Is there a shelf life for EQ-5D value sets: evidence of evolving health preferences towards EQ-5D-5L

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Abstract

Objectives

To compare TTO values and value sets based on them between recent and early EQ-5D-5L value set studies.

Methods

Data from early and recent EQ-5D-5L value set studies in China and Singapore were analyzed. The early Chinese study was conducted in 2012 (N=1271), and the recent one in 2023 (N=1206). The early Singaporean study was conducted in 2014-2015 (N=1000), and the recent one in 2023-2024 (N=500). Health preference was measured by composite time trade-off (cTTO). We compared the cTTO data from early and recent studies within each country, in terms of value distribution, mean values for each health state, logical consistency, and resultant value sets.

Results

In Chinese studies, respondents were similar in sex but differed in age, education, and residency. The recent study showed higher proportion of 1 value (8.35% vs 2.88%), higher mean observed values for mild states (p-value<0.05), and lower logical inconsistency rate (1.53% vs 4.78%, p-value<0.001). Model predicted values from the recent study were higher for mild states (p-value<0.05) and lower for severe states (p-value<0.05), with the value range widened from (-0.339, 0.881) to (-0.541, 0.967). The rank order of five dimensional disutility changed from mobility (0.303) > pain/discomfort (0.268) > anxiety/depression (0.224) > self-care (0.222) > usual activities (0.204) of the early study to pain/discomfort (0.425) > anxiety/depression (0.301) > mobility (0.289) > usual activities (0.252) > self-care (0.241).

In Singaporean studies, respondents were similar in sex and ethnicity but differed in age and education. The recent study showed higher proportion of 1 value (15.03% vs 9.48%) and lower proportion of -1 value (14.73% vs 22.20%), higher mean observed values for mild and moderate states (p-value<0.05), and comparable logical inconsistency rates. Model predicted values from the updated study were higher for mild and moderate states (p-value<0.05), with the value range widened from (-0.569, 0.823) to (-0.653, 0.960). The rank order of five dimensional disutility changed from anxiety/depression (0.318) > pain/discomfort (0.310) > mobility (0.291) > self-care (0.259) > usual activities (0.214) of the early study to pain/discomfort (0.445) > anxiety/depression (0.365) > mobility (0.304) > self-care (0.250) = usual activities (0.250).

Conclusion

In both China and Singapore, the cTTO values from the recent EQ-5D-5L valuation studies and the value sets based on them differed from those derived from early studies, suggesting the evolving of the general public's health preferences.

Introduction

Value sets for preference-based measures, which represents a set of utility values for all possible health states defined by the measure's descriptive system, play a critical role in informing healthcare decisions across a variety of settings and applications. These value sets are primarily applied in two key areas [1]. First, they are used as quality adjustment weights in the calculation of quality-adjusted life years (QALYs) for cost-utility analysis in health technology assessment (HTA). Second, they serve as a means of summarizing health-related quality of life (HRQoL) profile data into a single index for statistical analysis in non-QALY applications, such as population health studies and patient condition studies.

EQ-5D is one of the most widely used preference-based measures [2]. It assesses health status across five dimensions: mobility (MO), self-care (SC), usual activities (UA), pain/discomfort (PD), and anxiety/depression (AD) [3]. EQ-5D value sets are typically generated by using standardized EuroQol Valuation Technology (EQ-VT) protocols to elicit preferences from representative general population samples within specific countries or regions. Over the years, many countries have established their country-specific value sets for different versions of the EQ-5D. As of January of 2025, EQ-5D-3L and EQ-5D-5L value sets are available for 36 countries/regions, and EQ-5D-Y-3L value sets have been developed for 9 countries/regions [4].

After their initial development, many EQ-5D value sets have remained in use for over a decade. There are growing concerns regarding the continued validity and relevance of these existing values sets in contemporary context [1, 5]. One of the major concerns is that population composition might have changed significantly since the time of original data collection, due to demographic changes such as aging populations and urbanization. Moreover, cultural and societal shifts, such as increased awareness of mental health and changing attitudes toward euthanasia and end-of-life care, as well as major public health events (e.g., COVID-19 pandemic) may result in changes in society's health preferences. Beyond the shifts in population composition and societal preference, refinements and advancement in valuation methodologies have also emerged. Previous research suggests that methodological elements, including EQ-VT version and quality control (QC) processes, were significantly associated with some dimension-level coefficients of value sets [6]. The importance of QC processes in ensuring interviewer adherence to protocols and enhancing overall data quality has been widely recognized [7, 8]. Earlier valuation studies that primarily relied on less rigorous methodologies may have produced value sets that are less reliable. These issues raise concerns about the shelf

life of value sets and whether earlier value sets require updating to better reflect contemporary population health preferences and methodological advancement.

With growing recognition of these issues, Norman et al. [5] have proposed a framework for identifying and evaluating whether an existing value set remains fit for purpose or requires updating. However, there has been a lack of empirical research examining whether health preferences evolve within the same country over time and how these shifts manifest in value set studies. To address this gap, this study aimed to compare time trade-off (TTO) data collected in early and recent EQ-5D-5L value set studies in China and Singapore, providing empirical insights into the potential evolution of health preferences and the necessity of periodic updates to value sets.

Methods

Data sources and study design

This study used TTO data from four EQ-5D-5L value set studies conducted in China and Singapore [9-11](**Table 1**). All four studies followed the standardized EQ-VT protocol, albeit in different versions. The EQ-VT protocol specifies the preference elicitation methods and the health states (or profiles) to be valued. It includes a computer-assisted, interviewer-administered data collection tool and an in-process QC system, ensuring methodological consistency across studies [12]. The EQ-VT version 1 faced several data quality issues, including high rates of inconsistent values, value clustering, and low values for mild health states. The EQ-VT version 2 addressed these concerns by improving TTO practice questions, introducing a feedback module, and implementing QC monitoring and reporting. The EQ-VT lite version was developed for use in studies where it is challenging to recruit a large general population sample.

The EQ-VT protocol uses the composite TTO (cTTO) and discrete choice experiment (DCE) techniques. In cTTO, an iterative elicitation procedure is used to determine the values of EQ-5D health states [13]. In essence, for health states considered better-than-dead (BTD), respondents identified their point of indifference between living x years in full health (Life A) and living 10 years in an impaired health state (Life B), resulting in a BTD value calculated as $x/10$. For health states perceived as worse-than-dead (WTD), the lead-time TTO approach was applied. Participants determined their indifference point between living x years in full health

(Life A) and living 10 years in full health followed by 10 years in an impaired state (Life B), leading to a WTD value computed as $(x-10)/10$.

The early Chinese EQ-5D-5L valuation study [9] was conducted in 2012 through face-to-face computer-assisted personal interviews (CAPI) in five metropolitan cities. A total of 1271 general population respondents were recruited using quota sampling based on age, sex, and education level. Following the EQ-VT 1.0 protocol, a total of 86 health states were directly valued, with each respondent valuing 10 health states using cTTO. Unlike later studies, no formal QC procedures were implemented.

The recent Chinese EQ-5D-5L valuation study [10] expanded geographic coverage and incorporated QC procedures. Data were collected in 2023 using face-to-face CAPI interviews across 15 provinces and cities, covering five geographical regions. A total of 1206 general population respondents were recruited using quota sampling based on age, sex, education level, and registered residence (rural/urban). Following the EQ-VT 2.1 protocol, 86 health states same as those included in version 1.0 were directly valued using cTTO, with each respondent valuing 10 health states.

The early Singaporean EQ-5D-5L valuation study was conducted between 2014 and 2015 using face-to-face CAPI interviews. A total of 1000 general population respondents were recruited using quota sampling based on age, sex, ethnicity, and education level [14]. The study followed the EQ-VT 1.1 protocol, with 86 health states directly valued using cTTO, and each respondent valuing 10 health states.

The recent Singaporean EQ-5D-5L valuation study [11] in 2023–2024 employed a hybrid data collection approach that combined face-to-face and video conferencing interviews. A total of 500 general population respondents were recruited using quota sampling based on age, sex, ethnicity, and education level. The study followed the EQ-VT 2.1 (Lite) protocol, with 91 health states (comprising the 86 health states from the standard EQ-VT protocol and 45555, 54555, 55455, 55545, and 55554) directly valued using cTTO, and each respondent valuing 20 health states [15].

Data analysis

Descriptive analyses were performed to examine respondent characteristics. Continuous variables were reported as mean and standard deviation (SD) and categorical variables as

frequencies and percentages. Comparisons between the early and recent value set studies were performed using chi-square tests for categorical variables and two-sample t-tests for continuous variables.

We compared the cTTO data from the early and recent value set studies, in terms of logical consistency, value distribution, mean values for health states, and dimensional disutility estimated using modelling analysis. Logical consistency was defined as a better health state having an equal or higher value than a logically worse health state. We calculated the individual logical consistency rates and percentages of respondents who provided consistent responses across all cTTO tasks. Value distributions were examined using frequency analysis and histograms.

Simple and multiple linear regression models with cTTO value as the dependent variable were used to examine differences in observed mean health state valuations between the early and recent value set studies. Following the classification method of Roudijk et al.[16], health states were categorized into mild (at most moderate problems in up to two dimensions), severe (extreme problems in at least two dimensions), and moderate (all other states excluding mild and severe states) states. Simple linear regression models were conducted across all health states, as well as separately for mild, moderate, and severe states, and for each of the 86 health states individually. Multiple linear regression models were conducted separately for mild, moderate and severe states to account for additional covariates. In the Chinese study, each multiple linear regression model included study time (early/recent), level sum scores (LSS) (as an indication of health state severity), age group, sex, and residency, along with interaction terms between study time and age group, sex and residency. In the Singaporean study, each model incorporated study time, LSS, age group, sex, and ethnicity, along with interaction terms between study time and age group, sex and ethnicity.

To investigate how dimensional disutility and value sets based on cTTO values may differ between the early and recent studies, we modeled the cTTO data using the 8-parameter cross-attribute level effects (CALE) model. The CALE model was chosen as it outperformed the 20-parameter main effects model in cross-validation analyses in numerous EQ-5D valuation studies [17-21] including the four studies used in this analysis. The models from the early and recent valuation studies were compared for the ranking of dimensional disutility (determined by the coefficient magnitude for the worst level in each dimension), the range of possible values, and the proportion of worse-than-dead (WTD) states out of the 3125 health states. Differences

in predicted values for the 3125 EQ-5D-5L health states between models of the early and recent studies were visualized using scatter plots.

The statistical significance level was set to 0.05. All statistical analyses were performed using Stata/SE 18.0 (StataCorp, College Station, TX).

Results

Chinese EQ-5D-5L value set studies

The demographic characteristics of respondents in the recent and early Chinese valuation studies were comparable in terms of sex but the recent study had a higher proportion of respondents aged ≥60, those with a primary school education, and rural residents (**Table 2 [a]**).

Compared to the early study, the mean cTTO values from the recent valuation study exhibited a higher logical consistency rate (98.47±3.61% vs 95.55±8.70%, p-value<0.001), and a greater proportion of respondents who provided consistent responses across all tasks (78.44% vs 56.18%, p-value<0.001).

The cTTO data from the recent valuation study exhibited a higher proportion of responses assigning a value of 1 (8.35% vs. 2.88%) (**Figure 1[a]**). Additionally, compared to the early study, the recent valuation study yielded higher mean observed values for mild health states (0.915 ± 0.134 vs. 0.826 ± 0.237, p-value<0.001) and lower mean observed values for severe health states (-0.177 ± 0.561 vs. -0.061 ± 0.593, p-value<0.001) (**Figure 1[b]**, **Appendix Table 1**). The coefficient estimate for the study time variable was statistically significant in the multiple regression model for mild states (0.088; 95% confidence interval [CI]: 0.066, 0.110) and for severe states (-0.086; 95% CI: -0.148, -0.024). The residency variable was statistically significant only in the model for mild states (-0.019; 95%CI: -0.033, -0.005). No interaction terms were found to be statistically significant in any of the multiple regression models.

Compared to the early study, model-predicted values from the recent valuation study were higher for mild health states and lower for severe health states (**Figure 1 [c]**), with the value range being widened from (-0.339, 0.881) to (-0.541, 0.967). The rank order of five dimensional disutility changed from MO (0.303), PD (0.268), AD (0.224), SC (0.222), UA (0.204) in the early study to PD (0.425), AD (0.301), MO (0.289), UA (0.252), and SC (0.241).

The proportion of WTD states among the 3125 possible health states increased in the recent study compared to the early study (15.20% vs 10.27%).

Singaporean EQ-5D-5L value set studies

The demographic characteristics of respondents in the recent and early Singaporean valuation studies were comparable in terms of sex and ethnicity but the recent study had a higher proportion of those aged ≥65, those with a university education or higher, and those who were single (**Table 2 [b]**).

Relative to the early study, the cTTO data from the recent valuation study exhibited similar individual logical consistency rates (97.76 ± 2.67% vs 98.09 ± 4.63%, p-value=0.140) but a significantly lower proportion of respondents who provided consistent responses across all tasks (32.60% vs 76.80%, p-value<0.001).

The cTTO data from the recent valuation study had a higher proportion of 1 value (15.03%vs 9.48%) and a lower proportion of -1 value (14.73% vs 22.20%) (**Figure 2[a]**). The recent valuation study tended to yield higher mean observed values for mild (0.901 ± 0.202 vs. 0.798 ± 0.366, p-value<0.001) and moderate health states (0.135 ± 0.671 vs. 0.047 ± 0.668, p-value=0.001) (**Figure 2[b]**, **Appendix Table 1**). The coefficient estimate for the study time variable was statistically significant in the multiple regression model for mild states (0.111; 95% CI: 0.054, 0.168) but not in the models for moderate and severe states. The age variable was significant across all three models and the ethnicity variable was significant in the models for moderate and severe states. Statistically significant interaction terms were observed for the Study time × Age ≥65 variable in the models for mild (0.123; 95% CI: 0.038, 0.207) and moderate states (0.174; 95% CI: 0.014, 0.335).

Compared to the early study, model-predicted values from the recent valuation study were higher for mild and moderate health states (**Figure 2 [c]**), and the value range widened from (-0.569, 0.823) to (-0.653, 0.960). The rank order of the five dimensional disutility changed from AD (0.318), PD (0.310), MO (0.291), SC (0.259), UA (0.214) in the early study to PD (0.445), AD (0.365), MO (0.304), SC (0.250) and UA (0.250) in the recent study. The proportion of WTD states among the 3125 possible health states decreased in the recent study compared to the early study (34.43% vs 41.86%).

Discussion

This study compared the cTTO data and the resultant value sets from recent EQ-5D-5L value set studies in China and Singapore with their respective early counterparts. The findings reveal significant differences between the recent and early studies in terms of value distribution, mean health state values, and dimensional disutility. These results suggest the potential necessity of periodically updating value sets to ensure that they remain reflective of contemporary population health preferences.

A key observation in both countries was the differences in observed health state valuations and dimensional disutility between the early and recent studies. Several factors likely contributed to these differences, including advancements in valuation technology, changes in population composition, and change in societal preferences. First, valuation method refinements have played a crucial role in improving data quality and could be a potential source for the observed differences. Earlier valuation studies, including the early Chinese and Singaporean studies, had less rigorous interviewer training and lacked formal QC processes. Previous EQ-5D-5L valuation studies using the EQ-VT 1.0 protocol exhibited high inconsistency rates and low values for mild health states [7, 12]. This was also evident in the early Chinese study, where the lack of QC measures likely resulted in higher inconsistency rates. The enhancements in interviewer training and EQ-VT protocol in the recent studies likely contributed to more extreme TTO values, namely, higher values for mild states and lower values for severe states. Indeed, value set studies using the EQ-VT protocol version 2 generally reported a larger magnitude of value set coefficient for PD compared to those using the EQ-VT protocol version 1 [6].

Second, changes in population composition could have contributed to the observed differences in health state valuations. Previous studies have shown that health preferences are associated with a variety of individual characteristics, including age, gender, ethnicity, education level, marital status, and residence [22-27]. In both China and Singapore, the demographic characteristics of study samples in the early and recent studies differed because of population aging. Additionally, the recent Chinese valuation study expanded geographic coverage and included rural residents, leading to a more representative sample compared to the earlier study. In the Chinese studies, our multiple regression analyses suggest that rural residents tended to assign lower values to mild health states compared to urban residents. This finding is consistent with previous studies by Liu et al. [23]and Liao et al. [22], which explored urban/rural differences in preferences for EQ-5D-3L and EQ-5D-5L health states, respectively. However,

a study by Zhuo et al. [28] reported that rural residents tended to assign higher values to EQ-5D-3L states compared to urban residents. The discrepancy between these studies might be attributed to differences in TTO methods. Unlike other studies, Zhuo et al. [28] employed a non-iterative, open-ended TTO which did not introduce immediate death following hypothetical life scenarios. In the Singaporean studies, our findings suggest that middle-aged and older respondents, as well as Chinese respondents tended to assign lower values to moderate and severe health states compared to younger and non-Chinese respondents, respectively. A recent study suggests that preferences for immediate death over living in poor health in Singapore are primarily driven by concerns about becoming a burden to family members, particularly among middle-aged respondents [29]. This may partly explain our finding that middle-aged respondents assigned lower values to moderate and severe health states.

Third, societal preferences related to health may have shifted over time. The observed changes in the ranking of dimensional disutility in both China and Singapore may indicate evolving societal attitudes toward health. The past decade has been marked by substantial advancements in both economic development and technological innovation. In particular, the COVID-19 pandemic has exerted a profound influence on society and global systems [30]. A growing body of evidence suggests that the pandemic has prompted shifts in preferences related to health and healthcare services [31, 32]. The observed shift in ranking of dimensional disutility is particularly pronounced in the Chinese studies, where the importance of MO has declined while that of PD has risen. One plausible explanation is that rapid urbanization and substantial infrastructure development over the past decade have lessened the everyday impact of mobility limitations in China [6, 33]. Additionally, with technology advancements and labor market shifts, fewer individuals are engaged in physically demanding jobs, which may contribute to a lower valuation of mobility limitations. In addition, findings from the Singaporean studies indicated a notable interaction between study time and age in the multiple regression analyses for mild and moderate states. Specifically, the results suggest that the preferences of older adults in Singapore may have shifted over time, with current older adults perceiving mild and moderate health problems as less concerning compared to their counterparts a decade ago. One possible reason for this shift is the increased government subsidies for healthcare available for older adults in Singapore nowadays [34], which may have alleviated concerns about managing mild and moderate health conditions. Collectively, as societies develop, certain health problems may become more or less salient in affecting people's life and well-being, ultimately

reshaping their health preferences over time. Additionally, it is noteworthy that the ranking of dimensional disutility in both countries appear to be evolving towards patterns observed in western countries/areas, where PD or AD is usually the most important dimension, followed by MO, SC and UA [35].

Given that health-state utility values are crucial to economic evaluations, outdated value sets may lead to biased QALY estimates, potentially misinforming healthcare decision-making. Our findings suggest the potential need to periodically update value sets. However, it should be acknowledged that this process comes with challenges [1, 5]. Updating value sets is costly and resource-intensive and may divert resources from other research priorities, underscoring the need for a structured evaluation framework to assess its necessity. Additionally, decision-makers may be hesitant to switch from widely used existing value sets due to concerns about comparability and consistency between past and present evaluations. The availability of multiple competing value sets may also induce the 'cherry-picking' behavior, where certain value sets are selectively used to favor specific outcomes. To address these challenges, the transition to a recent value set demands strong stakeholder engagement and a well-structured process for managing its implementation.

Due to the limited number of instances where EQ-5D value sets have been updated, this study specifically utilized data from China and Singapore. As a results, the generalizability of our findings to other countries or regions may be limited. In addition, this study has not evaluated how the differences between the early and recent value sets would influence health economic evaluations in real-world settings by using empirical data, such as clinical trial data. Incorporating such data would enable a direct comparison of QALY estimations and provide insights into the implications for cost-utility analyses. Future research could address this gap to provide a more comprehensive understanding of the shelf life of value sets.

Conclusion

In both China and Singapore, the cTTO values of EQ-5D-5L health states from the recent valuation studies and the value sets based on them differed with those derived from the early valuation studies. Although improved valuation technology and changes in population composition might have contributed to the differences, there is some evidence suggesting the evolving of the general public's health preferences in the past decade in these two countries. Our findings highlight the possible need of periodically updating EQ-5D value sets.

Table 1. Study design of the four EQ-5D-5L value set studies

	China (Recent)	**China (Early)**	**Singapore (Recent)**	**Singapore (Early)**
Time of data collection	2023	2012	2023-2024	2014-2015
Data collection mode	CAPI via face-to-face interviews	CAPI via face-to-face interviews	CAPI via face-to-face interviews and video conferencing	CAPI via face-to-face interviews
Sample size (analyzed)	1206	1271	500	1000
Sampling area	15 provinces/cities covering 5 different geographical parts of China including: North China (Beijing, Tianjin, Heilongjiang, Shandong, Shanxi), East China (Shanghai, Jiangsu), South China (Guangdong, Fujian), Central China (Henan, Anhui), and West China (Guizhou, Chongqing Sichuan, Shaanxi).	5 metropolitan cities: Beijing, Shenyang, Nanjing, Chengdu, and Guiyang.	Covering all 5 regions: Central Region, North Region, North-East Region, East Region and West Region	Covering all 5 regions: Central Region, North Region, North-East Region, East Region and West Region
Sampling method	Quota sampling (age, sex, education level, registered residence area [rural/urban])	Quota sampling (age, sex, education level)	Quota sampling (age, sex, ethnicity, education level)	Quota sampling (age, sex, ethnicity, education level)
Protocol version	EQ-VT 2.1	EQ-VT 1.0	EQ-VT 2.1 (Lite)	EQ-VT 1.1
Quality control procedure	Yes	No	Yes	Yes
Number of health states directly valued	86	86	91	86
Number of health states valued by each respondent	10	10	20	10

CAPI, computer-assisted personal interview

Table 2. Characteristics of respondents and their valuation behaviours

(a) Chinese EQ-5D-5L value set studies

	China (Recent, n=1206)		China (Early, n=1271)		
	n	**%**	**n**	**%**	**p-value [a]**
Age					**<0.001**
18-29	184	15.26	313	24.63	
30-39	253	20.98	244	19.20	
40-49	225	18.66	272	21.40	
50-59	256	21.23	220	17.31	
≥60	288	23.88	222	17.47	
Sex					0.883
Female	598	49.59	634	49.88	
Male	608	50.41	637	50.12	
Education					**<0.001**
Primary school	304	25.21	138	10.86	
Junior high	284	23.55	396	31.16	
High school or professional high	391	32.42	446	35.09	
University and above	227	18.82	291	22.90	
Employment					**<0.001**
Working	702	58.21	827	65.07	
Retired	164	13.60	240	18.88	
Students	113	9.37	115	9.05	
Farming	136	11.28	20	1.57	
Others	91	7.55	69	5.43	
Insurance					
Urban employee basic medical insurance	449	37.23	551	43.35	**0.002**
Resident's basic medical insurance	756	62.69	615	48.39	**<0.001**
Commercial insurance	159	13.18	156	12.27	0.497
Other insurance	73	6.05	171	13.45	**<0.001**
No insurance	11	0.91	56	4.41	**<0.001**
Residency					
Urban	765	63.43			
Rural	441	36.57			
Ethnicity					
Han	1,144	94.86			
Minority	62	5.14			
Marital status					
Single	214	17.74			
Married	926	76.78			
Divorced	29	2.40			
Widowed	37	3.07			
EQ VAS (mean, SD)	83.28	11.07	85.96	11.46	**<0.001**
Experienced serious illness					
In yourself	407	33.75	257	20.22	**<0.001**
In your family	507	42.04	479	37.69	**0.027**
In caring for others	181	15.01	507	39.89	**<0.001**
Individual logical consistency rate (mean, SD), %	98.47	3.61	95.22	8.70	**<0.001**
% of respondents who made consistent responses across all tasks	78.44		56.18		**<0.001**

SD, standard deviation

[a] Pearson's chi-squared test or two-sample t-test

Table 2. Characteristics of respondents and their valuation behaviours

(b) Singaporean EQ-5D-5L value set studies

	Singapore (Recent, N=500)		Singapore (Early, N=1000)		
	n	**%**	**n**	**%**	**p-value [a]**
Age					**<0.001**
21-44	210	42.00	509	50.90	
45-64	178	35.60	361	36.10	
≥65	112	22.40	130	13.00	
Sex					0.257
Female	249	49.80	529	52.90	
Male	251	50.20	471	47.10	
Ethnicity					0.234
Chinese	384	76.80	753	75.30	
Malay	71	14.20	128	12.80	
Indian	34	6.80	99	9.90	
Others	11	2.20	20	2.00	
Education					**<0.001**
No formal education	6	1.20	21	2.10	
Primary PSLE	19	3.80	141	14.10	
Secondary 'N' level, 'O' level	148	29.60	309	30.90	
Post secondary (Non-Tertiary) 'A' level, ITE Nitec, Higher Nitec, vocational	64	12.80	76	7.60	
Diploma & Professional Qualification	94	18.80	188	18.80	
University & above	169	33.80	251	25.10	
Refused	0	0	14	1.40	
Marital status					**<0.001**
Single	176	35.20	273	27.30	
Married	273	54.60	671	67.10	
Widowed	17	3.40	22	2.20	
Divorced/separated	34	6.80	25	2.50	
Refused	0	0	9	0.90	
Employment					**<0.001**
Employed/self-employed	337	67.40	643	64.30	
Retired	84	16.80	123	12.30	
Student	45	9.00	56	5.60	
Looking after home	25	5.00	167	16.70	
Refused	9	1.80	11	1.10	
Housing type					**<0.001**
HDB 1 or 2 room flat	24	4.80	39	3.90	
HDB 3 room flat	83	16.60	205	20.50	
HDB 4 room flat	183	36.60	427	42.70	
HDB 5 room or executive flat	130	26.00	264	26.40	
Condominium & other apartments	58	11.60	33	3.30	
Landed properties	21	4.20	0	0	
Refused	1	0.20	32	3.20	
EQ VAS (mean, SD)	81.89	12.24	79.55	12.53	**0.001**
Experienced serious illness					
In yourself	231	46.20	62	6.20	**<0.001**
In your family	293	58.60	210	21.00	**<0.001**
In caring for others	128	25.60	161	16.10	**<0.001**
Individual logical consistency rate (mean, SD), %	97.76	2.67	98.09	4.63	0.140
% of respondents who made consistent responses across all tasks	32.60		76.80		**<0.001**

SD, standard deviation

[a] Pearson's chi-squared test or two-sample t-test

Table 3. Results of multiple linear regression models.

(a) Chinese EQ-5D-5L value set studies

	Mild states (n=4176)	Moderate states (n=13621)	Severe states (n=6973)
Value	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	**1.242 (1.190, 1.294)**	**1.373 (1.319, 1.427)**	**1.303 (1.237, 1.368)**
LSS	**-0.062 (-0.070, -0.055)**	**-0.074 (-0.077, -0.071)**	**-0.067 (-0.070, -0.065)**
Study time (ref: Early study)			
Recent study	**0.088 (0.066, 0.110)**	0.001 (-0.049, 0.051)	**-0.086 (-0.148, -0.024)**
Age (ref: <45)			
45-64	-0.019 (-0.045, 0.007)	0.005 (-0.043, 0.053)	-0.016 (-0.071, 0.039)
≥65	0.026 (-0.012, 0.064)	0.027 (-0.053, 0.108)	-0.034 (-0.128, 0.060)
Sex (ref: Female)			
Male	-0.01 (-0.034, 0.013)	-0.024 (-0.069, 0.021)	0.029 (-0.023, 0.081)
Residency (ref: Urban)			
Rural	**-0.019 (-0.033, -0.005)**	0.019 (-0.022, 0.060)	0.005 (-0.045, 0.054)
Study time x Age			
Recent study x Age 45-64	0.018 (-0.011, 0.047)	0.008 (-0.055, 0.071)	-0.023 (-0.097, 0.051)
Recent study x Age ≥65	-0.031 (-0.076, 0.013)	-0.002 (-0.102, 0.098)	0.009 (-0.111, 0.129)
Study time x Sex			
Recent study x Male	0.006 (-0.021, 0.033)	0.015 (-0.043, 0.074)	-0.046 (-0.115, 0.023)

Interaction term *Recent study * Rural* was omitted because of collinearity

(b) Singaporean EQ-5D-5L value set studies

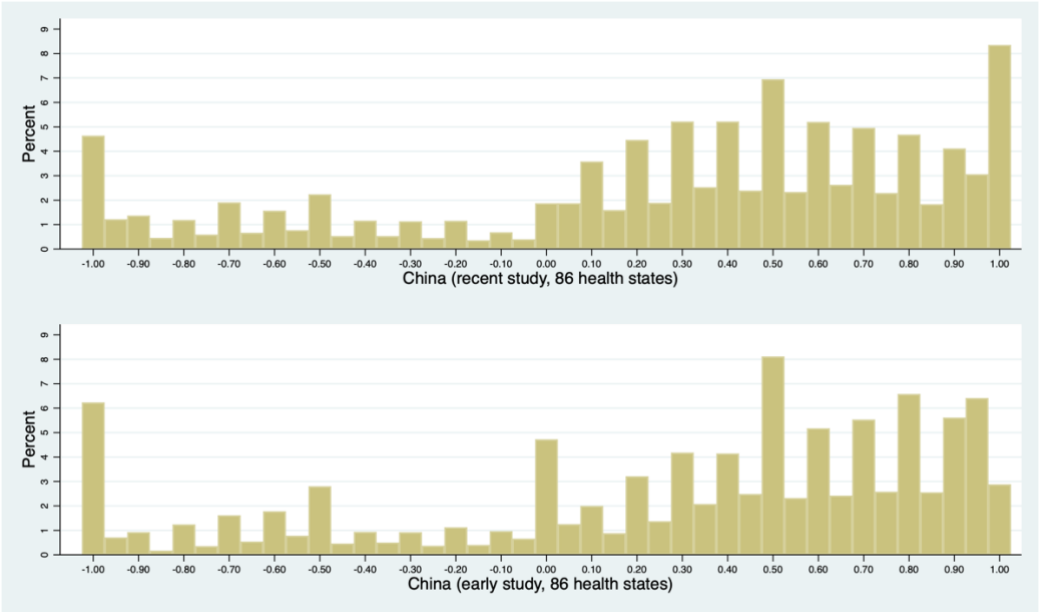
	Mild states (n=3383)	Moderate states (n=11060)	Severe states (n=5057)
Value	Coefficient (95%CI)	Coefficient (95%CI)	Coefficient (95%CI)
Intercept	**1.240 (1.165, 1.315)**	**1.364 (1.264, 1.463)**	**0.939 (0.829, 1.050)**
LSS	**-0.064 (-0.074, -0.053)**	**-0.081 (-0.085, -0.076)**	**-0.055 (-0.058, -0.051)**
Study time (ref: Early study)			
Recent study	**0.111 (0.054, 0.168)**	0.052 (-0.093, 0.197)	-0.054 (-0.209, 0.102)
Age (ref: <45)			
45-64	-0.040 (-0.084, 0.004)	**-0.124 (-0.198, -0.051)**	**-0.109 (-0.185, -0.033)**
≥65	**-0.141 (-0.218, -0.064)**	**-0.252 (-0.363, -0.142)**	**-0.189 (-0.297, -0.081)**
Sex (ref: Female)			
Male	0.010 (-0.030, 0.050)	0.015 (-0.053, 0.082)	0.020 (-0.050, 0.090)
Ethnicity (ref: Non-Chinese)			
Chinese	0.012 (-0.034, 0.059)	**-0.096 (-0.173, -0.019)**	**-0.096 (-0.180, -0.011)**
Study time x Age			
Recent study x Age 45-64	0.007 (-0.049, 0.063)	0.056 (-0.069, 0.181)	0.059 (-0.067, 0.185)
Recent study x Age ≥65	**0.123 (0.038, 0.207)**	**0.174 (0.014, 0.335)**	0.155 (-0.006, 0.315)
Study time x Sex			
Recent study x Male	0.002 (-0.047, 0.051)	-0.063 (-0.173, 0.047)	-0.041 (-0.153, 0.072)
Study time x Ethnicity			
Recent study x Chinese	-0.041 (-0.099, 0.016)	0.041 (-0.090, 0.172)	0.034 (-0.104, 0.173)

Table 4. Modelling results of CALE models in Chinese studies

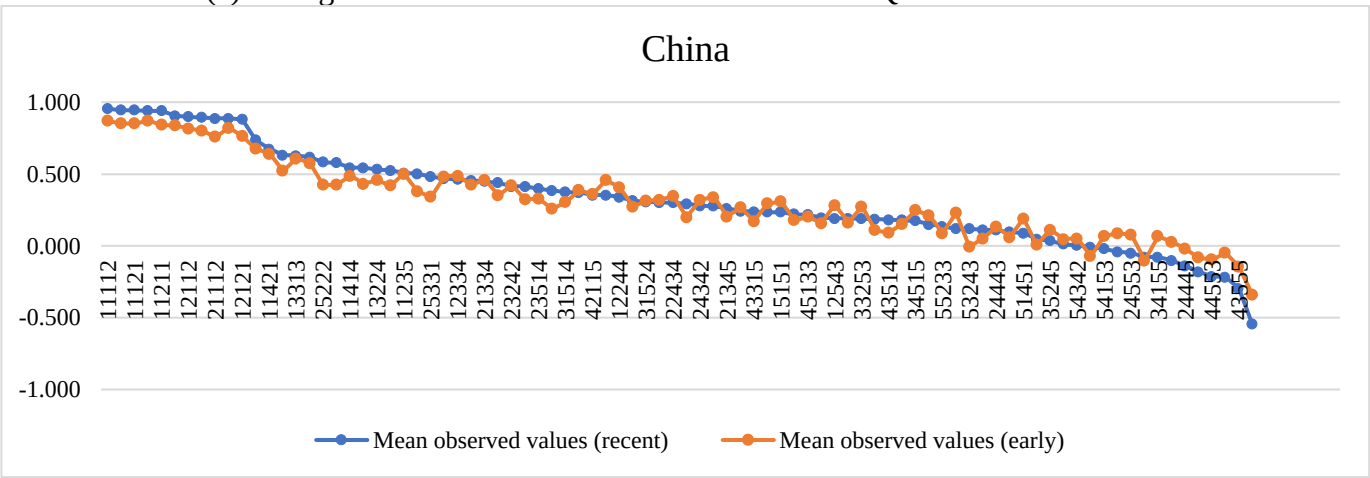
	China (Recent, N=1206)			China (Early, N=1271)			Singapore (Recent, N=500)			Singapore (Early, N=1000)		
	Coef.	**SE**	**p-value**	**Coef.**	**SE**	**p-value**	**Coef.**	**SE**	**p-value**	**Coef.**	**SE**	**p-value**
Intercept	0.033	0.012	0.007	0.119	0.014	<0.001	0.040	0.019	<0.001	0.177	0.021	<0.001
MO	0.289	0.011	<0.001	0.303	0.013	<0.001	0.304	0.016	<0.001	0.291	0.018	<0.001
SC	0.241	0.011	<0.001	0.222	0.013	<0.001	0.250	0.017	<0.001	0.259	0.018	<0.001
UA	0.252	0.011	<0.001	0.204	0.013	<0.001	0.250	0.016	<0.001	0.214	0.018	<0.001
PD	0.425	0.011	<0.001	0.268	0.013	<0.001	0.445	0.016	<0.001	0.310	0.017	<0.001
AD	0.301	0.011	<0.001	0.224	0.013	<0.001	0.365	0.017	<0.001	0.318	0.019	<0.001
L2	0.134	0.018	<0.001	0.191	0.026	<0.001	0.209	0.025	<0.001	0.276	0.031	<0.001
L3	0.377	0.015	<0.001	0.459	0.022	<0.001	0.440	0.022	<0.001	0.530	0.028	<0.001
L4	0.779	0.014	<0.001	0.846	0.021	<0.001	0.950	0.022	<0.001	0.953	0.026	<0.001
MAE	0.028			0.041			0.062			0.088		
No. of nonmonotonicity	0			0			0			0		
No. of insignificant coefficients	0			0			0			0		
Range of possible values	[-0.541, 0.967]			[-0.339, 0.881]			[-0.653, 0.960]			[-0.569, 0.823]		
Ranking of dimensions	PD>AD>MO>UA>SC			MO>PD>AD>SC>UA			PD>AD>MO>SC=UA			AD>PD>MO>SC>UA		
Value for 22222	0.765			0.647			0.623			0.438		
Value for 33333	0.398			0.321			0.251			0.085		
Value for 44444	-0.207			-0.152			-0.572			-0.504		
Value for 55555	-0.541			-0.339			-0.653			-0.569		
Percentage of WTD states out of 3125 health states (%)	15.20			10.27			34.43			41.86		

AD, anxiety/depression; MAE, mean absolute error by leaving one health state out each time; MO, mobility; PD, pain/discomfort; SC, self-care; SE, standard error; UA, usual activities; WTD, worse-than-dead

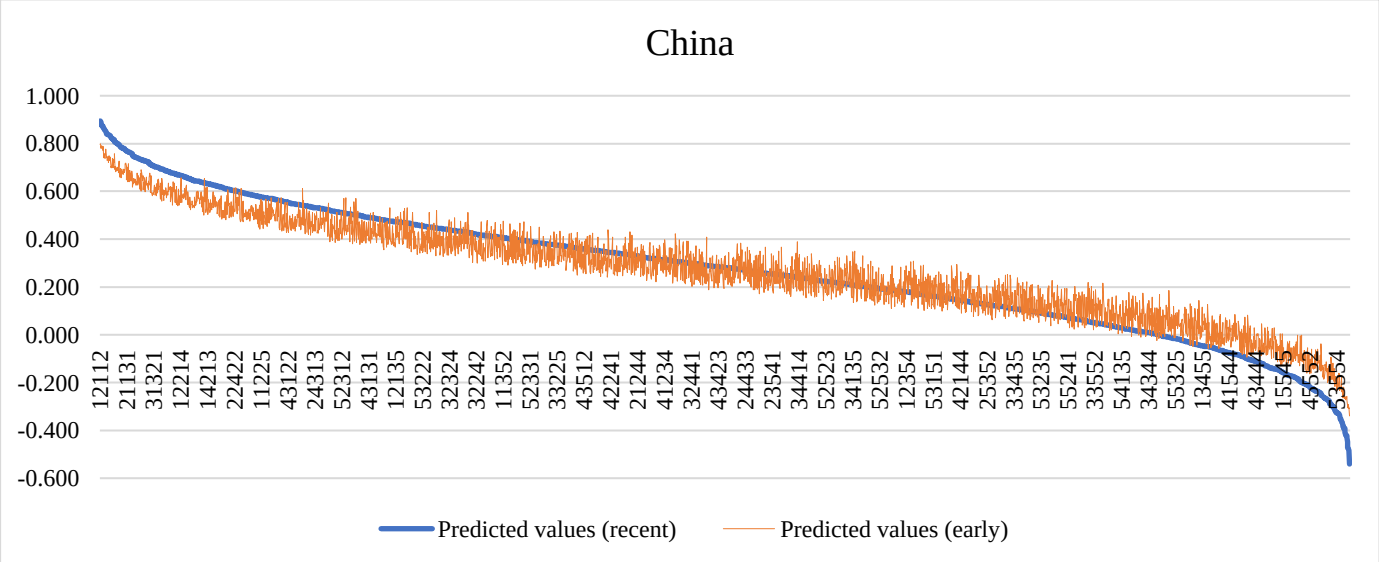
Figure 1. Histograms and scatter plots of TTO values in Chinese studies.



(a) Histograms of observed TTO values for the 86 EQ-5D-5L health states.

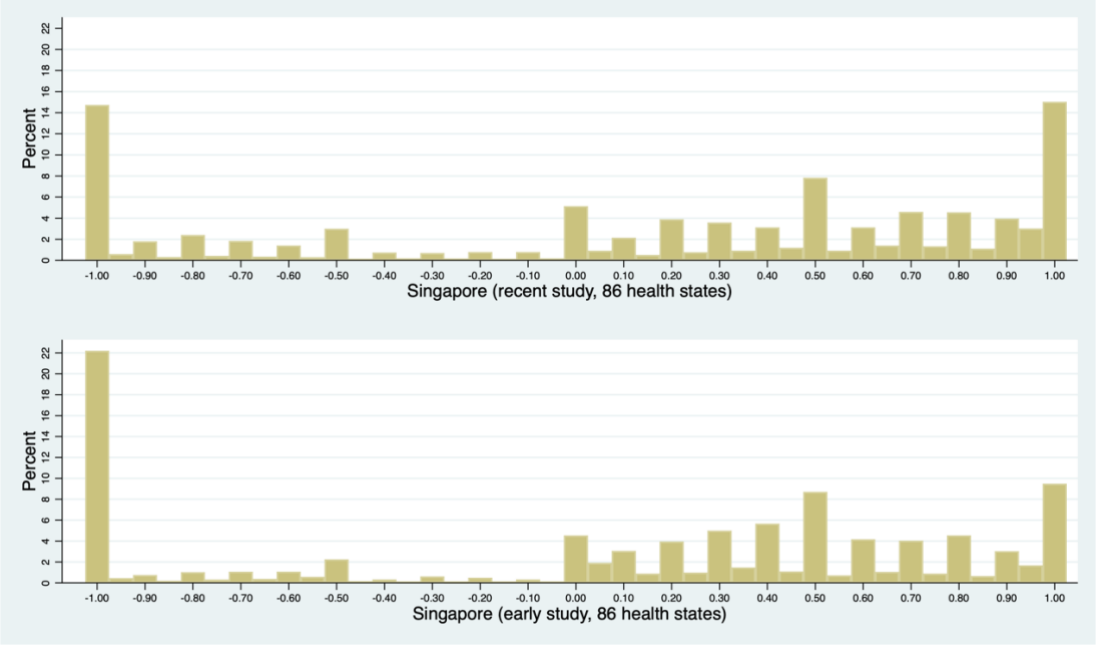


(b) Scatter plots of observed TTO values for the 86 EQ-5D-5L health states.

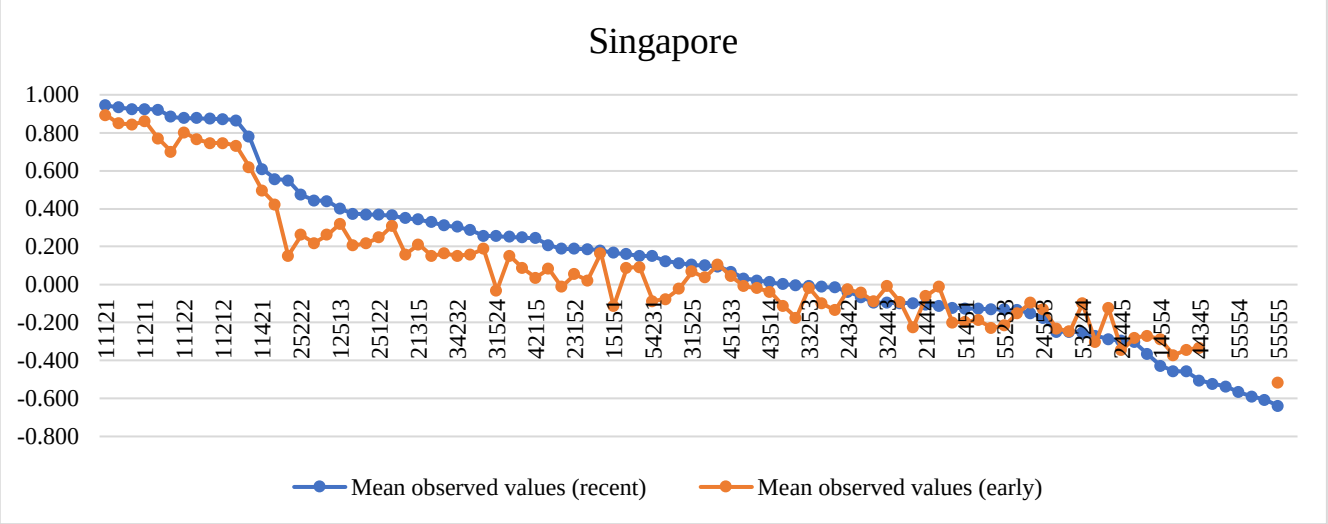


(c) Scatter plots of predicted values for the 3125 EQ-5D-5L health states by CALE models.

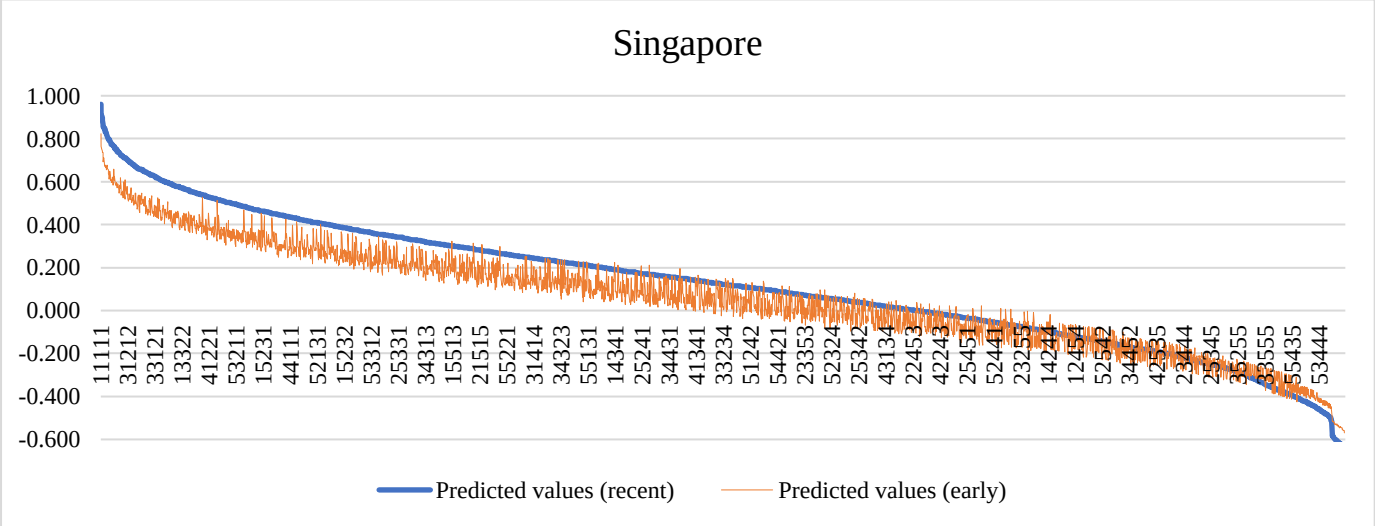
Figure 2. Histograms and scatter plots of TTO values in Singapore.



(a) Histograms of observed TTO values for the 86 EQ-5D-5L health states.



(b) Scatter plots of observed TTO values for the 86 EQ-5D-5L health states.



(c) Scatter plots of predicted values for the 3125 EQ-5D-5L health states by CALE models.

Appendix Table 1. Observed mean values for the EQ-5D-5L health states

		China (Recent, N=1206)			China (Early, N=1271)				
Severity	**Profile**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**Unadjusted mean difference [a]**	**p-value**
Mild	11112	245	0.954	0.086	268	0.871	0.227	0.083	**<0.001**
Mild	21111	257	0.945	0.112	249	0.852	0.199	0.093	**<0.001**
Mild	11121	228	0.945	0.099	253	0.852	0.223	0.092	**<0.001**
Mild	12111	248	0.941	0.114	237	0.871	0.150	0.070	**<0.001**
Mild	11211	228	0.940	0.088	264	0.842	0.238	0.098	**<0.001**
Mild	11221	111	0.904	0.120	111	0.837	0.146	0.067	**<0.001**
Mild	12112	114	0.897	0.128	123	0.817	0.220	0.080	**0.001**
Mild	11212	114	0.893	0.172	123	0.800	0.269	0.092	**0.002**
Mild	21112	115	0.887	0.139	133	0.758	0.299	0.129	**<0.001**
Mild	11122	137	0.886	0.130	126	0.821	0.183	0.066	**0.001**
Mild	12121	119	0.881	0.135	148	0.765	0.309	0.116	**<0.001**
Mild	13122	109	0.735	0.226	116	0.675	0.330	0.060	0.113
Moderate	11421	143	0.673	0.262	126	0.640	0.353	0.033	0.381
Moderate	14113	129	0.631	0.270	149	0.521	0.423	0.109	**0.012**
Moderate	13313	143	0.626	0.232	126	0.608	0.361	0.019	0.610
Moderate	25122	143	0.617	0.287	126	0.575	0.396	0.043	0.310
Moderate	25222	113	0.584	0.295	120	0.426	0.470	0.158	**0.003**
Moderate	42321	137	0.578	0.291	126	0.425	0.493	0.153	**0.002**
Moderate	11414	113	0.543	0.345	120	0.488	0.427	0.056	0.275
Moderate	12513	115	0.543	0.313	133	0.433	0.498	0.110	**0.042**
Moderate	13224	137	0.531	0.340	126	0.457	0.457	0.075	0.132
Moderate	32314	116	0.524	0.331	119	0.421	0.477	0.103	0.056
Moderate	11235	111	0.507	0.404	111	0.502	0.468	0.005	0.933
Moderate	35311	137	0.501	0.363	126	0.377	0.503	0.124	**0.022**
Moderate	25331	113	0.480	0.338	120	0.340	0.494	0.140	**0.013**
Moderate	21315	129	0.470	0.409	149	0.483	0.426	-0.013	0.794
Moderate	12334	116	0.461	0.412	119	0.487	0.472	-0.026	0.656
Moderate	12514	111	0.455	0.382	111	0.425	0.516	0.030	0.621
Moderate	21334	116	0.448	0.394	119	0.460	0.462	-0.011	0.839
Moderate	53221	115	0.439	0.408	133	0.351	0.518	0.088	0.143
Moderate	23242	116	0.412	0.364	119	0.424	0.489	-0.011	0.839
Moderate	34232	137	0.412	0.385	126	0.323	0.514	0.089	0.113
Moderate	23514	119	0.396	0.379	148	0.330	0.523	0.066	0.249
Moderate	53412	116	0.384	0.366	119	0.257	0.542	0.127	**0.036**
Moderate	31514	113	0.373	0.409	120	0.305	0.478	0.068	0.249
Moderate	23152	114	0.371	0.395	123	0.387	0.497	-0.016	0.786
Moderate	42115	109	0.353	0.425	116	0.361	0.497	-0.008	0.903
Moderate	11425	109	0.352	0.433	116	0.458	0.434	-0.105	0.070
Moderate	12244	143	0.338	0.409	126	0.408	0.449	-0.070	0.181
Moderate	54231	111	0.313	0.454	111	0.273	0.562	0.040	0.560
Moderate	31524	129	0.307	0.419	149	0.313	0.501	-0.006	0.912
Moderate	35332	109	0.303	0.436	116	0.319	0.507	-0.017	0.793
Moderate	22434	109	0.300	0.413	116	0.345	0.450	-0.044	0.443
Moderate	52431	129	0.293	0.429	149	0.199	0.534	0.094	0.111
Moderate	24342	116	0.278	0.420	119	0.320	0.511	-0.042	0.496
Moderate	21345	114	0.259	0.455	123	0.205	0.543	0.054	0.410
Moderate	43315	129	0.236	0.471	149	0.173	0.507	0.063	0.285
Moderate	12344	115	0.234	0.461	133	0.296	0.515	-0.062	0.322

Moderate	45233	143	0.220	0.465	126	0.179	0.468	0.041	0.477
Moderate	45133	119	0.216	0.490	148	0.201	0.551	0.015	0.817
Moderate	45413	109	0.195	0.452	116	0.157	0.550	0.038	0.572
Moderate	12543	119	0.191	0.516	148	0.283	0.543	-0.092	0.161
Moderate	44125	115	0.190	0.458	133	0.164	0.571	0.027	0.686
Moderate	33253	116	0.189	0.434	119	0.274	0.559	-0.086	0.192
Moderate	35143	113	0.187	0.487	120	0.110	0.579	0.077	0.274
Moderate	43514	114	0.181	0.468	123	0.091	0.564	0.090	0.184
Moderate	21444	113	0.178	0.479	120	0.153	0.540	0.025	0.705
Moderate	32443	119	0.118	0.559	148	0.229	0.552	-0.110	0.108
Moderate	53243	113	0.117	0.508	120	-0.008	0.582	0.125	0.083
Moderate	24443	129	0.110	0.465	149	0.132	0.535	-0.021	0.723
Moderate	34244	114	0.094	0.482	123	0.059	0.535	0.035	0.599
Moderate	43542	119	0.011	0.552	148	0.047	0.600	-0.036	0.614
Moderate	54342	115	0.003	0.508	133	0.051	0.524	-0.048	0.470
Moderate	53244	113	-0.009	0.533	120	-0.073	0.599	0.064	0.394
Moderate	45144	111	-0.042	0.499	111	0.089	0.572	-0.132	0.069
Moderate	24445	137	-0.139	0.531	126	-0.018	0.568	-0.121	0.076
Moderate	44345	115	-0.180	0.500	133	-0.082	0.554	-0.098	0.145
Severe	31525	143	0.276	0.440	126	0.338	0.485	-0.063	0.268
Severe	52215	119	0.241	0.484	148	0.267	0.547	-0.025	0.692
Severe	15151	129	0.234	0.459	149	0.308	0.529	-0.074	0.215
Severe	34515	111	0.175	0.464	111	0.248	0.538	-0.073	0.283
Severe	51152	109	0.148	0.490	116	0.210	0.545	-0.063	0.366
Severe	55233	143	0.134	0.480	126	0.088	0.532	0.045	0.462
Severe	52335	137	0.111	0.487	126	0.051	0.583	0.061	0.360
Severe	51451	111	0.089	0.481	111	0.191	0.540	-0.102	0.138
Severe	55225	116	0.047	0.480	119	0.008	0.554	0.039	0.561
Severe	35245	111	0.035	0.484	111	0.112	0.572	-0.077	0.280
Severe	54153	129	-0.022	0.472	149	0.067	0.526	-0.089	0.142
Severe	24553	109	-0.050	0.494	116	0.078	0.581	-0.128	0.077
Severe	55424	114	-0.079	0.483	123	-0.102	0.552	0.023	0.733
Severe	34155	119	-0.079	0.583	148	0.068	0.581	-0.148	**0.040**
Severe	14554	115	-0.101	0.506	133	0.027	0.565	-0.129	0.061
Severe	44553	114	-0.214	0.490	123	-0.095	0.525	-0.119	0.072
Severe	52455	143	-0.218	0.515	126	-0.049	0.554	-0.169	**0.010**
Severe	43555	137	-0.297	0.516	126	-0.144	0.572	-0.153	**0.023**
Severe	55555	1206	-0.546	0.441	1271	-0.341	0.536	-0.205	**<0.001**
All states		12060	0.279	0.583	12710	0.283	0.591	-0.004	0.744
Mild states		2025	0.915	0.134	2151	0.826	0.237	0.088	**<0.001**
Moderate states		6620	0.321	0.467	7001	0.292	0.535	0.026	0.085
Severe states		3415	-0.177	0.561	3558	-0.061	0.593	-0.119	**<0.001**
Severe	45555								
Severe	54555								
Severe	55455								
Severe	55545								
Severe	55554								

Appendix Table 1. Observed mean values for the EQ-5D-5L health states (continued)

		Singapore (Recent, N=500)			Singapore (Early, N=1000)				
Severity	**Profile**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**Unadjusted mean difference [a]**	**p-value**
Mild	11112	207	0.925	0.202	201	0.844	0.318	0.081	**0.002**
Mild	21111	188	0.934	0.133	186	0.848	0.346	0.085	**0.002**
Mild	11121	195	0.945	0.129	214	0.893	0.247	0.051	**0.010**
Mild	12111	201	0.922	0.190	195	0.770	0.417	0.152	**<0.001**
Mild	11211	209	0.924	0.178	204	0.859	0.280	0.065	**0.005**
Mild	11221	98	0.864	0.241	96	0.731	0.391	0.133	**0.005**
Mild	12112	96	0.884	0.185	90	0.701	0.466	0.184	**<0.001**
Mild	11212	96	0.872	0.213	90	0.746	0.428	0.126	**0.011**
Mild	21112	92	0.877	0.188	110	0.765	0.392	0.113	**0.012**
Mild	11122	103	0.877	0.234	99	0.802	0.326	0.076	0.059
Mild	12121	98	0.874	0.229	102	0.746	0.369	0.129	**0.004**
Mild	13122	111	0.779	0.309	102	0.619	0.455	0.161	**0.003**
Moderate	11421	92	0.609	0.422	96	0.496	0.536	0.112	0.113
Moderate	14113	96	0.549	0.539	103	0.151	0.704	0.398	**<0.001**
Moderate	13313	92	0.557	0.524	96	0.423	0.574	0.134	0.098
Moderate	25122	92	0.368	0.601	96	0.248	0.662	0.121	0.193
Moderate	25222	103	0.473	0.546	104	0.263	0.667	0.210	**0.014**
Moderate	42321	103	0.443	0.567	99	0.219	0.652	0.224	**0.010**
Moderate	11414	103	0.365	0.574	104	0.310	0.591	0.055	0.498
Moderate	12513	92	0.399	0.544	110	0.321	0.632	0.078	0.353
Moderate	13224	103	0.372	0.610	99	0.207	0.654	0.166	0.064
Moderate	32314	111	0.312	0.612	98	0.163	0.671	0.148	0.096
Moderate	11235	98	0.349	0.627	96	0.159	0.670	0.191	**0.042**
Moderate	35311	103	0.440	0.615	99	0.263	0.579	0.177	**0.037**
Moderate	25331	103	0.369	0.636	104	0.218	0.654	0.151	0.094
Moderate	21315	96	0.344	0.641	103	0.211	0.634	0.133	0.143
Moderate	12334	111	0.329	0.582	98	0.152	0.646	0.177	**0.039**
Moderate	12514	98	0.160	0.669	96	0.088	0.667	0.072	0.456
Moderate	21334	111	0.257	0.617	98	0.189	0.638	0.068	0.435
Moderate	53221	92	0.286	0.606	110	0.160	0.672	0.127	0.164
Moderate	23242	111	0.208	0.636	98	0.083	0.675	0.124	0.172
Moderate	34232	103	0.304	0.654	99	0.152	0.624	0.153	0.091
Moderate	23514	98	0.095	0.661	102	0.106	0.618	-0.011	0.904
Moderate	53412	111	0.187	0.644	98	0.021	0.679	0.166	0.071
Moderate	31514	103	0.180	0.659	104	0.166	0.608	0.014	0.872
Moderate	23152	96	0.188	0.667	90	0.054	0.698	0.134	0.184
Moderate	42115	111	0.245	0.569	102	0.036	0.637	0.209	**0.012**
Moderate	11425	111	0.249	0.624	102	0.087	0.645	0.162	0.064
Moderate	12244	92	-0.114	0.650	96	-0.012	0.680	-0.102	0.297
Moderate	54231	98	0.151	0.684	96	-0.086	0.680	0.237	**0.016**
Moderate	31524	96	0.256	0.611	103	-0.031	0.677	0.287	**0.002**
Moderate	35332	111	0.251	0.611	102	0.152	0.606	0.099	0.237
Moderate	22434	111	0.151	0.648	102	0.093	0.644	0.059	0.508
Moderate	52431	96	0.189	0.617	103	-0.011	0.643	0.200	**0.026**
Moderate	24342	111	-0.039	0.660	98	-0.026	0.654	-0.013	0.889
Moderate	21345	96	0.022	0.678	90	-0.019	0.670	0.041	0.677
Moderate	43315	96	0.123	0.668	103	-0.077	0.654	0.201	**0.034**

Moderate	12344	92	-0.095	0.660	110	-0.090	0.669	-0.006	0.953
Moderate	45233	92	0.002	0.652	96	-0.111	0.666	0.113	0.241
Moderate	45133	98	0.067	0.652	102	0.045	0.634	0.022	0.811
Moderate	45413	111	-0.012	0.688	102	-0.100	0.610	0.087	0.330
Moderate	12543	98	0.100	0.645	102	0.038	0.677	0.062	0.510
Moderate	44125	92	-0.134	0.655	110	-0.150	0.667	0.016	0.863
Moderate	33253	111	-0.008	0.639	98	-0.017	0.661	0.009	0.918
Moderate	35143	103	0.033	0.676	104	-0.008	0.643	0.040	0.661
Moderate	43514	96	0.013	0.679	90	-0.038	0.680	0.051	0.611
Moderate	21444	103	-0.104	0.693	104	-0.059	0.657	-0.045	0.630
Moderate	32443	98	-0.095	0.650	102	-0.008	0.628	-0.088	0.334
Moderate	53243	103	-0.066	0.670	104	-0.043	0.660	-0.022	0.810
Moderate	24443	96	-0.128	0.648	103	-0.187	0.654	0.059	0.522
Moderate	34244	96	-0.098	0.642	90	-0.092	0.687	-0.006	0.949
Moderate	43542	98	-0.150	0.687	102	-0.097	0.629	-0.053	0.566
Moderate	54342	92	-0.303	0.614	110	-0.281	0.656	-0.022	0.809
Moderate	53244	103	-0.252	0.678	104	-0.100	0.648	-0.152	0.100
Moderate	45144	98	-0.270	0.657	96	-0.303	0.632	0.033	0.724
Moderate	24445	103	-0.296	0.616	99	-0.345	0.601	0.050	0.561
Moderate	44345	92	-0.505	0.543	110	-0.333	0.610	-0.173	**0.036**
Severe	31525	92	0.104	0.650	96	0.069	0.644	0.036	0.707
Severe	52215	98	0.113	0.652	102	-0.022	0.641	0.135	0.140
Severe	15151	96	0.167	0.666	103	-0.114	0.670	0.281	**0.003**
Severe	34515	98	-0.122	0.645	96	-0.200	0.658	0.078	0.408
Severe	51152	111	-0.015	0.639	102	-0.134	0.639	0.119	0.175
Severe	55233	92	-0.131	0.659	96	-0.215	0.667	0.084	0.389
Severe	52335	103	-0.003	0.682	99	-0.174	0.631	0.171	0.066
Severe	51451	98	-0.126	0.651	96	-0.195	0.644	0.070	0.454
Severe	55225	111	-0.130	0.654	98	-0.227	0.658	0.097	0.288
Severe	35245	98	-0.248	0.649	96	-0.232	0.636	-0.016	0.861
Severe	54153	96	-0.098	0.656	103	-0.226	0.640	0.128	0.166
Severe	24553	111	-0.177	0.609	102	-0.130	0.625	-0.047	0.578
Severe	55424	96	-0.248	0.660	90	-0.248	0.681	-0.001	0.995
Severe	34155	98	-0.287	0.641	102	-0.124	0.637	-0.163	0.072
Severe	14554	92	-0.428	0.573	110	-0.290	0.644	-0.138	0.112
Severe	44553	96	-0.367	0.595	90	-0.270	0.673	-0.097	0.300
Severe	52455	92	-0.459	0.558	96	-0.344	0.630	-0.115	0.188
Severe	43555	103	-0.456	0.562	99	-0.372	0.583	-0.085	0.295
Severe	55555	500	-0.638	0.492	1000	-0.516	0.566	-0.122	**<0.001**
All states		9500	0.176	0.717	10000	0.075	0.716	0.100	**<0.001**
Mild states		1694	0.901	0.202	1689	0.798	0.366	0.092	**<0.001**
Moderate states		5525	0.135	0.671	5535	0.047	0.668	0.087	**0.002**
Severe states		2281	-0.265	0.656	2776	-0.308	0.640	0.050	0.083
	45555	98	-0.608	0.505					
	54555	92	-0.590	0.515					
	55455	96	-0.522	0.536					
	55545	111	-0.536	0.526					
	55554	103	-0.566	0.543					

[a] Using univariate linear regression model (early value set study as reference group).

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