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EQ-5D value set based scaling factor models for estimating value sets for EQ-PSO bolt-ons

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Background

- EQ-5D sometimes lacks sensitivity for condition-specific aspects (e.g., psoriasis).
- EQ-PSO bolt-on adds itching and self-confidence items.
- Full valuation studies for bolt-ons are costly; scaling factor model (SFM) offers an efficient alternative.

Study Aim

- To test the feasibility and performance of the scaling factor model in valuing the EQ-PSO bolt-on in China.

Methods

- **Sample**: 401 adults in China (representative, face-to-face cTTO).
- **Design**: EQ-7D health states (EQ-5D + itchness + self-confidence), orthogonal design with 25 states + 7 mild + pits.
- **Models**: Standalone cTTO model; Scaling factor model using old Chinese value set; Scaling factor model using new Chinese value set
- **Validation**: by-state cross-validation; CCC, MAE, RMSE.

Table 1. Demographic information of the Chinese sample

TTO sample, N=401, n, %			
Sex	Male	206	51.37
	Female	195	48.63
Residency	Urban	255	63.59
	Rural	146	36.41
Age group	20-29	63	15.71
	30-39	82	20.45
	40-49	76	18.95
	50-59	83	20.7
	>60	97	24.19
Education	Low	102	25.44
	Middle	224	55.86
	High	75	18.7
Ethnicity	Han	377	94.01
	Minority	24	5.99
Working status	Employed	223	55.61
	Retired	43	10.72
	Student	44	10.97
	Farmer	57	14.21
	Others	34	8.48
Health Insurance status	Employee insurance	132	32.92
	Resident insurance	270	67.33
	Commercial insurance	61	15.21
	Other insurance	11	2.74
	No insurance	1	0.25
Health condition	No	279	69.58
	1 condition	81	20.2
	more than 2 conditions	41	10.21
Marriage status	Single	72	17.96
	Married or live together	306	76.31
	Divorced or separated	14	3.49
	Widowed	9	2.24
Household income (monthly, RMB)	<=5000	43	10.72
	5001-8000	116	28.93
	8001-12000	92	22.94
	12001-20000	63	15.71
	>20000	29	7.23
	Prefer not to say	58	14.46

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Results

- **Sample characteristics**:： A total of 401 participants completed face-to-face interviews across five provinces in China.
- The sample was broadly representative in terms of sex, age, residence, and education.
- **Model performance**： Standalone model achieved the highest prediction accuracy (RMSE = 0.059; MAE = 0.044; CCC = 0.988).Scaling factor model (new Chinese value set) produced very similar results (RMSE = 0.066; MAE = 0.048; CCC = 0.985), meeting the study criterion of acceptable performance (<20% difference from standalone).Scaling factor model (old Chinese value set) performed less well (RMSE = 0.098; MAE = 0.083; CCC = 0.968).
- **Scale parameter** (λ)： New value set: λ = 0.948 (<1), consistent with the compression effect, where coefficients of the core five EQ-5D dimensions shrink after adding the EQ-PSO bolt-on. Old value set: λ = 1.046 (>1), suggesting an inflation effect, i.e., larger coefficients after adding the bolt-on.
- **Dimension importance**： In the standalone model, itching (IT) was more important than anxiety/depression (AD). Self-confidence (CO) consistently had the smallest weight. Relative to the core dimensions, pain/discomfort (PD) remained dominant across models.
- **Worst health state prediction (5555555)**： Standalone: –0.808； Scaling factor (new set): –0.787； Scaling factor (old set): –0.698.

Table 2. Modelling results of the EQ-PSO data

	f10TTO	f10ScaleTTOnew 2024	f10ScaleTTOold 2012
INTERCEPT6D	0.035	-0.035	-0.060
SCALE	/	0.948	1.046
MO	0.309	0.299	0.345
SC	0.242	0.241	0.253
UA	0.243	0.279	0.233
PD	0.447	0.447	0.302
AD	0.200	0.289	0.258
IT	0.225	0.238	0.211
CO	0.108	0.110	0.093
L2	0.090	0.110	0.191
L3	0.307	0.356	0.458
L4	0.773	0.704	0.832
Model performance			
MAE	0.044	0.048	0.083

Conclusions

- The scaling factor model (SFM) performed similarly to the standalone model when anchored to the new Chinese value set, confirming its robustness.
- The difference in results between the new vs. old Chinese value sets highlights how updates in national value sets influence bolt-on valuation outcomes.
- The compression effect (λ < 1) was again observed, consistent with previous bolt-on studies (vision, cognition).Overlap between bolt-ons and core dimensions (e.g., itch vs. pain/discomfort) can reduce the weight of some core dimensions, but SFM still produced valid estimates.
- Using SFM avoids inconsistencies in the core EQ-5D dimension weights that may arise with standalone bolt-on value sets.