



ScienceDirect

Contents lists available at sciencedirect.com
Journal homepage: www.elsevier.com/locate/jval

Preference-Based Assessments

Deciding Between SF-6Dv2 Health States: A Think-Aloud Study of Decision-Making Strategies Used in Discrete Choice Experiments



Lynne Broderick, MPH, Jakob B. Bjorner, PhD, Miranda Lauher-Charest, ScM, Michelle K. White, PhD, Mark Kosinski, MA, Brendan Mulhern, PhD, John Brazier, PhD

ABSTRACT

Objective: This study aimed to gain insight into decision-making strategies individuals used when evaluating pairs of SF-6Dv2 health states in discrete choice experiments (DCEs).

Methods: This qualitative, cross-sectional, noninterventional study asked participants to use a think-aloud approach to compare SF-6Dv2 health states in DCEs. Thematic analysis focused on comprehension and cognitive strategies used to compare health states and make decisions.

Results: Participants (N = 40) used 3 main strategies when completing DCEs: (1) trading, (2) reinterpretation, and (3) relying on previous experience. Trading was the most common strategy, used by everyone at least once, and involved prioritizing key attributes, such as preferring a health state with significant depression but no bodily pain. Reinterpretation was used by 17 participants and involved reconstructing health states by changing underlying assumptions (eg, rationalizing selecting a health state with significant pain because they could take pain medications). Finally, some (n = 13) relied on previous experience when making decisions on some choice tasks. Participants with experience dealing with pain, for instance, prioritized health states with the least impact in this dimension.

Conclusions: Qualitatively evaluating the decision-making strategies used in DCEs allows researchers to evaluate whether the tasks and attributes are interpreted accurately. The findings from this study add to the understanding of the generation of SF-6Dv2 health utility weights and the validity of these weights (e.g., reinterpreting health states could undermine the validity of DCEs and utility weights), and the overall usefulness of the SF-6Dv2. The methodology described in this study can and should be carried forth in valuing other health utility measures, not just the SF-6Dv2.

Keywords: discrete choice experiment, health state utility, qualitative, SF-6Dv2, think-aloud..

VALUE HEALTH. 2022; 25(12):2034–2043

Introduction

A discrete choice experiment (DCE) is a survey-based methodology wherein individuals assess attributes of different scenarios and choose between them, indicating their overall preference.^{1,2} When focused on health-related quality of life, data from DCEs can be used to derive utility indices for calculating quality-adjusted life-years (QALYs), according to individuals' preferences for living in different health states.^{1,2} DCEs have been used to estimate utility weights for health utility measures, such as the EQ-5D and SF-6D Health Utility Survey (SF-6D).^{3–7}

In DCEs used to value health utility measures, participants are asked to choose among 2 health states, each characterized by a length of survival and a level on each of the health dimensions, or attributes, covered by the measures. Attributes assessed in DCEs need to be leveled (ie, each could be perceived as better or worse than another) and capable of being traded (ie, individuals are willing to swap “worse” attributes for “better” ones).^{8,9} The

derivation of utility weights rests on assuming (1) participants will assume health states are stable over time (eg, moderate pain for 2 years is twice as bad as 1 year), (2) participants will consider the length of survival and the decrement from negative health states along the dimensions of the measure (eg, negative outcomes are traded against positive outcomes), and (3) participants will tend to choose the health state with the largest utility.^{2,10–12}

These underlying assumptions come with inherent problems. First, if an attribute is not clearly understood, there is a risk the individual will ignore it (ie, attribute nonattendance).^{8,11–18} Next, individuals might be unwilling to trade because they have a dominant preference for a single attribute, and make decisions based solely on that preference (ie, lexicographic preferences).^{8,9,14} To minimize measurement error, careful consideration of study design and methods is needed to ensure participants interpret DCE tasks and attributes accurately.^{14,19}

Despite these potential issues, DCEs are important in the development of health utility measures. They examine patient

Figure 1. Sample DCE exemplifying SF-6Dv2 domains and pairing of health state attributes.

	Health Description A	Health Description B
Years of life left until death	You live for 10 years with the following then you die:	You live for 1 year with the following then you die:
Physical Functioning	Limited in vigorous activities not at all	Limited in moderate activities a lot
Role Functioning	Accomplish less than you would like all of the time	Accomplish less than you would like some of the time
Pain	No pain	Mild pain
Vitality	Worn out none of the time	Worn out some of the time
Social Functioning	Social activities are limited all of the time	Social activities are limited most of the time
Mental Health	Depressed or very nervous none of the time	Depressed or very nervous most of the time
	Which do you prefer?	
	Health description A <input type="checkbox"/>	Health description B <input type="checkbox"/>

DCE indicates discrete choice experiment.

priorities, informing both healthcare policy and clinician education, and enable survey developers to estimate and select a value set for understanding health preferences.^{3,8,20,21} Previous research identified common strategies used when completing DCEs for estimating utility weights. These strategies align with the general assumptions described above and include trading,^{8,12,14,18,22} selecting the least risk/most positive scenario,^{11,14} making substitutions by ignoring/not attending to certain attributes,^{11,14} adding or inferring information not included in the scenario (including inferring causality between attributes),^{8,12,14} allowing 1 to 3 key attributes to influence decision making,^{8,12,14} changing the key attributes in each scenario,^{8,12,14} and considering all attributes.^{11,12}

Given the variety of potential completion strategies and issues linked to DCE tasks, it is recommended to pilot test DCEs—including asking individuals to complete them using a think-aloud approach—to a priori identify problems¹¹ and provide evidence participants interpret the task and attributes accurately.¹⁴

Cognitive interviewing, a qualitative research method informed by cognitive theory,²³ uses think-aloud and probing techniques to understand how individuals form judgments, make decisions, and answer survey questions.²⁴ It can be used to optimize survey design and implementation and to reduce measurement errors.²⁵

The purpose of this study was to use a think-aloud approach to gain insight into the decision-making process used by individuals when evaluating and selecting preferred SF-6Dv2 DCE health states.

Methods

Study Design

This qualitative, cross-sectional, noninterventional study consisted of one-on-one cognitive interviews. The 75-minute audio-recorded interviews were conducted by 1 of 2 experienced and trained qualitative researchers (L.B. and M.L.C.). All interviews were conducted using videoconferencing software, allowing for nationwide participation by a diverse geographic sample. All study

materials were approved by one central independent review board (WCG/New England Institutional Review Board Study #1293768).

Study Population

The study used purposive sampling to recruit 40 participants from the general population via a third-party recruitment vendor. The final sample size was predetermined based on the number of choice tasks, the complexity of the choice tasks, and the desired sample diversity.^{26,27} Specific quotas were established to ensure a diverse and representative sample in age, sex, presence of chronic health conditions, race/ethnicity, and education (see Appendix 1, Table 1 in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). All participants were required to be 18 years of age or older, living in the United States, and fluent in English.

Potential participants completed an online screening questionnaire to assess study inclusion criteria and demographic information. A total of 87 potential participants were screened for eligibility, and recruitment was stopped when all quotas were met. Participants were excluded from the study if they were unwilling or unable to participate in an interview. During screening, participants were also asked how they would describe their current health (poor, fair, good, very good, excellent) and to rate their health satisfaction on a scale from 0 (not at all satisfied) to 10 (completely satisfied).

Study Procedures

During each interview, participants completed DCE choice tasks using a think-aloud approach. Participants were asked to read all information in each choice task out loud and to articulate their thoughts—including any points of confusion and how they ultimately decided the meaning of the item in question—as they read the health states and selected which they preferred. Upon completing each choice task, participants responded to semi-structured follow-up questions, and spontaneous probing questions if necessary, to help the interviewer better understand their decision-making process and rationale for the choice they made.

Table 1. Participant characteristics.

Demographics	n (%)	
Sex		
Female	23 (57.5)	
Male	17 (42.5)	
Age	Female	Male
18-29 years	1 (4)	0 (0)
30-39 years	9 (39)	4 (24)
40-49 years	2 (9)	4 (24)
50-59 years	9 (39)	6 (35)
60+ years	2 (9)	3 (18)
Race/ethnicity		
White	26 (65.0)	
Black or African American	10 (25.0)	
Asian	3 (7.5)	
Hispanic/Latino or of Spanish origin	3 (7.5)	
Education		
High school diploma or GED	11 (27.5)	
Some college but no degree	5 (12.5)	
Associate's degree or technical certificate	8 (20.0)	
Bachelor's degree (BA, BS)	10 (25.0)	
Graduate degree (MA, MS, PhD, MD, etc)	6 (15.0)	
Has chronic health condition		
Yes	29 (72.5)	
No	11 (27.5)	
Region of residence		
Northeast	12 (30.0)	
West	7 (17.5)	
Midwest	5 (12.5)	
South	16 (40)	
Current work status		
Retired	4 (10.0)	
On disability or leave of absence	2 (5.0)	
Temporarily furloughed	1 (2.5)	
Unemployed, but looking for work	1 (2.5)	
Employed full time (\geq 40 hours per week)	21 (52.5)	
Employed part time ($<$ 40 hours per week)	8 (20.0)	
Student (full or part time)	5 (12.5)	
Stay-at-home parent or spouse	4 (10.0)	
Other: self-employed	1 (2.5)	

GED indicates General Educational Development.

For each choice task, participants rated on a scale of 0 to 10 how difficult it was to select a preferred health state. After each interview, the audio recording was sent for verbatim transcription and each participant was given an honorarium.

To minimize burden, participants were divided into 8 groups of 5 by their order of entry into the study. Each group of 5 was asked to complete 1 of 8 sets of 4 choice tasks evaluating and selecting from pairs of SF-6Dv2 health state profiles (health

states A and B). Each pair of health state profiles included the following attributes (Fig. 1): years of life left until death, physical function (activity limitations), role function (limitations accomplishing tasks), pain intensity, vitality, social function (limitations in social activities), and mental health (feeling depressed or very nervous). Choice tasks were strategically selected so (1) very unusual health states were avoided by only including health states observed in a large general population data set ($N = 75\,000$),²⁸ (2) comparisons including identical levels for 1 or more attributes were avoided, and (3) the number of different attribute levels being examined was maximized. The health states were scored using UK utility weights⁴ and choice tasks were characterized as representing a large or small QALY difference (compared with the median difference of 2.4) and a high or a low average QALY level (compared with the median average level of 1.7). The first-choice task in each set represented a large QALY difference between health states and a high average QALY level, the second-choice task represented a large difference and a low level, the third-choice task represented a small difference and a high level, and the fourth-choice task represented a small difference and a low level. These selection criteria aimed to make the tasks challenging but realistic, starting with easier tasks before proceeding to more challenging tasks.

Coding and Analysis

Coding of interview data began immediately after each interview based solely on interviewer field notes. The interviewers populated a spreadsheet with any notable issues that arose during the interview and recorded choice task preferences.

Once received, all transcripts were cross-checked against the initial coding spreadsheet to ensure consistency and completeness and then coded using NVivo software (QSR International Pty Ltd, Burlington, MA, 2018). Transcripts were coded to identify overall opinions on the choice tasks, the decision-making approaches and strategies used when evaluating the health states, and any other suggestions or insights. The researchers independently coded the same first 2 transcripts and then met to review their coding and resolve any discrepancies. This meeting allowed for any adjustments to the codebook and code definitions. Once coding was consistent, the remaining transcripts were randomly divided between the 2 coders and coded independently. The coders communicated throughout coding (3 formal meetings) to ensure consistency and address any questions; the study principal investigator (L.B.) reviewed all coding to ensure coding reliability.

Once transcripts were coded, the 2 researchers used inductive thematic analysis to distill meaning from the data. Thematic analysis is a qualitative method in which researchers identify and interpret common themes or patterns of meaning throughout the data.^{29,30} Analysis focused on the cognitive strategies used to compare and select preferred health states. This analysis included an assessment of each participant's decision-making process, preferential attributes of each scenario, clarity of health descriptions, and the level of difficulty in making decisions.

Given that each health state was assigned a utility score using the UK weights,⁴ the research team queried the coded data to evaluate (1) whether cognitive strategies differed according to utility score (ie, whether different strategies were used for health states with high versus low QALY scores) and (2) whether strategies differed according to large versus small differences between the 2 health states. Finally, the data were organized into sets according to age (18-49 years and 50 years or older) and presence or absence of a chronic health condition and queried to determine whether the cognitive strategies used in decision making differed according to these factors.

Results

Participant Demographics

Notably, 40 individuals participated in this study. Participants were white ($n = 26$, 65.0%), were female ($n = 23$, 58.0%), had completed some form of post-high school education ($n = 29$, 72.5%), and had a chronic health condition ($n = 29$, 72.5%). Half of the sample was between the ages of 18 and 49 years, and the other half was age 50 years or older; 14 participants (35%) rated their overall health as “very good” or “excellent.” Health satisfaction ratings were wide ranging across the 11-point scale, with an average of 5.8 (lowest and highest observed scores were 1 and 9, respectively). See [Table 1](#) for additional demographic data.

Strategies Used

Interviewers observed participants understood the choice tasks and easily completed them. This was confirmed by participants' answers to the questions asked after the think-aloud.

Participants used 3 main strategies when comparing and selecting preferred health states: (1) trading, (2) reinterpreting a health state, and (3) relying on previous experience or preconceived ideas of an attribute. Participants most often used 1 decision-making strategy per choice task. In some cases, participants used the same strategy for every choice task whereas others switched strategies each time. Although decision making was not a linear process, a general pattern for decision making was found across vignettes. When initially evaluating each choice task, participants were observed easily identifying either a key attribute to prioritize or whether deeper consideration of the health states was needed. [Figure 2](#) illustrates the cognitive strategies participants were observed using in this study. Response strategies not following this pattern included a single participant who added up self-defined positives in each scenario and selected the health state with the highest score.

Trading

Trading was the most common strategy deployed in decision making and was used by every participant at least once. When trading, participants sacrificed 1 or more attributes for another. Participants used hierarchical decision making, prioritizing specific, key attributes over others ([Table 2](#)). Participants would compare those key attributes between the 2 health states and ultimately base their decision on this comparison, trading less preferable attributes in favor of the key attributes. Nevertheless, some participants were less focused on key attributes and more generally traded multiple less preferable attributes for preferable ones. Less pain, better mental health, and more years of life were frequently determined to be key attributes in a trade. Only when participants considered the combination of key attributes in description A to have similar values to the combination of those in description B did they consider other health dimensions (vitality; physical, role, and social functioning).

Reinterpretation of health state

Just less than half of participants ($n = 17$) would, for 1 or more choice tasks, reinterpret or change the underlying assumptions of 1 or both health states ([Table 2](#)). In using this strategy, participants refused to believe 1 or more of the attributes presented would remain the same for the duration of time provided or refused to believe attributes could go together. In not accepting the less desirable attributes as static, participants indicated they could change over time given the more positive attributes (eg, not having pain would, over time, improve mental health).

Alternatively, in refusing to believe the attributes they were presented with could coexist (eg, severe pain and no social limitations), participants selected the health state in which the attributes seemed more consistent and in line with their expectations. Participants also reinterpreted the health states by inferring outside information that was not presented to them. For example, some rationalized living with high levels of pain because they could take pain medications. One participant interpreted all the health states to mean they had a chronic or fatal condition and made decisions based on that inference.

Relying on previous experience/preconceived ideas of attribute

The final strategy participants used when deciding between 2 health states was relying on previous experience or preconceived ideas of an attribute ([Table 2](#)). This strategy was used at least once by 13 participants. Participants were more apt to use this strategy for attributes with which they had personal experience, most commonly pain and mental health. Participants with experience with significant pain or episodes of depression or anxiety most often prioritized health states with the least impact in these dimensions, regardless of the severity of the other dimensions. This strategy was also used when participants more broadly considered their nonhealth life situations, including how the severity of some attributes might impact their ability to care for their families. Although the use of the other strategies may also have been influenced by personal experience, this strategy is distinct in that participants explicitly indicated when and why they were taking a specific experience or preconceived notion into account versus focusing in on a key attribute.

Comparison of high and low scores and large versus small differences in scores

Trading was the predominant strategy used across all DCEs regardless of utility score or the difference between the utility scores of the 2 health states (see [Appendix 2, Table 1](#) in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). Although some participants used multiple strategies to make their decisions, this approach did not appear to be related to either the utility score level or the difference between the 2 scores. Subsequently, we examined patterns in strategies used by how difficult participants rated the decision-making process (on a scale of 0-10). In general, participants tended to rate health state comparisons with smaller differences (< 2.4) as more difficult, but this trend did not hold up across all comparisons (see [Appendix 2, Table 1](#) in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). There was no clear pattern to the difficulty rating when comparing high and low utility scores.

Age

Age did not appear to make a difference in the strategies used when deciding between health states ([Appendix 2, Table 2](#) in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). All participants used trading at least once, followed by inferring additional information about a health state or an attribute, and finally relying on previous experience or preconceived ideas (specifically, making decisions based on pain and mental health). Participants aged 18 to 49 years tended to reinterpret health states to a larger degree than those aged 50 years and older (55% vs 35%).

Chronic conditions

The decision-making processes used by participants with a chronic condition varied slightly from those without a chronic

Table 2. Participant examples of strategies used.

Trading	
DCE Set 2, Comparison 4	
State A	State B
You live for 1 year with the following then you die: Limited in vigorous activities not at all Accomplish less than you would like none of the time No pain Worn out none of the time Social activities are limited all of the time Depressed or very nervous all of the time	You live for 4 years with the following then you die: Limited in bathing and dressing a lot Accomplish less than you would like a little of the time Moderate pain Worn out all of the time Social activities are limited some of the time Depressed or very nervous most of the time
<p>“Just like being depressed is horrible and being like anxious is horrible, and to feel that way all the time, like for an entire year just, it sounds awful. Like I feel like I would rather tolerate physical pain than like depression”</p> <p style="text-align: center;">ID 08, Female, 38 y/o</p>	
DCE Set 1, Comparison 2	
State A	State B
You live for 7 years with the following then you die: Limited in vigorous activities a little Accomplish less than you would like all of the time Severe pain Worn out most of the time Social activities are limited most of the time Depressed or very nervous most of the time	You live for 7 years with the following then you die: Limited in bathing and dressing a lot Accomplish less than you would like most of the time Mild pain Worn out all of the time Social activities are limited none of the time Depressed or very nervous none of the time
<p>“I would definitely choose Option B, Health Description B, because, uhm, both descriptions give you living with it for seven years, and while I would be limited in dressing and bathing, a lot, uhm, I would also have mild pain as opposed to Description A's severe pain, and while I'd be worn out all of the time, uhm, I do feel like, because my social activities would be limited, none of the time, as opposed to Option A's most of the time, I'd be worn out, and I would also have limited activities, most of that time, and plus, you know, for Option B, or Description B, I would be depressed or very nervous, none of the time, with – and while, and, uh, whereas in Description A, I'd be depressed or nervous, most of the time. So, for me, I think the description B is much better.”</p> <p style="text-align: center;">ID 02, Male, 38 y/o</p>	

Table 2. Continued

Reinterpreting Health States	
DCE Set 1, Comparison 1	
State A	State B
You live for 10 years with the following then you die: Limited in vigorous activities not at all Accomplish less than you would like all of the time No pain Worn out none of the time Social activities are limited all of the time Depressed or very nervous none of the time	You live for 1 year with the following then you die: Limited in moderate activities a lot Accomplish less than you would like some of the time Mild pain Worn out some of the time Social activities are limited most of the time Depressed or very nervous most of the time
<p>R: You know, there's that aren't mentioned in the questions there, there's going to be medications. And medications are going to have side effects.</p> <p>I: <i>What, what is it about, uhm, the description or health description A that makes you think that there is medication involved?</i></p> <p>R: No pain. No pain. Uhm, the only thing that's going to help you with the pain is narcotics. When, when you have cancer, when you have cancer, you have pain.</p> <p>I: <i>Yeah. And can I ask why you're, uhm, interpreting that, uhm, this person has cancer?</i></p> <p>R: Uhm, well, usually when you have a sentence like this with 10 years, you know, it's, it's, it could, it's most likely cancer...Or it's a, or it's a neurological disorder.</p> <p>I: <i>So, that lead-in sentence, "You live for 10 years with the following, and then you die," are you, is that kind of signaling to you that there's some other bigger health problem happening?</i></p> <p style="text-align: center;">ID 03, Male, 50 y/o</p>	
DCE Set 1, Comparison 2	
State A	State B
You live for 7 years with the following then you die: Limited in vigorous activities a little Accomplish less than you would like all of the time Severe pain Worn out most of the time Social activities are limited most of the time Depressed or very nervous most of the time	You live for 7 years with the following then you die: Limited in bathing and dressing a lot Accomplish less than you would like most of the time Mild pain Worn out all of the time Social activities are limited none of the time Depressed or very nervous none of the time
<p>"And so, I see that I'm not able to bathe and dress. But in this scenario, in my head, I just have a spouse that loves me and helps me, and then we make jokes."</p> <p style="text-align: center;">ID 04 Female, 37 y/o</p>	

Table 2. Continued

Relying on Pervious Experience/Preconceived Ideas of Attribute	
DCE Set 4, Comparison 3	
State A	State B
You live for 7 years with the following then you die: Limited in vigorous activities a little Accomplish less than you would like all of the time Mild pain Worn out most of the time Social activities are limited most of the time Depressed or very nervous some of the time	You live for 4 years with the following then you die: Limited in moderate activities a little Accomplish less than you would like some of the time Very mild pain Worn out some of the time Social activities are limited a little of the time Depressed or very nervous all of the time
<p>“I think it’s the depression and the nervousness. Like I don’t, I’ve seen people be with depression, and I, I don’t think I could, I don’t know that I want to live with that all the time. Uhm, I think I would rather have just the some of the time with the depression and the nervousness.”</p> <p style="text-align: center;">ID 17, Female, 50 y/o</p>	
DCE Set 2, Comparison 3	
State A	State B
You live for 7 years with the following then you die: Limited in bathing and dressing a lot Accomplish less than you would like none of the time Mild pain Worn out most of the time Social activities are limited most of the time Depressed or very nervous most of the time	You live for 4 years with the following then you die: Limited in vigorous activities a little Accomplish less than you would like some of the time Moderate pain Worn out a little of the time Social activities are limited a little of the time Depressed or very nervous some of the time
<p>“I choose Health Description B, because given the choices, that seems to be the best way to live. And the reason that I chose that answer is because a lot of these questions, uh, the reason I chose that answer is because I dealt with my mother, who died last year, who, um, [sighs] was disabled I would say for a lot of her latter years, I would say maybe 20, uh, who—who lived for a long time. She had a miserable life. She—she didn’t do anything and, uh, for herself, uh, she, um, had a lot of pain, was depressed all the time, lived in fear, you know. So I—I look at that. I looked at how she lived and I, you know, I didn’t want to live like that. So, um, that’s it. [laughs]. That’s why I answered these questions the way I did.”</p> <p style="text-align: center;">ID 07 Female, 65 y/o</p>	

DCE indicates discrete choice experiment.

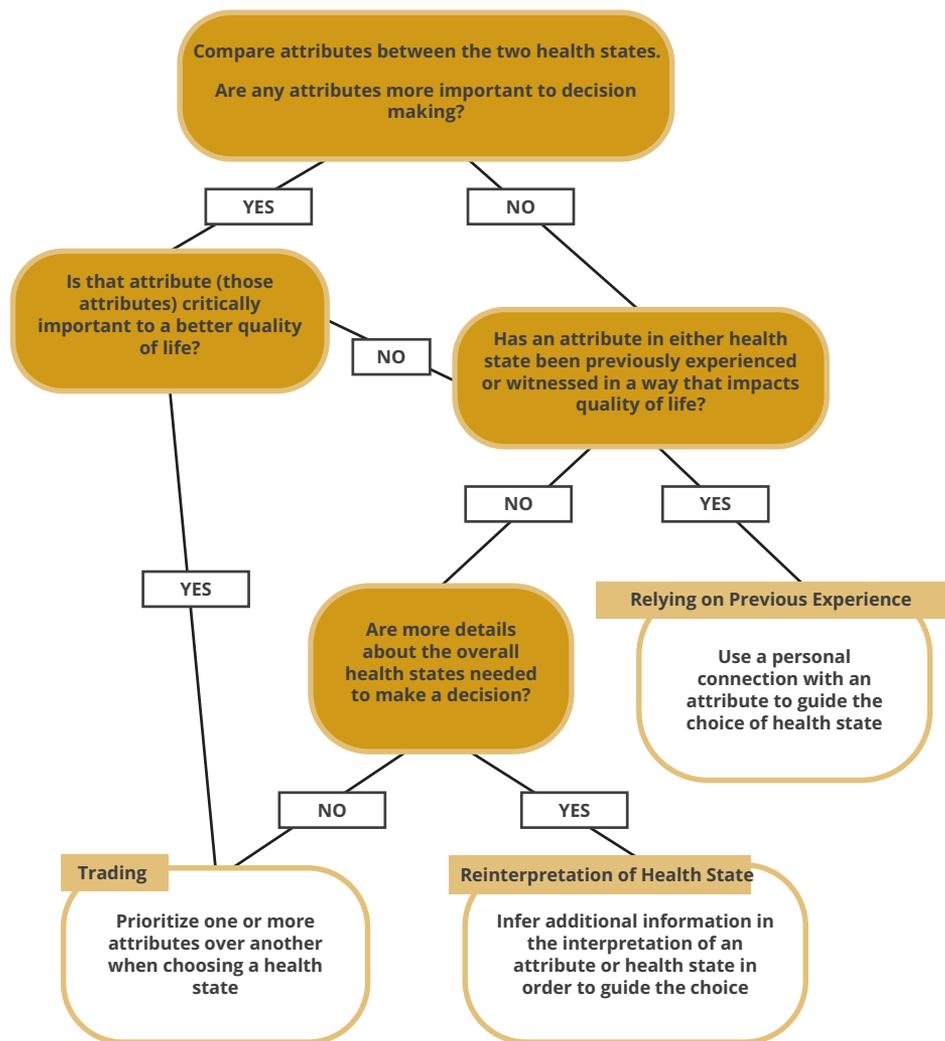
condition (Appendix 2, Table 2 in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). Although all members of both groups used trading, participants without a chronic condition also made decisions by reinterpreting health states more often than participants with a chronic condition did (63.3% vs 34.5%).

Interaction between age and chronic conditions

The data suggest decision-making processes were slightly different among individuals who were younger (18–49 years old)

and had a chronic condition compared with younger participants without chronic disease (Appendix 2, Table 2 in Supplemental Materials found at <https://doi.org/10.1016/j.jval.2022.07.018>). Younger participants with a chronic condition relied less on reinterpreting health states than those without (40% vs 70%) and relied more on previous experience (40% vs 20%). Given that there was only 1 participant older than the age 50 years without a chronic condition, it is not possible to make any comparison about the decision-making strategies that were used.

Figure 2. DCE cognitive strategies for decision making.



DCE indicates discrete choice experiment.

Discussion

This was a qualitative, cross-sectional, noninterventive study consisting of one-on-one, 75-minute interviews designed to provide insight into the decision-making process used by individuals participating in a DCE study comparing and selecting preferred SF6Dv2 health states. This research aimed to ascertain participants' understanding of the task they were asked to complete and the strategies they used to do so by asking them to use a think-aloud approach. Data from the interviews were coded and analyzed to distill the decision-making strategies used by participants. Coding and analysis proceeded using an inductive approach, after which the research team identified how the data aligned with previous research.

Using the think-aloud approach and follow-up questions with participants gave great insight into the strategies they used. The strategies identified in this study were (1) trading for a priority attribute over lower-priority attributes, (2) reinterpreting attributes and inferring additional information about health states, and (3) relying on preconceived ideas about attributes. Although trading was the dominant strategy used, participants were observed using the strategies in concert with one another.

There was some evidence the choice of strategy was influenced by age group and health status. Older participants and those who live with a chronic condition did not need to infer additional information as frequently as those who were younger or did not have a chronic condition. This may have been because these individuals could more easily relate to attributes of a hypothetical health state given their lived experiences. A future study with a more precise distribution of sample by age would enable more in-depth analyses by chronic condition and age.

The strategies participants used to complete choice tasks align with previous work examining strategies for evaluating health states, indicating decision-making strategies are common across groups and tasks. Previous studies have used a think-aloud approach to examine the decision-making strategies used when completing choice tasks across a number of content areas: breast cancer screening,¹⁸ bowel cancer screening,¹² vaccination preferences,^{11,12} primary care preferences,⁸ prostate cancer screening,¹¹ and preferences for funding new health technology assessments.²² These previous studies indicate, regardless of the topic area or the population, the strategies used to complete choice tasks tend to be the same.

Asking participants to complete this task using a think-aloud approach confirmed earlier findings that not all attributes are relevant or of high priority to all individuals and that they can and will disregard those low priority attributes when making their decision.¹² In the current study, the key, preferred attributes included less pain, better mental health, and longer duration of survival, whereas lower-priority attributes were better vitality, physical functioning, role functioning, and social functioning.

In this study, attribute nonattendance was not observed, nor was it described during the think-aloud. This may be because the think-aloud exercise of the choice tasks followed a cognitive debriefing of the SF-6Dv2.³¹ This meant participants were familiar with and had a clear understanding of the attributes¹ and had already been considering how each attribute related to their daily lives, making the evaluation during the choice task more personal and less hypothetical in nature. Although not used exclusively, one participant completed choice tasks based solely on their perception of which scenario in the choice task was more “positive.” This approach has been observed in previous think-aloud studies²² and has potential implications for the underlying assumption of DCE studies, which is that individuals make decisions based on preference. Additional decision-making heuristics were not observed.

Some participants reinterpreted SF-6Dv2 health states to make them more palatable or to make the decision-making process easier. This aligns with previous studies in which individuals were found to reinterpret the attributes they were evaluating, including inferring causality between them.^{8,12,14} Reconstructing health states presented in choice tasks has potential issues for the assumptions underlying DCEs, namely, that they are being interpreted as written. It is advisable to revise the DCE instructions to alert participants that the health states they are comparing are hypothetical and should be considered “as written.”^{8,32} Asking participants to consider the health states “as written” also serves to focus those who may have previous experience with one of the disease states.

This study is not without limitations. First, the think-aloud method itself has limitations. The request for verbalization may change the process of selecting health states. It is not always clear comments made when thinking aloud aligned with participants’ processing of the task. To mitigate this issue, a series of semi-structured follow-up questions was asked after each DCE task to allow the interviewer to gain a better understanding of the person’s process and rationale for choosing a particular health state. Second, it is preferable to conduct these interviews in person, and although videoconferencing software mitigates this limitation, it did not eliminate it. Third, although all health states used in the DCEs had been reported in practice by at least 1 person from a large general population sample, interpretation of what could be considered an unusual health state is subjective. As described earlier, some found combinations unlikely. This has implications for how participants may have valued those specific choice tasks, thus affecting their overall preference. Fourth, the pairs of SF-6Dv2 health states participants were asked to evaluate and choose between did not include an opt-out option and forced participants to make a selection. This adds a degree of difficulty to interpreting the choices made by participants who did not have a clear preference.² Finally, participants were presented with fewer choice tasks than they would be asked in a typical DCE study. This may have reduced learning effects, survey fatigue, and decision fatigue.

This study also had a number of strengths. In addition to participants being familiar with the attributes before completing the think-aloud of the DCE health states, qualitative research strategies confirmed their interpretations of the attributes were correct and provided the study team a clear understanding of the decision-making strategies being used. This qualitative

understanding of the decision-making strategies has been highlighted as key to developing and conducting DCEs.^{1,2,8,12,14,32,33} Additionally, imposing sampling quotas helps ensure the DCEs are understandable across broad populations.

A further strength of this study was using a think-aloud approach to gain a deeper understanding of the decision-making strategies used when completing DCEs evaluating pairs of SF-6Dv2 health states. The think-aloud process highlighted the importance of ensuring the instructions for how to complete a DCE task are clear and uncomplicated. To that end, minor revisions to the instructions have been made so that when participants complete the DCE in future studies, they are clear on what is being asked of them.

Conclusion

To the best of the authors’ knowledge, this is the first qualitative study to investigate the decision-making strategies implicit in valuing multiattribute health utility measures such as the SF-6Dv2. Although qualitative studies have been conducted to evaluate the content validity of existing health utility measures, including the SF-6Dv2,³¹ this study sought to gain qualitative insight into the decision-making strategies that drive the scoring of health utility measures, namely, the SF-6Dv2. The evidence from this study adds to the depth of understanding of the choice tasks for the SF-6Dv2, to the strength of the utility weights to be developed, and to the overall usefulness of the SF-6Dv2. The findings further suggest the methodology described in this study can and should be carried forth in valuing other health utility measures, not just the SF-6Dv2.

Supplemental Material

Supplementary data and materials, including sample interview guide questions, associated with this article can be found in the online version at <https://doi.org/10.1016/j.jval.2022.07.018>.

Article and Author Information

Accepted for Publication: July 31, 2022

Published Online: September 2, 2022

doi: <https://doi.org/10.1016/j.jval.2022.07.018>

Author Affiliations: QualityMetric, Johnston, RI, USA (Broderick, Bjorner, Lauher-Charest, White, Kosinski); University of Copenhagen, Copenhagen, Denmark (Bjorner); Centre for Health Economics Research and Evaluation, University of Technology Sydney, Sydney, NSW, Australia (Mulhern); School of Health and Related Research (SchHARR), University of Sheffield, Sheffield, England, UK (Brazier).

Correspondence: Lynne Broderick, MPH, QualityMetric, 1301 Atwood Ave, Ste 216E, Johnston, RI 02919, USA. Email: lbroadrick@qualitymetric.com

Author Contributions: *Concept and design:* Broderick, Bjorner, Lauher-Charest, White, Kosinski, Brazier

Acquisition of data: Broderick, Lauher-Charest

Analysis and interpretation of data: Broderick, Bjorner, Lauher-Charest, White, Mulhern, Brazier

Drafting of the manuscript: Broderick, Lauher-Charest, White, Kosinski, Mulhern, Brazier

Critical revision of the paper for important intellectual content: Broderick, Bjorner, Lauher-Charest, White, Kosinski, Mulhern, Brazier

Provision of study materials or patients: Broderick, Lauher-Charest

Obtaining funding: Bjorner

Administrative, technical, or logistic support: Broderick, Lauher-Charest

Supervision: Bjorner, White

Conflict of Interest Disclosures: Dr Mulhern reported receiving grants outside the submitted work. He is also an editor of *Value in Health* and had no role in the peer-review process of this article. Dr Brazier reported receiving royalties paid to his institution based on the use of the SF-6D. No other disclosures were reported.

Funding/Support: This work was supported by QualityMetric.

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

REFERENCES

- Clark MD, Determann D, Petrou S, Moro D, de Bekker-Grob EW. Discrete choice experiments in health economics: a review of the literature. *Pharmacoeconomics*. 2014;32(9):883–902.
- Lancsar E, Louviere J. Conducting discrete choice experiments to inform healthcare decision making: a user's guide. *Pharmacoeconomics*. 2008;26(8):661–677.
- Mulhern B, Norman R, Brazier J. Valuing SF-6Dv2 in Australia using an international protocol. *Pharmacoeconomics*. 2021;39(10):1151–1162.
- Mulhern BJ, Bansback N, Norman R, Brazier J, SF-6Dv2 International Project Group. Valuing the SF-6Dv2 classification system in the United Kingdom using a discrete-choice experiment with duration. *Med Care*. 2020;58(6):566–573.
- Norman R, Cronin P, Viney R. A pilot discrete choice experiment to explore preferences for EQ-5D-5L health states. *Appl Health Econ Health Policy*. 2013;11(3):287–298.
- Norman R, Viney R, Brazier J, et al. Valuing SF-6D health states using a discrete choice experiment. *Med Decis Making*. 2014;34(6):773–786.
- Wu J, Xie S, He X, et al. Valuation of SF-6Dv2 health states in China using time trade-off and discrete-choice experiment with a duration dimension. *Pharmacoeconomics*. 2021;39(5):521–535.
- Cheraghi-Sohi S, Bower P, Mead N, McDonald R, Whalley D, Roland M. Making sense of patient priorities: applying discrete choice methods in primary care using 'think aloud' technique. *Fam Pract*. 2007;24(3):276–282.
- Lancsar E, Louviere J. Deleting 'irrational' responses from discrete choice experiments: a case of investigating or imposing preferences? *Health Econ*. 2006;15(8):797–811.
- Reed Johnson F, Lancsar E, Marshall D, et al. Constructing experimental designs for discrete-choice experiments: report of the ISPOR Conjoint Analysis Experimental Design Good Research Practices Task Force. *Value Health*. 2013;16(1):3–13.
- Veldwijk J, Determann D, Lambooj MS, et al. Exploring how individuals complete the choice tasks in a discrete choice experiment: an interview study. *BMC Med Res Methodol*. 2016;16:45.
- Ryan M, Watson V, Entwistle V. Rationalising the 'irrational': a think aloud study of discrete choice experiment responses. *Health Econ*. 2009;18(3):321–336.
- Waters EA, Weinstein ND, Colditz GA, Emmons K. Formats for improving risk communication in medical tradeoff decisions. *J Health Commun*. 2006;11(2):167–182.
- Kenny P, Hall J, Viney R, Haas M. Do participants understand a stated preference health survey? A qualitative approach to assessing validity. *Int J Technol Assess Health Care*. 2003;19(4):664–681.
- Bryan S, Dolan P. Discrete choice experiments in health economics. For better or for worse? *Eur J Health Econ*. 2004;5(3):199–202.
- Lagarde M. Investigating attribute non-attendance and its consequences in choice experiments with latent class models. *Health Econ*. 2013;22(5):554–567.
- Miguel FS, Ryan M, Amaya-Amaya M. 'Irrational' stated preferences: a quantitative and qualitative investigation. *Health Econ*. 2005;14(3):307–322.
- Vass C, Rigby D, Payne K. I was trying to do the maths": exploring the impact of risk communication in discrete choice experiments. *Patient*. 2019;12(1):113–123.
- Mulhern B, Bansback N, Brazier J, et al. Preparatory study for the revaluation of the EQ-5D tariff: methodology report. *Health Technol Assess*. 2014;18(12):vii–xxvi, 1–191.
- Morgan A, Shackley P, Pickin M, Brazier J. Quantifying patient preferences for out-of-hours primary care. *J Health Serv Res Policy*. 2000;5(4):214–218.
- Vick S, Scott A. Agency in health care. Examining patients' preferences for attributes of the doctor-patient relationship. *J Health Econ*. 1998;17(5):587–605.
- Whitty JA, Walker R, Golenko X, Ratcliffe J. A think aloud study comparing the validity and acceptability of discrete choice and best worst scaling methods. *PLoS One*. 2014;9(4):e90635.
- Drennan J. Cognitive interviewing: verbal data in the design and pretesting of questionnaires. *J Adv Nurs*. 2003;42(1):57–63.
- Padilla J-L, Leighton JP. Cognitive interviewing and think aloud methods. In: Zumbo BD, Hubley AM, eds. *Understanding and Investigating Response Processes in Validation Research*. Vol. 69. Cham, Switzerland: Springer International Publishing; 2017:211–228.
- Collins D. Pretesting survey instruments: an overview of cognitive methods. *Qual Life Res*. 2003;12(3):229–238.
- Willis GB. *Cognitive Interviewing: A Tool for Improving Questionnaire Design*. Thousand Oaks, CA: Sage Publications; 2005.
- Patrick DL, Burke LB, Gwaltney CJ, et al. Content validity—establishing and reporting the evidence in newly developed patient-reported outcomes (PRO) instruments for medical product evaluation: ISPOR PRO Good Research Practices Task Force report: part 2—assessing respondent understanding. *Value Health*. 2011;14(8):978–988.
- Taylor DC, Kosinski M, Reilly K, Lindner L. Comparison of the burden of Ibs with constipation on health-related quality of life (HRQOL), work productivity, and health care utilization to asthma, migraine, and rheumatoid arthritis in the US, UK, and France. *Value Health*. 2014;17(7):A371–A372.
- Kiger ME, Varpio L. Thematic analysis of qualitative data: AMEE guide no. 131. *Med Teach*. 2020;42(8):846–854.
- Castleberry A, Nolen A. Thematic analysis of qualitative research data: is it as easy as it sounds? *Curr Pharm Teach Learn*. 2018;10(6):807–815.
- Broderick L, Bjorner JB, Lauher-Charest M, et al. Development of the SF-6Dv2 health utility survey: comprehensibility and patient preference. *J Patient Rep Outcomes*. 2022;6(1):47.
- Pearce A, Harrison M, Watson V, et al. Respondent understanding in discrete choice experiments: a scoping review. *Patient*. 2021;14(1):17–53.
- Vass C, Rigby D, Payne K. The role of qualitative research methods in discrete choice experiments. *Med Decis Making*. 2017;37(3):298–313.