Quality of Life Utility-Core 10 Dimensions (QLU-C10D) scores based on cancer patients' health preferences are more sensitive than those based on general public's health preferences

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Declarations

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Abstract

Objective: This study aimed to develop a value set for the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Utility-Core 10 Dimensions (QLU-C10D) based on the preferences of Chinese cancer patients, and to compare results with the Chinese general population value set.

Methods: Patients with mixed cancer diagnoses were recruited from two hospitals in China between September and November 2024. Patients completed the EORTC Core Quality of Life Questionnaire (QLQ-C30) followed by a discrete choice experiment (DCE) valuation survey consisting of 16 choice sets through face-to-face interviews. A conditional logit model was applied to analyze patient preferences. The characteristics and sensitivity of the derived QLU-C10D value set were compared with those of the Chinese general population QLU-C10D value set. Sensitivity was evaluated by ability to discriminate cancer stage and performance status, and effect sizes (ES) were estimated.

Results: Data from 659 cancer patients were analyzed. The cancer patients' value set showed a broader utility range (-0.092 to 1.0) compared to the general population's value set (0.083 to 1). The mean utility score for the cancer patient sample (0.656) was significantly lower than that for the general population (0.738, $P < 0.01$). Both value sets demonstrated good sensitivity, but the cancer patients' value set was more effective in distinguishing clinical subgroup differences (ES = 2.76–4.46 vs. ES = 2.47–3.48).

Conclusion: Differences in value sets between cancer patients and the general population underscore the importance of more comprehensively integrating patient perspectives into existing evaluation frameworks.

Keywords: Value Set, Cancer Patients, General Population, QLU-C10D, China

1 Introduction

Cost-utility analysis (CUA) is a key method for reimbursement decisions in healthcare, typically using preference-based health-related quality of life (HRQoL) utility values to derive quality-adjusted life years (QALYs). The QALY combines morbidity and mortality into a single metric, weighed by preferences that reflect the relative desirability of health states, serving as the basis for evaluating the impact of health interventions [1]. Country-specific value sets, reflecting societal preferences and collective benefits, are considered ideal for healthcare decision-making [2, 3]. This practice, rooted in the principle of maximizing societal value, has been widely endorsed by economic evaluation guidelines across multiple countries [4].

However, in the context of patient-centered decision-making, the debate over prioritizing general population versus patient-derived preferences remains unresolved [4-6]. While general population preferences capture societal benefits, patient preferences represent the lived experiences associated with specific health states. In Germany, the HTA framework led by the Institute for Quality and Efficiency in Health Care focuses on qualitative assessments of "added clinical benefit" from the patient perspective, such as survival gains and symptom improvement. It directly incorporates patient-reported outcomes (PROs) to evaluate therapies against comparators, ensuring patient voices are central to treatment benefit evaluations[7]. Similarly, Sweden’s Dental and Pharmaceutical Benefits Agency emphasizes ethical principles like "human value and need" and "solidarity" in its health economic evaluations, which prioritize patient experiences. These evaluations integrate condition-specific PROs to align resource allocation with patients’ actual needs [8]. By incorporating patient preferences, HTAs can better align resource allocation with actual patient needs, improve perceived health benefits and satisfaction, and enhance personalized healthcare [9-11]. Therefore, integrating value sets representing preferences informed by the lived experience alongside societal perspectives offers a more comprehensive framework for clinical and policy decision-making.

Significant preference differences highlight the critical importance of choosing between patient and general population preferences. A meta-analysis conducted in 2006 indicated that minimal or no significant differences between utility values derived from these groups [5]. However, recent studies increasingly reveal notable discrepancies between these groups, encouraging the development of patient-specific value sets. For example, some studies suggest that utility values derived from patients tend to be systematically higher [12, 13], while others report the opposite trend [14-16]. Moreover, the direction and magnitude of these differences appear to be influenced by factors such as disease type and national context [17]. These findings reflect the unique experiences, recovery expectations, and treatment perceptions of patients, highlighting the limitations of universally applying general population-based value sets in healthcare decision-making. This calls for further exploration into the role of patient preferences in health evaluations and their divergence from general preferences.

In recent years, the European Organization for Research and Treatment of Cancer (EORTC), in collaboration with the Multi-Attribute Utility in Cancer (MAUCa) Consortium, developed the QLU-C10D [18], a cancer-specific preference-based measure (PBM) derived from the widely used Quality of Life Questionnaire - Core 30 (QLQ-C30) [19, 20]. In China, value sets based on general population preferences have been developed for several generic PBMs, including the EQ-5D [21-24], EQ-5D-Y [25], and SF-6D [26]. While these PBMs are widely applied in HTA, they are not cancer-specific and may not fully capture the symptom burden and HRQoL changes experienced by cancer patients. The QLU-C10D, by contrast, has shown high sensitivity in detecting subtle health changes and distinguishing between health states among cancer patients [27-32]. Value sets for the QLU-C10D, developed from general population preferences, are now available in 16 countries [33-45], including China, facilitating its application in HTA [46-49]. However, patient-derived QLU-C10D value sets have received increasing attention only recently. Gamper et al. were the first to apply the QLU-C10D valuation survey among cancer patients in Austria, confirming its feasibility and laying the groundwork for patient-specific value sets [10]. Gandhi et al. extended this work by comparing utilities derived from general population and cancer patient preferences in Singapore [50]. However, the impact of such differences on CUAs remains underexplored, warranting further research to advance personalized healthcare and refine economic evaluation methods.

This study aimed to develop QLU-C10D utility weights for cancer patients in China, the country with the highest global cancer incidence [51], to inform clinical decision-making. Additionally, it aimed to explore differences in Chinese QLU-C10D value sets based on health preferences from cancer patients versus the general population, and consider how these differences may impact CUA.

2 Methods

The research design and analytical approach in this study follow the established QLU-C10D valuation methods used in previous studies, which are based on general population preferences from multiple countries [33-45]. These methods generally adhere to the standardized EORTC protocol for value set endorsement, with two adjustments for the patient context: recruitment and administration of the valuation study. Previous studies have demonstrated the feasibility of conducting QLU-C10D valuations among cancer patients [10].

2.1 Sample recruitment and management

From September to November 2024, the study recruited hospitalized cancer patients from two Grade A tertiary public hospitals in Harbin, the capital of Heilongjiang Province, including a cancer specialty hospital. The aim was to ensure a diverse sample in terms of age, residence, diagnosis, and treatment modalities. Participants were selected by hospital doctors or nurses based on the following criteria: (1) confirmed clinical diagnosis of cancer; (2) anticipated survival of at least one year for patient safety and ethical compliance; (3) age ≥18 years; and (4) proficiency in reading and communicating in Chinese.

Eligible patients provided written informed consent and participated in face-to-face interviews conducted by trained interviewers in hospital wards. First, as a familiarization exercise, the patient self-completed the QLQ-C30, albeit with the items read to them by an interviewer. The interviewer then explained the discrete choice experiment (DCE) task, using example questions to ensure comprehension. Responses were recorded electronically, with interviewers providing clarifications when needed. Standardized training was implemented, and a protocol was strictly followed to minimize interviewer bias and ensure data quality.

2.2 The QLU-C10D health state classification

The scenarios in the DCE focused on the QLU-C10D dimensions, derived from the QLQ-C30 by the MAUCa Consortium (2010–2016) using item response theory, qualitative interviews with cancer patients, expert opinion of oncologists and HRQOL researchers [18]. The QLU-C10D includes 13 items across ten health dimensions—physical, role, social, and emotional functioning; pain; fatigue; sleep disorders; appetite; nausea; and bowel problems. Each dimension has four severity levels (reflecting the source QLQ-C30 items levels), defining 1,048,576 unique health states [18]. Table A (supplementary material) details the classification system.

2.3 Valuation survey and DCE design

The valuation survey followed the original methods designed by the MAUCa Consortium and EORTC QOL Group [33], modified only in recruitment and implementation methods to enable cancer patient involvement. The DCE design and data management were supported by Survey Engine, and complied with the International Code on Market, Opinion and Social Research and Data Analytics [52].

Participants completed a survey comprising four sections: (1) self-reported health scales (with assistance of interviewers for reading and entering responses only), including QLQ-C30 [19], Kessler Psychological Distress Scale (Kessler-10) [53] for mental health, EQ-5D-5L [54], and SF-6Dv2 [55], all using officially endorsed Chinese versions; (2) DCE tasks with 16 choice sets; (3) feedback on DCE tasks, covering task difficulty, clarity, and choice strategies; and (4) sociodemographic questions, such as gender, age, and residence. Clinical data, including diagnosis, cancer staging, treatment modalities, and ECOG performance status, were obtained from medical records [56].

This study employed the DCE-based QLU-C10Dvaluation protocol described by King et al. [33], widely used thereafter in valuation studies across numerous countries [33-45]. Patients completed 16 choice sets, selected from 960 combinations via a D-efficiency procedure (a key method under optimal design theory) that prioritizes maximizing the efficiency of main effect parameter estimates. Interaction effects were not included to balance survey feasibility and statistical precision, consistent with common practices [33-45]. To control biases, health state A/B assignment and the order of 11 attributes across 10 QLU-C10D domains (the physical functioning dimension was split into 2 attributes, one for ‘long walk' and one for ‘short walk' (see Table A from supplementary material) were randomized per respondent; a balanced incomplete block design (BIBD) defined four differing dimensions per set (others held equal) to minimize burden. Each set presented two hypothetical QLU-C10D health states, differing in four of ten HRQoL dimensions and survival times (1, 2, 5, or 10 years), with differences highlighted for clarity. Examples are shown in Figures A and B (Chinese version) in the supplementary material. Details on QLU-C10D methodology, including formats, attribute ordering, and reliability, are provided in related studies [10, 57-59].

2.4 Data quality control

First, face-to-face interviews were conducted to optimize survey comprehension and interactivity: trained interviewers clarified DCE tasks, offered assistance as required, and halted surveys exclusively under specific circumstances—including inability to understand the survey interface, persistent failure to grasp task requirements (despite repeated explanations), or voluntary requests to withdraw (e.g., due to fatigue). These situations were deemed to directly compromise data validity. A total of 7 surveys (1.06% of the initial sample) were terminated, resulting in a final sample of 659 participants. The primary reasons for termination were fatigue (n=5) and persistent comprehension difficulties (n=2). Notably, none of these terminations were due to uncertainty or difficulty in making choices during the choice tasks. Secondly, patients who provided the most negative responses to all four DCE feedback questions (“Survey is more difficult,” “Health states very unclear,” “Choices very difficult,” and “No choice strategy”) were excluded as part of a robustness check to ensure task comprehension. Lastly, to assess the impact of survey duration on data quality, respondents were divided into deciles by completion time. Pseudo-R^2 values and significant coefficients from conditional logit analysis were plotted to examine trends.

2.5 Data analysis

Descriptive statistics summarized the characteristics of the cancer patient sample; specifically, frequency and percentage for categorical variables, mean and standard deviation for continuous variables.

Conditional logistic regression was employed to model utility and calculate utility weights by interacting QLU-C10D dimensions with survival time. Utility values were anchored at 0 ("dead") and 1 ("full health") to maintain ratio-scale properties[60, 61],yet remained unconstrained during initial estimation to capture states "worse than deaths". The utility of each option was calculated as follows:

$$U_{isj} = \alpha \mathrm{TIME}_{isj} + \beta X_{isj}^{'} \mathrm{TIME}_{isj} + \varepsilon_{isj} \quad (1)$$

where TIME_{isj} represents the survival time presented in DCE option j, and X'_{isj} was a set of dummy variables corresponding to the levels of the health state in DCE option j. The error term, εisj, was assumed to follow a Gumbel distribution. Conditional logistic regression estimated parameters α (utility per life year) and β (utility weights for each health state level). Utility decrements were calculated as the ratio of β to α, reflecting the HRQoL-life expectancy trade-off. Non-monotonic coefficients were adjusted by constraining adjacent levels, as per standard practice[62].

Line charts were used to compare utility decrements across QLU-C10D dimensions and levels between the cancer patient value set versus the Chinese general population value set. The general population value set served as the baseline to illustrate the percentage changes in utility decrements for the cancer patient value set, visualized using bar charts. Additionally, 1,000 hypothetical health states were generated by randomly combining the 4 levels across the 10 dimensions of the QLU-C10D descriptive system. This sampling approach ensured proportional representation of each dimension’s levels, with states spanning the full severity spectrum—from mild (e.g., most dimensions at levels 1–2) to severe (e.g., majority at levels 3–4)—and explicitly including the best-possible (all dimensions at level 1) and worst-possible (all dimensions at level 4) health states. This comprehensive coverage of potential health states was designed to ensure robust utility comparisons between the two value sets.

Box plots displayed utility scores derived from both value sets, highlighting ranges and means. Agreement was assessed using intraclass correlation coefficients (ICC; high > 0.75) and Bland-Altman plots [63]. Sensitivity analysis stratified patients by cancer stage (I–IV) and ECOG performance status (Grades 0–4). Mean utility scores for each subgroup were compared using one-way ANOVA. "Extreme subgroups" here refer to the two ends of the stratified variables: for cancer stage, these were Stage I (earliest) and Stage IV (most advanced); for ECOG performance status, they were Grade 0 (fully active) and Grade 4 (completely disabled). Effect sizes (ES) quantified the clinical significance of differences between these extreme subgroups, calculated as the mean score difference divided by their pooled standard deviation [64]. Incremental utility was defined as the absolute difference in mean utility values between these extreme subgroups, reflecting the utility change associated with moving from the most severe to the least severe end of the stratified variable. We hypothesized higher utility values for earlier cancer stages or lower ECOG grades[29, 65-67].

3 Results

3.1 Sample characteristics

Of the 727 participants, 68 were excluded due to missing medical records or incomplete disease information, leaving 659 patients with various cancer types. The most common cancers were lung, breast stomach, and thyroid. Cancers with a prevalence of less than 3% were grouped into the 'other' category, which accounted for 7% of the sample. The sample included 347 males (53%) and 312 females (47%), with 48% aged 60 or older, 61% residing in urban areas, 69% having a junior high education or below, and 91% married. Detailed socio-demographic characteristics are presented in Table 1.

Table 1 Socio-demographic characteristics of the study samples

	Cancer patient sample (n=659)	
	N	%
Gender[a]		
Male	347	52.7
Female	312	47.3
Age group		
18-39	53	8.0
40-59	287	43.6
≥60	319	48.4
Residence		
Urban	402	61.0
Rural	257	39.0
Education level		
Junior high school or below	454	68.9
Senior high school/technical school	118	17.9
Post-secondary	87	13.2
Marital status		
Single	21	3.2
Married	602	91.4
Widowed/divorced/separated	36	5.5
Cancer type		
Lung cancer	145	22.0
Breast cancer	108	16.4
Stomach cancer	87	13.2
Thyroid cancer	67	10.2
Lymphoma	53	8.0
Leukemia	46	7.0
Liver cancer	44	6.7
Colorectal cancer	33	5.0
Prostate cancer	28	4.2
Others	48	7.3

[a] No significant difference was found between the distribution in this study and the latest incidence rates reported by the National Cancer Center and the International Agency for Research on Cancer (IARC). (/www.iarc.who.int/wp-content/uploads/2024/02/pr345_E.pdf) ($\chi^2 = 0.343$, $p = 0.558$)

3.2 Data quality control

Most patients found the DCE survey difficulty comparable to other surveys (79%), with few citing unclear health state descriptions (2%) or difficulty choosing between health states (14%, “very difficult” 0.2%). A majority (69%) focused on the “highlighted aspects” of the tasks. Detailed feedback results are shown in Figure C (supplementary material). No participants were excluded for consistently negative responses.

The mean survey completion time was 29.95 minutes (range: 5.39–80.12). Completion times decreased with task familiarity (Figure D in the supplementary material). The median decile produced the highest number significant coefficients (25/31). The fastest decile produced the fewest significant coefficients (6/31) and yet achieved comparable or higher model fit (pseudo-R^2 value 0.442) than other deciles (Figure E in the supplementary material); for further detail and discussion see the supplementary material. These results confirm the dataset's high quality and reliability.

3.3 Utility estimates

As shown in the "Unconstrained" column of Table 2, incremental moves to worse levels within each dimension generally led to significantly greater coefficients. However, non-monotonicities were observed in role functioning levels 3 and 4, where level 4 was preferred over level 3. A likelihood-ratio test confirmed no significant difference between these levels, so monotonicity was imposed and the model re-estimated. Utility estimates for the cancer patient sample after correction show similar utility weights in both unconstrained and monotonicity-corrected model.

Monotonicity-corrected results were used to develop the QLU-C10D value set for cancer patients in China. Utility scores are derived by mapping QLQ-C30 responses to the corresponding QLU-C10D dimensions and levels (Table A in the supplementary material). For example, for QLQ-C30 responses matching the QLU-C10D health state "3233412432," the utility score is calculated as: 1 - 0.275 - 0.052 - 0.035 - 0.057 - 0.125 - 0 - 0.046 - 0.083 - 0.075 - 0.030 = 0.222. The worst possible health state (PITS state 4444444444) had a utility value of −0.092, considerably lower than the Chinese general population PITS value (0.083)[45].

Table 2 QLU-C10D model coefficients and utility decrements for the cancer patient sample

		Unconstrained			**Corrected for monotonicity**		
Parameter	**Level**[a]	**Coefficient (α, β)**	**SE**	**Utility decrement (β/ α)**	**Coefficient (α, β)**	**SE**	**Utility decrement (β/ α)**
Time coefficient (α)	(linear)	0.885**	0.059		0.882 **	0.059	
Attributes (β)							
Physical Functioning	2	-0.145 **	0.026	-0.164	-0.145 **	0.027	-0.165
Physical Functioning	3	-0.242 **	0.032	-0.273	-0.242 **	0.032	-0.275
Physical Functioning	4	-0.300 **	0.032	-0.339	-0.301 **	0.032	-0.341
Role Functioning	2	-0.048 **	0.013	-0.054	-0.046 **	0.013	-0.052
Role Functioning	3	-0.098 **	0.014	-0.111	-0.091 **	0.013	-0.103
Role Functioning	4	-0.087 **	0.013	-0.098	-0.091**	0.013	-0.103
Social Functioning	2	-0.014	0.012	-0.016	-0.015	0.012	-0.017
Social Functioning	3	-0.031 *	0.013	-0.035	-0.031 *	0.013	-0.035
Social Functioning	4	-0.057 **	0.012	-0.064	-0.056 **	0.012	-0.064
Emotional Functioning	2	-0.024 *	0.012	-0.027	-0.024 *	0.012	-0.027
Emotional Functioning	3	-0.050 **	0.013	-0.057	-0.050 **	0.013	-0.057
Emotional Functioning	4	-0.096 **	0.012	-0.108	-0.096 **	0.012	-0.109
Pain	2	-0.034 **	0.013	-0.039	-0.034 **	0.012	-0.039
Pain	3	-0.094 **	0.013	-0.106	-0.093 **	0.013	-0.106
Pain	4	-0.111 **	0.012	-0.125	-0.110 **	0.012	-0.125
Fatigue	2	-0.035 **	0.011	-0.040	-0.035 **	0.011	-0.040
Fatigue	3	-0.055 **	0.013	-0.062	-0.054 **	0.012	-0.061
Fatigue	4	-0.061 **	0.011	-0.068	-0.060 **	0.011	-0.068
Sleep disorders	2	-0.041 **	0.011	-0.046	-0.041 **	0.011	-0.046
Sleep disorders	3	-0.051 **	0.012	-0.058	-0.051 **	0.012	-0.058
Sleep disorders	4	-0.057 **	0.010	-0.065	-0.057 **	0.010	-0.064
Lack of appetite	2	-0.042 **	0.011	-0.047	-0.041 **	0.011	-0.047
Lack of appetite	3	-0.055 **	0.013	-0.062	-0.054 **	0.013	-0.061
Lack of appetite	4	-0.074 **	0.012	-0.083	-0.073 **	0.012	-0.083
Nausea	2	-0.039 **	0.012	-0.044	-0.040 **	0.012	-0.045
Nausea	3	-0.067 **	0.013	-0.075	-0.066 **	0.013	-0.075
Nausea	4	-0.072 **	0.012	-0.081	-0.071 **	0.012	-0.080
Bowel problems	2	-0.027 *	0.012	-0.030	-0.026 *	0.012	-0.030
Bowel problems	3	-0.035 **	0.012	-0.039	-0.034 **	0.012	-0.039
Bowel problems	4	-0.049 **	0.011	-0.055	-0.049 **	0.011	-0.055

* p<0.05; ** p<0.01;

[a] Level 2= a little; Level 3 = quite a bit; Level 4 = very much; SE= Standard

3.4 Comparison of value sets from cancer patients versus the general population

Utility decrements increased monotonically with higher severity levels in most dimensions in both value sets. The cancer patient value set had more dimensions with monotonic decrements than the general population value set, requiring fewer corrections. Functional dimensions (e.g., physical, emotional) exhibited larger utility decrements than symptom dimensions in both value sets. Physical functioning had by far the biggest utility decrements in both value-sets, and pain ranked second in both. Emotional functioning ranked third in the cancer patient value set, while role functioning ranked third in the general population value set (Figure 1). For the symptoms, the patient data consistently yielded larger decrements than the general population data, except for pain. The standard errors for cancer patients' utility decrement—visualized as error bars in Figure 1—occasionally exceed these observed differences, with such error bars reflecting statistical uncertainty.

Figure 2 compares utility decrements across severity levels from the cancer patient value set and the general population value set (with the baseline set at 0), highlighting absolute differences. Cancer patients showed significantly larger decrements across all dimensions, except for certain levels of role and social functioning and sleep disorders, and all levels of pain. The largest differences were observed at level 2, particularly in symptom dimensions like fatigue, lack of appetite, and bowel problems.

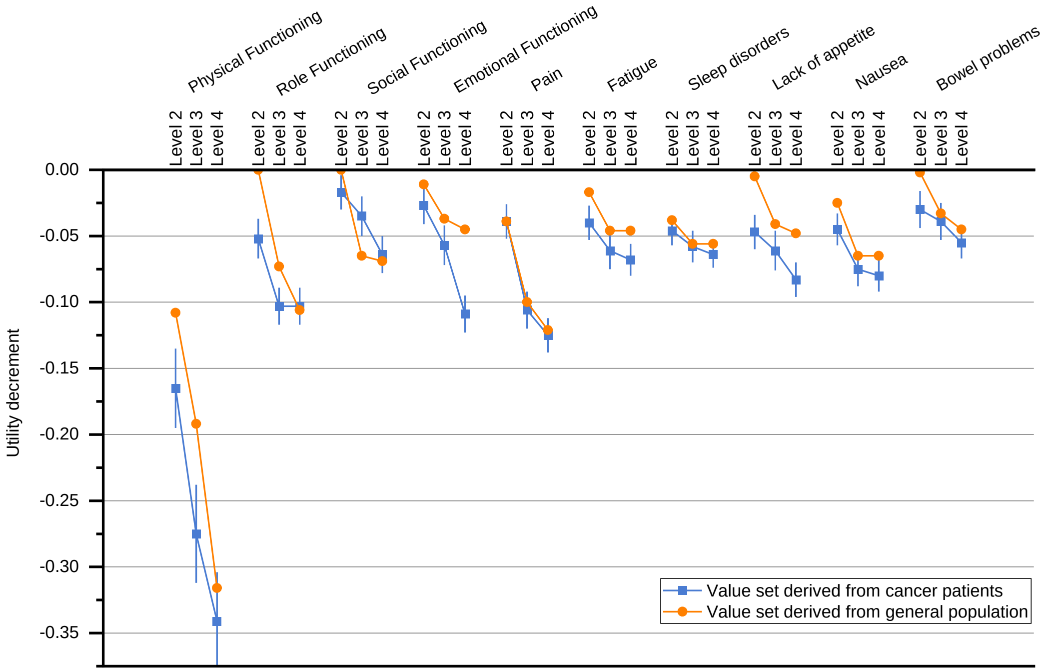

Fig. 1 QLU-C10D value sets for the cancer patient sample and the general population

Note: The value set derived from the general population is based on data from a published study[45].

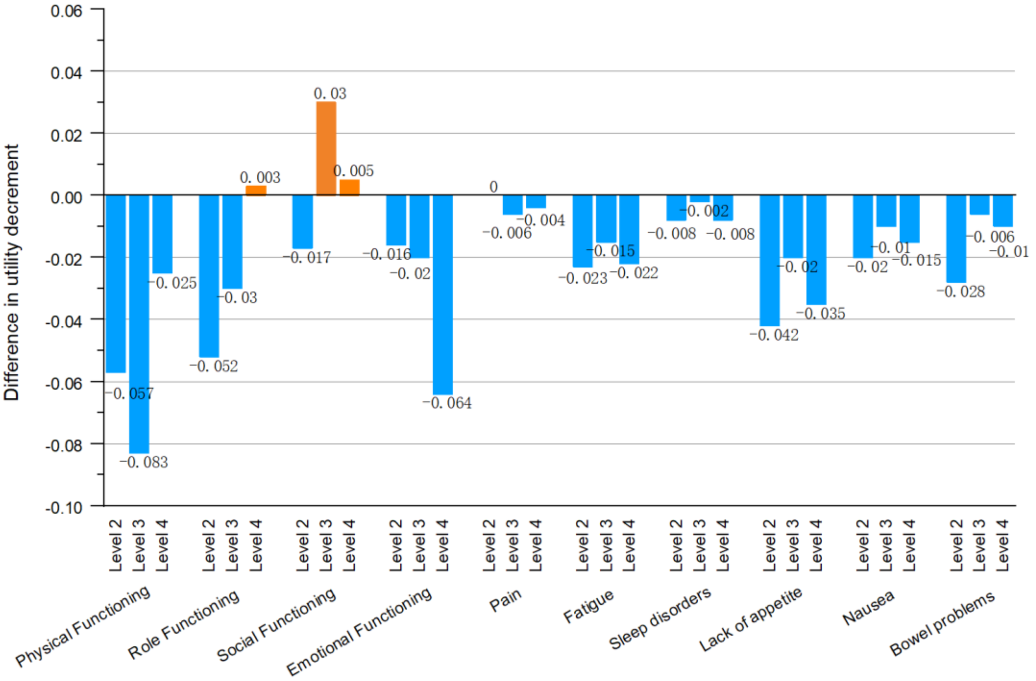

Fig. 2 Difference in value sets between cancer patients and the general population

Note: The baseline (0) represents the value set derived from the general population. The value set derived from the general population is based on data from a published study[45].

Figure 3 shows utility values for 1,000 randomly selected QLU-C10D health states, estimated using value sets from cancer patients and the general population, and ordered according to the values from the general population. Utility values from the cancer patient value set were consistently lower, especially for better health states.

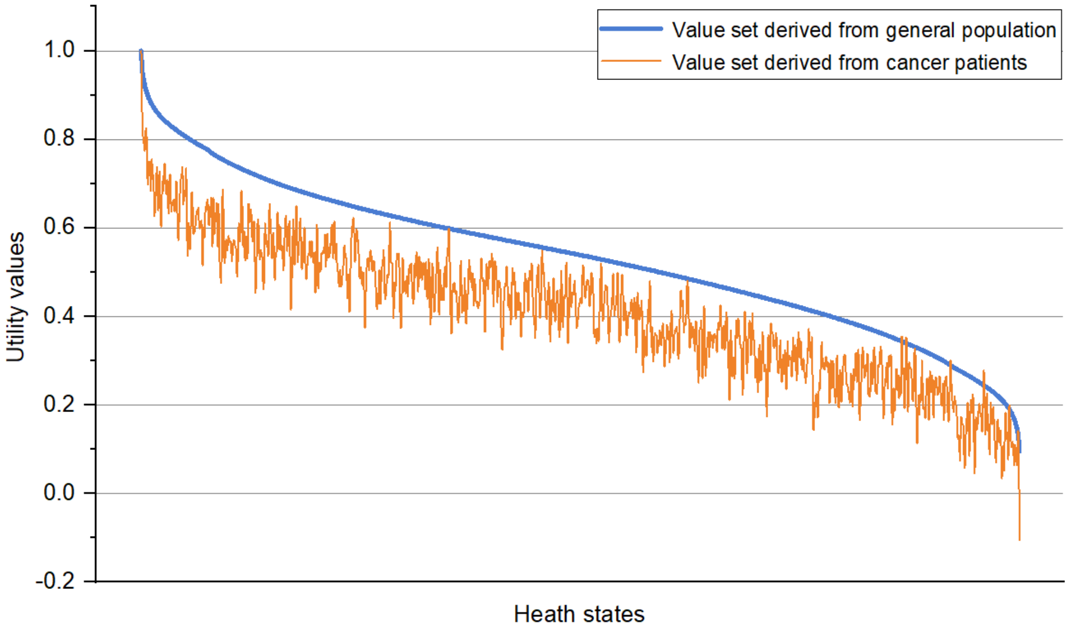

Fig. 3 QLU-C10D health states values estimated using value sets derived from Chinese cancer patients and the Chinese general population (based on data from a published study[45]), ordered according to the

values from the general population.

Figure F in the supplementary material presents utility value distributions for cancer patients using both patient and general population value sets. The cancer patient value set had a broader range (-0.035 to 1.0) and lower mean utility score (0.656) compared to the general population value set (0.091 to 1.0, mean score: 0.783), with a significant difference (P<0.01). High agreement was observed (ICC = 0.87). The Bland-Altman plot (Figure G in the supplementary material) showed proportional bias, with 95% limits of agreement ranging from -0.30 to 0.05.

3.5 Sensitivity comparison between value sets derived from cancer patients and the general population

Utility values derived from the general population and cancer patient value sets differed significantly (p<0.01) across groups stratified by cancer stage and ECOG performance status (Table 3). ES estimates comparing extreme subgroups for the cancer patient value set were larger than those for the general population for cancer stage and ECOG performance status, with larger incremental utilities.

Table 3 Sensitivity for value sets derived from Chinese cancer patients and general population

Preferences	**Cancer stage**	**N**	**Mean (SD)**	***p*-value**	**ES**	**Incremental utilities**
Cancer patients	I	195	0.84±0.14			
	II	252	0.68±0.20			
	III	137	0.40±0.12			
	IV	25	0.26±0.23	<0.01	4.46	0.49
General population	I	195	0.90±0.09			
	II	252	0.81±0.13			
	III	137	0.60±0.13			
	IV	25	0.47±0.16	<0.01	3.48	0.33
Preferences	**ECOG**	**N**	**Mean (SD)**	***p*-value**	**ES**	**Incremental utilities**
Cancer patients	Grade 0	154	0.87±0.17			
	Grade 1	361	0.64±0.21			
	Grade 2	111	0.49±0.21			
	Grade 3	28	0.42±0.23			
	Grade 4	5	0.39±0.18	<0.01	2.76	0.48
General population	Grade 0	154	0.92±0.12			
	Grade 1	361	0.78±0.14			
	Grade 2	111	0.65±0.17			
	Grade 3	28	0.56±0.22			
	Grade 4	5	0.55±0.19	<0.01	2.47	0.37

ES: Effect size; SD: Standard deviations

Note: The analyses of cancer stage excluded leukemia cases (N=609), whereas all other analyses were conducted on the full sample (N=659).

4 Discussion

This study developed a QLU-C10D value set based on the health preferences of cancer patients in China, the country with the highest cancer incidence globally [51], and compared them with the QLU-C10D value set of the general public in China derived. This enabled us to examine differences between cancer patient versus general population value sets within the same geographic and cultural context and with similar DCE valuation methodology. The cancer patient value set—with a broader range and lower utility values—reflects a key finding from DCE tasks: cancer patients assigned higher priority to improvements in QLU-C10D attributes than to survival time extension alone. Moreover, the cancer patient value set exhibits greater sensitivity in distinguishing between different disease subgroups, perhaps better capturing the prioritization of symptom control and quality of life improvements. These insights provide valuable guidance for selecting reference groups in health economic evaluation and underscore the importance of tailoring value sets to patient populations in specific contexts.

Among Chinese cancer patients, physical functioning, pain, and emotional functioning exhibit the highest utility decrements, which is consistent with findings from Singaporean cancer patients [50]. This similarity is likely influenced by shared Southeast Asian cultural contexts. However, in the value set for Chinese general population, emotional functioning exhibits the smallest utility decrement [45]. This discrepancy may be attributed to China's unique disease culture and traditional Chinese medicine belief that "emotions can cause cancer, and emotions can heal cancer" [68]. Utility decrements from the cancer patient value set exceed those from the general population across most dimensions, particularly symptom-related ones. The consequence is that the cancer patient health state values are generally lower than those of the general population, with the maximum difference at the pit state (-0.092 versus 0.083). The most likely explanation of preference differences that patients' have a nuanced understanding of health impairments through their lived experience and conversely that the general population tend to underestimate the impact of symptoms due to a lack of firsthand experience [9, 69]. It is important to note that cross-population differences could also reflect scale heterogeneity (i.e., variations in choice consistency) [70], as well as differences in model constraints applied to address non-monotonicities between groups. These factors may influence utility estimates beyond true preference differences, warranting cautious interpretation. While some studies suggest that patients may evaluate the impact of health impairments less than the general population [12, 13], this is often attributed to generic PBMs failing to capture patients' specific concerns about symptoms and quality of life. A systematic review found that preference differences between patients and the general population are in the same direction as in our study, and are more pronounced in disease-specific PBMs than in generic PBMs [5].

Compared to the value set of the general population, cancer patients demonstrate significantly larger utility decrements for lower severity levels (Level 2) symptoms, such as fatigue, nausea, and bowel problems, which is similar with findings from the Singaporean cancer patient value set [50]. This leads to more pronounced differences between patient versus general population value sets for better health states, while differences are smaller for worse health states. It can be inferred that cancer patients prioritize alleviating mild symptoms, likely due to their heightened sensitivity to physical vulnerability and the cumulative burden of long-term treatments. Physiologically, persistent chronic pain and treatment-related side effects significantly amplify patients' sensitivity to minor symptoms in cancer patients [71]. Psychologically, the profound anxiety about health deterioration triggered by a cancer diagnosis further intensifies this heightened sensitivity[72]. Our finding that differences in decrements between patient versus general population value sets were less pronounced at higher symptom severity levels was possibly due to patients' stronger desire for life extension and greater tolerance for discomfort [73]. This is supported by the higher time coefficient (0.882) observed in this patient cohort compared to the general population's time coefficient (0.531) [45]. A similar trend was evident in Singapore, where the time coefficient was notably higher for cancer patients (0.529) than for the general population (0.285)[50].

This study demonstrated the sensitivity of both value sets to cancer stage and performance status. However, when extrapolating intergroup differences to QALY gains based on changes in health states, the general population value set would tend to yield lower QALY gains than the cancer patient value set due to the systematically higher utility values from the general population. In the absence of specific decision-making preferences, and in cancer-specific decision-making, the cancer patient value set may be preferred as it more accurately reflects the treatment priorities of the patients. Some authors argue that value sets from the general population may be more suitable for HTA agencies adopting a payer perspective, while patient-derived index scores are better suited for patient registries, population health studies, and personalized medicine [36]. Furthermore, the differences between this study's cancer patient value set and Singapore's highlight the need for country-specific cancer value sets. Although recruiting cancer patients and conducting face-to-face interviews are more costly, hybrid methods, such as recalibrating general population value sets from the patient perspective, could enhance QALY comparability. Incorporating patient preferences into value sets and reprioritizing items based on their perspectives [17] could also be applied to QLU-C10D preference studies, enabling flexible integration of both societal and patient-based value sets in unified evaluations. Additionally, the online elicitation of personal utility functions (OPUF) tool offers a feasible approach for constructing value sets based on the preferences of small samples of cancer patients, which warrants further exploration and validation in future research[74].

This study has notable strengths, including adherence to the internationally standardized MAUCa Consortium protocol, amended for the patient context by use of a trained interviewer to facilitate the DCE valuation task, as done in the QLU-C10D pilot patient valuation [10]. Cognitive interviews conducted in the pilot patient valuation revealed patients' need for additional effort, time and explanation to make the DCE tasks easier to understand. Our interviewers provided that extra time and explanation, resulting in more positive participant feedback on the valuation process relative to the pilot [10]. Another study strength was that it enabled comparisons of health preferences between Chinese cancer patients and general population, as well as cross-country comparisons. However, several limitations should be acknowledged. Firstly, patient recruitment was limited to two tertiary public hospitals in Harbin, China. While this approach ensured data quality and feasibility, it may limit the generalizability of our findings, as the recruited sample might not fully represent the broader cancer patient population across China in terms of socioeconomic, regional, and clinical diversity. Secondly, voluntary participation may have introduced sample bias, potentially favoring individuals with milder conditions or better treatment outcomes, while close interviewer involvement could have induced some social desirability bias. Thirdly, we did not apply education weighting (as used in the general population value set) due to inherent differences in education distributions between cancer patients and the general population; this omission may weaken the stability of extrapolating our findings for cross-group comparisons. Finally, as with all stated preference methods, our use of discrete choice experiments may be subject to hypothetical bias, where participants' stated choices may not perfectly reflect real-world decision-making.

5 Conclusion

This study developed the first QLU-C10D value set based on the preferences of Chinese cancer patients, offering a vital resource for patient-centered clinical decision-making in the country with the highest cancer incidence worldwide. Furthermore, by comparing value sets derived from cancer patients and the general population of the same country, language and culture, and using a very similar valuation protocol, the study underscores the potential differences between the two, highlighting the importance of more comprehensively integrating patient perspectives into existing evaluation frameworks.

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Supplementary material

Quality of Life Utility-Core 10 Dimensions (QLU-C10D) scores based on cancer patients' health preferences are more sensitive than those based on general public's health preferences

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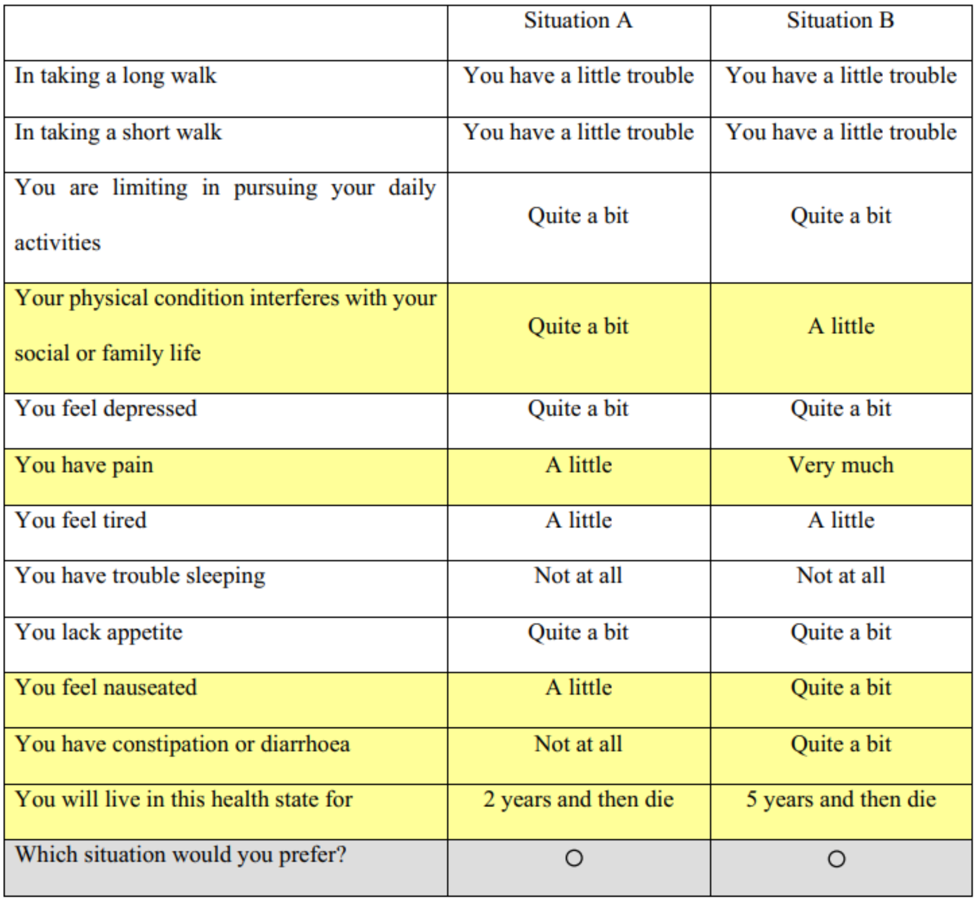
Contents

Table A Health state classification system of the QLU-C10D

Dimension	Level	Stem	Descriptor	QLQ-C30 item scores
Physical functioning	1	You have…	No trouble taking a long walk outside of the house	Item 2 (long walk) = 1
	2		No trouble taking a short walk outside of the house, but at least a little trouble taking a long walk	Item 3 (short walk) = 1 AND Item 2 ≥ 2
	3		At least a little trouble taking a short walk outside of the house, and at least a little trouble taking a long walk	Item 3 = 2 AND Item 2 ≥ 2
	4		Quite a bit or very much trouble taking a short walk outside the house	Item 3 ≥ 3 AND Item 2 ≥ 2
Role functioning	1	You are limited in pursuing your work or other daily activities…	Not at all	Item 6 = 1
	2		A little	Item 6 = 2
	3		Quite a bit	Item 6 = 3
	4		Very much	Item 6 = 4
Social functioning	1	Your physical condition or medical treatment interferes with your social or family life…	Not at all	Items 26 AND 27 = 1
	2		A little	Items 26 OR 27 = 2
	3		Quite a bit	Items 26 OR 27 = 3
	4		Very much	Items 26 OR 27 = 4
Emotional functioning	1	You feel depressed…	Not at all	Item 24 = 1
	2		A little	Item 24 = 2
	3		Quite a bit	Item 24 = 3
	4		Very much	Item 24 = 4
Pain	1	You have pain…	Not at all	Item 9 = 1
	2		A little	Item 9 = 2
	3		Quite a bit	Item 9 = 3
	4		Very much	Item 9 = 4
Fatigue	1	You feel tired…	Not at all	Item 18 = 1
	2		A little	Item 18 = 2
	3		Quite a bit	Item 18 = 3

	4		Very much	Item 18 = 4
Sleep	1	You have trouble sleeping…	Not at all	Item 11 = 1
	2		A little	Item 11 = 2
	3		Quite a bit	Item 11 = 3
	4		Very much	Item 11 = 4
Appetite	1	You lack appetite…	Not at all	Item 13 = 1
	2		A little	Item 13 = 2
	3		Quite a bit	Item 13 = 3
	4		Very much	Item 13 = 4
Nausea	1	You feel nauseated…	Not at all	Item 14 = 1
	2		A little	Item 14 = 2
	3		Quite a bit	Item 14 = 3
	4		Very much	Item 14 = 4
Bowel problems	1	You…	do not have constipation or diarrhoea at all	Items 16 AND 17 = 1
	2		have a little constipation or diarrhoea	Items 16 OR 17 = 2
	3		have constipation or diarrhoea quite a bit	Items 16 OR 17 = 3
	4		have constipation or diarrhoea very much	Items 16 OR 17 = 4



	Situation A	Situation B
In taking a long walk	You have a little trouble	You have a little trouble
In taking a short walk	You have a little trouble	You have a little trouble
You are limiting in pursuing your daily activities	Quite a bit	Quite a bit
Your physical condition interferes with your social or family life	Quite a bit	A little
You feel depressed	Quite a bit	Quite a bit
You have pain	A little	Very much
You feel tired	A little	A little
You have trouble sleeping	Not at all	Not at all
You lack appetite	Quite a bit	Quite a bit
You feel nauseated	A little	Quite a bit
You have constipation or diarrhoea	Not at all	Quite a bit
You will live in this health state for	2 years and then die	5 years and then die
Which situation would you prefer?	○	○

Fig. A Example of a choice set used in the discrete choice experiment valuation task to determine utility weights for the QLU-C10D

	健康状态A	健康状态B
对于长距离步行	有一点困难	有一点困难
对于短距离步行	有一点困难	有一点困难
您的工作和生活受到疾病限制	相当多	相当多
您的身体状况或医学治疗干扰到您的家庭或社交活动	相当多	有一点
您感到沮丧	相当多	相当多
您感到疼痛	有一点	非常多
您感到疲劳	有一点	有一点
您睡眠困难	没有	没有
您胃口不好	相当多	相当多
您感到恶心	有一点	相当多
您有便秘或腹泻	没有	相当多
您将在这种健康状态下生活	2年,然后去世	1年,然后去世
您选择哪一个?	○	○

Fig. B An example choice set from the discrete choice experiment valuation task in Chinese as presented to survey participants

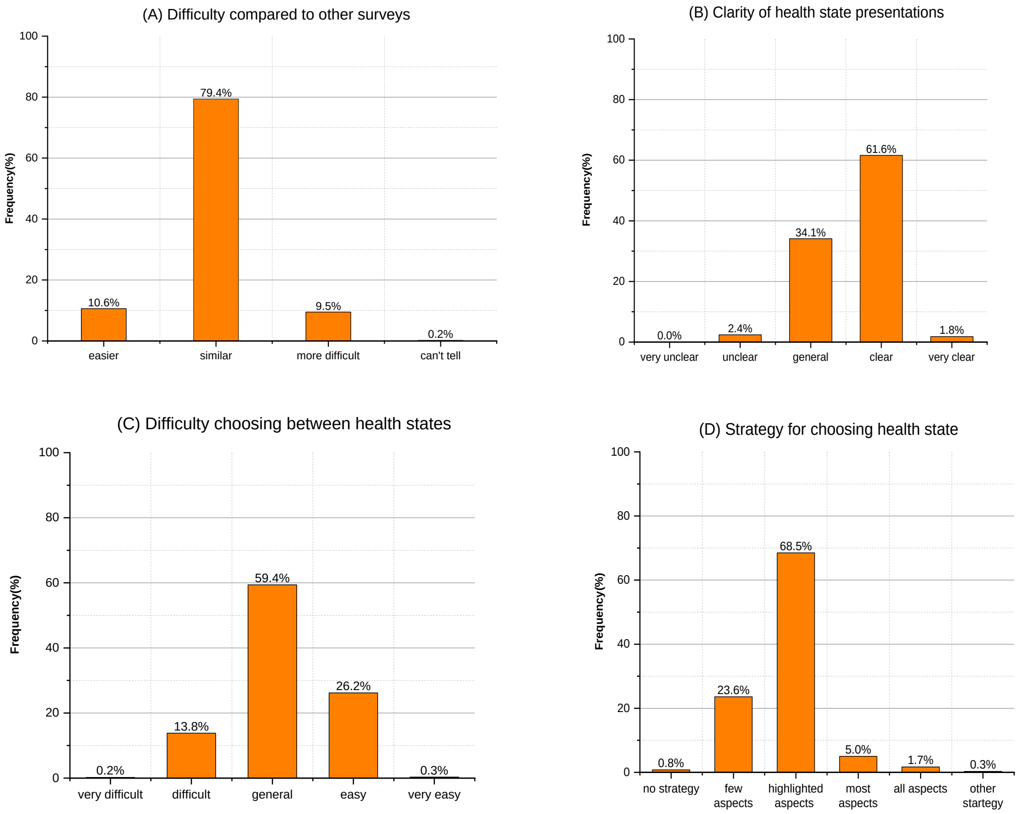


Fig. C Results from the QLU-C10D valuation survey feedback questions from patients

Data Quality Results and Discussion

Overall, as respondents became more familiar with the choice task, all respondents across the completion time deciles sped up (Figure D). Respondents in the sixth decile yielded the most statistically significant coefficients (24 of a possible 31). Although faster respondents produced fewer statistically significant coefficients, suggesting more random data, the pseudo-R^2 values of the fastest decile groups were relatively high. The slower respondents also produced fewer statistically significant coefficients, and the two slowest two deciles had the lowest pseudo-R^2 values (Figure E).

This phenomenon may be related to the following differential patterns of survey engagement in this cancer patient cohort. During the interviews, we observed that younger and healthier patients were often more willing to complete the questionnaire independently, with less need for the interviewer's explanation and interaction. They tended to complete tasks more quickly, making them more likely to appear in the earlier percentiles. In contrast, we observed that patients in poorer health or older patients generally required more time and assistance from the interviewer, even though both the interviewer's feedback and statistical results are less ideal. These informal observations were confirmed by corresponding differential composition of age and performance status across different percentiles (data not shown).

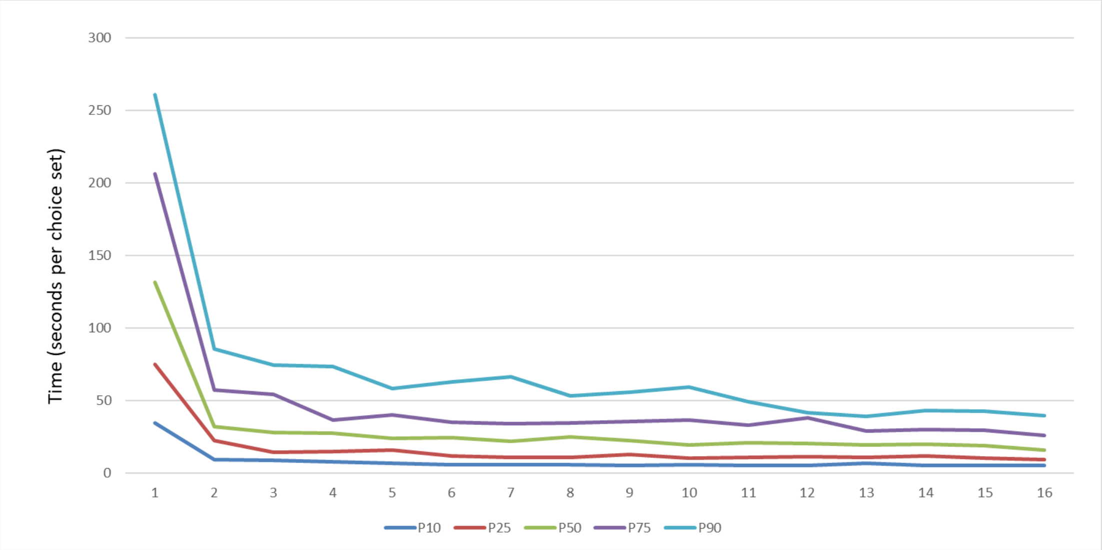


Fig. D Distribution of time to completion by choice set

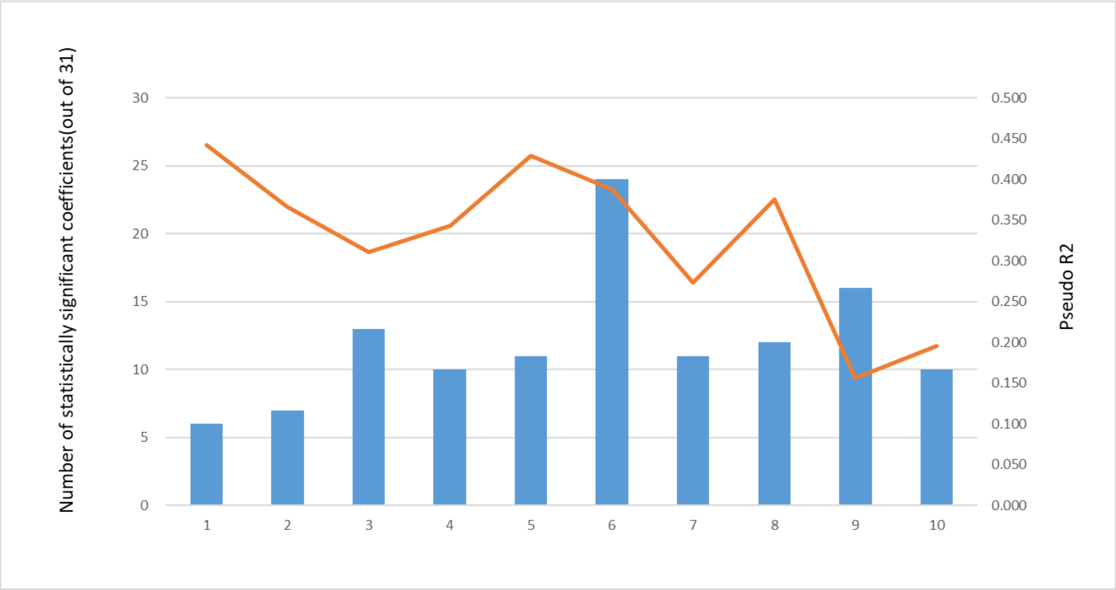


Fig. E **Relationship of completion time decile with model fit** (pseudo R-squared, orange line) and number of statistically significant coefficients (blue bars). Decile 1 contains the fastest 10% of respondents and decile 10 contains the slowest 10%.

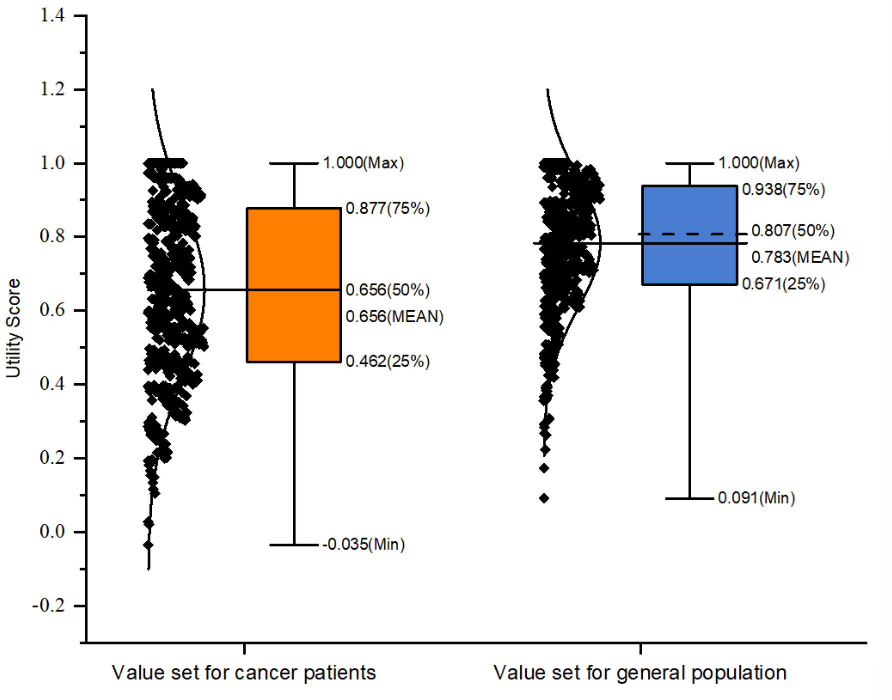


Fig. F Utility values of the Chinese cancer patients who participated in this study, calculated based on value sets derived from those cancer patients and the Chinese general population

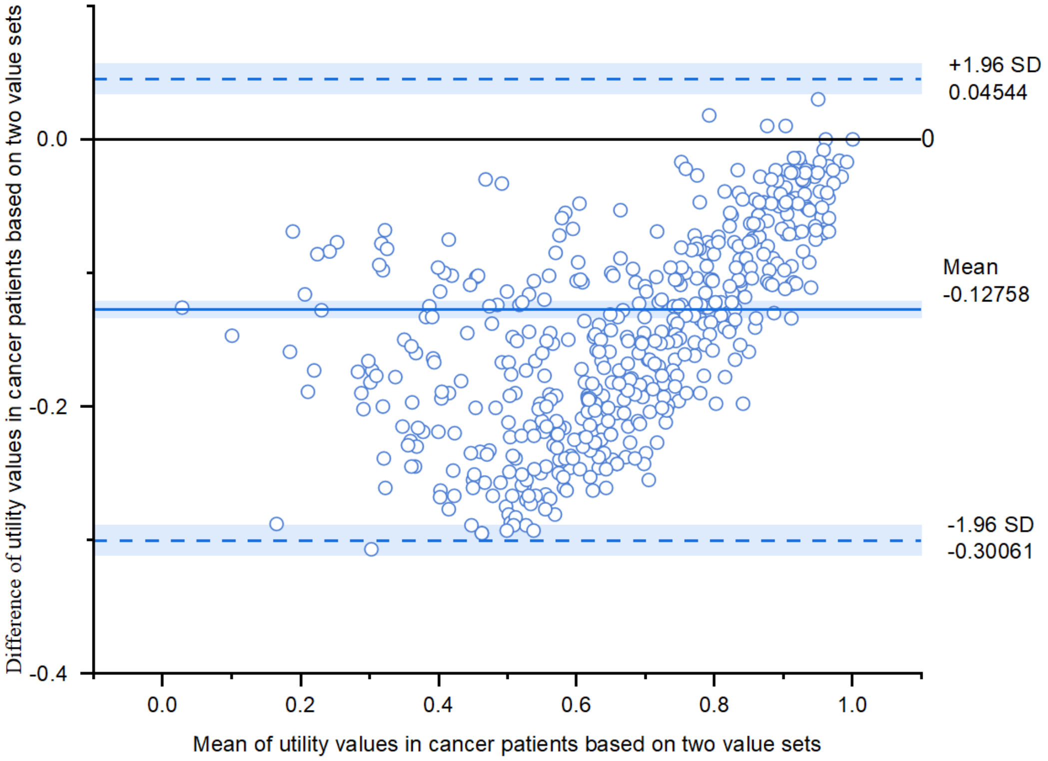


Fig. G Bland-Altman plot of utility values of the Chinese cancer patients who participated in this study calculated based on value sets derived from those cancer patients and the Chinese general population