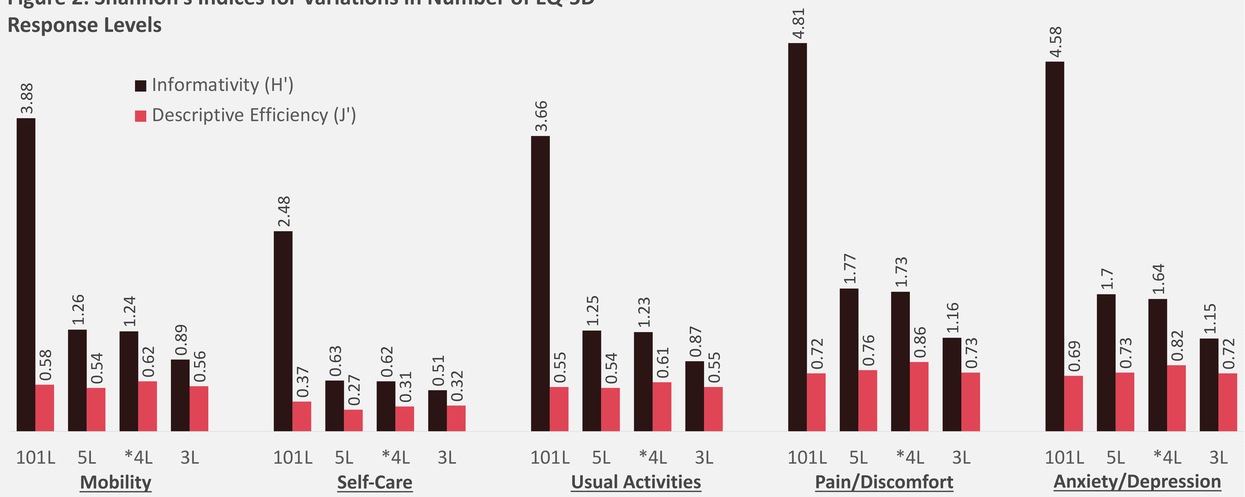


Figure 2: Shannon's Indices for Variations in Number of EQ-5D Response Levels



*The dataset included a total of 3151 participants, with data collected in-person (n=1133) or online (n=2018) using quota sampling based on age, sex, and race/ethnicity. There was poor differentiation between EQ-5D-5L level 4 and 5 responses when calibrated to the VAS. Only anxiety/depression demonstrated a substantial difference in mean VAS scores between levels 4 and 5 (**Table 1**). Averaged across all EQ-5D-5L dimensions, mean (SD) VAS ratings by levels 1/2/3/4/5 were 95.5 (11.1), 79.4 (19.0), 63.4 (23.4), 47.6 (27.6), 48.1 (33.6), respectively; a consistent mean difference of approximately 16 between levels 1/2, 2/3, 3/4, but minimal difference between 4/5. Across dimensions, descriptive efficiency (J') increased when combining EQ-5D-5L levels 4 and 5 into a 4-level (4L) system, with only marginal reductions in informativity (H') (**Figure 2**).*

Table 1: Dimension Specific VAS Ratings by EQ-5D Level

EQ-5D-5L Response Level	VAS Rating [Mean (SD)]	Number of Respondents
Mobility		
1	96.2 (9.0)	2236
2	79.6 (16.8)	569
3	63.7 (21.7)	251
4	43.8 (25.4)	73
5	44.1 (42.4)	22
4+5	43.9 (29.9)	95
Self-Care		
1	97.7 (7.6)	2815
2	75.8 (20.6)	215
3	69.6 (21.0)	89
4	58.4 (33.3)	20
5	68.0 (33.4)	12
4+5	62.0 (33.2)	32
Usual Activities		
1	96.1 (8.9)	2242
2	81.9 (17.7)	563
3	62.5 (24.6)	267
4	45.8 (30.4)	62
5	62.2 (27.6)	17
4+5	49.3 (30.4)	79
Pain/Discomfort		
1	94.3 (13.7)	1304
2	82.4 (18.5)	1134
3	61.5 (23.1)	534
4	43.1 (26.3)	143
5	39.9 (33.0)	36
4+5	42.5 (27.7)	179
Anxiety/Depression		
1	93.0 (17.4)	1685
2	77.5 (21.5)	796
3	59.8 (24.2)	480
4	47.0 (27.8)	124
5	26.4 (32.1)	66
4+5	39.9 (30.9)	190

Conclusions

- US general population **respondents poorly differentiate between levels 4 and 5 when anchoring on an independent VAS scale** for all dimensions except anxiety/depression.
- Compared to the 5L or 3L, **a system with 4 levels of response may be more optimal when considering the equipoise of descriptive richness and efficiency.** These findings may be related to the specific choice of labels for the 5L system (severe vs extreme).
- The generalizability **of these results could be considered in other settings and populations to inform future development of measures**.

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1. Herdman M, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Qual Life Res*. 2011;20(10):1727-1736.
2. Pickard, A.S., et al., *United States Valuation of EQ-5D-5L Health States Using an International Protocol.* Value Health, 2019;22(8):931-941.
3. Bas Janssen MF, et al. Evaluating the discriminatory power of EQ-5D, HUI2 and HUI3 in a US general population survey using Shannon's indices. *Qual Life Res*. 2007;16(5):895-904.
4. Pickard AS, et al. Psychometric comparison of the standard EQ-5D to a 5 level version in cancer patients. *Med Care*. 2007;45(3):259-263.
5. Janssen MF, et al. Measurement properties of the EQ-5D-5L compared to the EQ-5D-3L across eight patient groups: a multi-country study. *Qual Life Res*. 2013;22(7):1717-1727.