VALUE IN HEALTH ▮ (2017) ▮▮▮–▮▮▮

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A (Latent) Class of Their Own: Response Patterns in Trading Off Quantity and Quality of Life in Time Trade-Off Exercises

F.E. van Nooten, MSc[1,], K. Houghton, MSc[2], J. van Exel, PhD[1,4], M. van Agthoven, PhD[3], W.B.F. Brouwer, PhD[1], D.E. Stull, PhD[2]*

[1]*Institute of Health Policy and Management, Erasmus University Rotterdam, Rotterdam, The Netherlands;* [2]*RTI Health Solutions, Research Triangle Park, NC, USA;* [3]*Pharmaceutical Companies of Johnson & Johnson, Breda, The Netherlands;* [4]*Erasmus School of Economics, Erasmus University Rotterdam, Rotterdam, The Netherlands*

ABSTRACT

Background: Conflicting results regarding associations of time trade-off (TTO) valuations with respondent characteristics have been reported, mostly on the basis of regression analyses. Alternative approaches, such as the latent class analysis (LCA), may add to the further understanding of variations in TTO responses. **Objectives:** To identify whether subgroups of respondents can be identified on the basis of their responses to TTO exercises and to investigate which respondent characteristics are associated with membership of the identified subgroups. **Methods:** Members of the Dutch general public, aged 18 to 65 years, completed a Web-based questionnaire concerning sociodemographic characteristics, three TTO exercises valuing health states described using the domains of the EuroQol five-dimensional questionnaire, and preference for quality versus quantity of life. LCA was used to identify patterns in the responses. Predictive variables were included in the final LCA model to identify the particular respondent characteristics that predict subgroup membership. **Results:** The sample consisted of 1067 respondents. Four latent classes were identified in the responses to TTO exercises. Two were high traders, focusing on quality of life and trading off a relatively high number of years. The other two were low traders, focusing on length of life. Predictive analyses revealed significant differences between subgroups in terms of age, sex, subjective life expectancy, and preference for quantity over quality of life. **Conclusions:** We showed that distinct classes of respondents can be discerned in TTO responses from the general public, distinguishing subgroups of low and high traders. More research in this area should confirm our findings and investigate their implications for health state valuation exercises.

Keywords: economic evaluation, latent class analysis, preference heterogeneity, time trade-off.

Introduction

The time trade-off (TTO) method is commonly used for health state valuations (e.g., in Greiner et al. [1], Scalone et al. [2], and Lamers et al. [3]). For instance, the frequently used quality-of-life measure EuroQol five-dimensional questionnaire (EQ-5D) has several readily available national health state valuations (tariffs) for the health states described with the instrument, which were derived with the TTO method (e.g., in Dolan [4] and Lamers et al. [3]). A TTO exercise typically requires people to choose between two streams of health: one entailing a shorter life span that is spent in a better health state and the other entailing a longer life span spent in a poorer health state. Thus, the exercise requires participants to trade off length of life and quality of life. From this, relative health state valuations are derived, with "perfect health" anchored at the value of 1 and "dead" anchored at the value of 0 [5]. Despite being applied since the early 1970s, studies have shown that the answers to TTO exercises are still not fully understood, in particular the heterogeneity of responses and the associated respondent characteristics that may be driving this heterogeneity [6,7]. Indeed, it is not uncommon to see utilities for a given health state with a wide range, meaning that some individuals are more (or less) willing than others to trade off years of life for that health state. This is true both for general public ratings and for disease-specific ratings [8,9].

Several studies have shown that TTO responses may be influenced by basic respondent characteristics, such as age, sex, and marital status [7]. Nevertheless, these findings vary between studies and sometimes even contradict (e.g., studies by Hsu et al. [10], Kontodimopoulos and Niakas [11], Augestad et al. [12], Best et al. [13], Ayalon and King-Kallimanis [14], and Shimizu et al. [15]). Beyond basic respondent characteristics, subjective life expectancy (SLE) has also been shown to influence TTO responses, but the strength of its influence is limited [16–18]. Therefore, although there is often substantial variation in TTO responses between respondents, this variability is not yet well understood and further investigation is warranted. In that context, interestingly, Essink-Bot et al. [6] suggested

* *Address correspondence to:* F.E. van Nooten, Institute of Health Policy and Management, Erasmus University Rotterdam, Rotterdam, The Netherlands.

E-mail: floortjevannooten@hotmail.com.

1098-3015$36.00 – see front matter

http://dx.doi.org/10.1016/j.jval.2017.06.008

that individual response patterns (e.g., a "general" tendency to give either high or low scores in valuation exercises) might be more influential than demographic or other respondent characteristics.

Previous research investigating heterogeneity in TTO responses has done so by identifying possible explanatory variables and testing for differences. This approach requires an a priori understanding or hypothesis regarding what may be causing the variability. In addition, it requires the collection of all potential explanatory variables such that they can be used analytically. If the heterogeneity is driven by many variables, uncovering subgroups using multiple comparisons may introduce multiplicity problems and can be prohibitively time-consuming [19]. In addition, if information on a key explanatory variable is not collected, then true subgroups may go undiscovered. To more precisely uncover true subgroups that exist in heterogeneous TTO data, latent class analysis (LCA) is ideally suited. LCA is an analytic method that allows for the identification of subgroups of respondents by looking for common patterns of response within the heterogeneity of all responses in a study [20,21]. In LCA, common responses on observed variables are assumed to be due to an unobserved latent variable representing the previously unknown class of response type [22]. By studying the patterns of variation among the observed variables, the latent variable of class membership may be identified, and possibly the characteristics that help explain latent class membership [22]. Indeed, LCA has previously been used in the examination of TTO responses. Meghani et al. [23] applied the approach using data collected from men who had prostate cancer or were at risk of prostate cancer and identified three classes of respondents: low traders, high traders, and nontraders. Differences between the three classes were found in terms of age, race/ethnicity, history of prostate cancer, and the importance of sexual activity. Such findings indicate that applying LCA has the potential to contribute to further understanding of TTO valuations, which is highly relevant for economic evaluations and subsequent decision making.

Heterogeneity in TTO responses is problematic because when major differences between raters exist, consideration needs to be given to which group of preferences is the most important for the population subgroup of interest. This is particularly the case when policymakers must make decisions about providing health care resources to specific subpopulations. Two uses of TTO in health care decision making need to be distinguished here. In using patient preferences, understanding variation in TTO responses may be directly informative for treatment choices. Patients focusing on longevity for some reason may prefer other types of treatments than those focusing on quality of life. Here, we focus on variation in general public preferences for health states, the prominent source for health state valuations, and national tariffs (albeit not undisputedly so [24]). To serve as a foundation for health care decision making from a societal perspective, health state valuations are commonly required to represent the values provided by the general public respondents, on the basis of either hypothetical health states or their real experiences [25]. Although commonly average general public valuations are used in decision making, understanding variation and subgroups in these valuations nonetheless remains important, for at least two reasons. First, understanding variation in general public preferences may be important for sampling reasons. If obtaining representative, average valuations is the aim, sampling may need to include existing subgroups in a balanced way. This can also increase the comparability of results between studies. Second, basing policy decisions for treatments aimed at specific subgroups of responders (e.g., elderly, women, and low-income groups) on average valuations may misrepresent the relevant (ex ante) welfare impact of the treatments and even to "wrong" decisions when average valuations are unrepresentative for the relevant subgroup. Large, systematic variations in preferences may thus beg the question whether using average valuations is optimal or that valuations from a relevant subgroup (from the general public) may be better (see, e.g., Versteegh and Brouwer [24] for analogous reasoning in the choice between patient and general public preferences). Empirical evidence regarding the extent to which TTO choices differ as a function of respondent characteristics will therefore provide further evidence of the implications of using the values of groups overall versus the values of specific subgroups as well as indications for optimal sampling. Given the increasing use of health state valuations based on TTO in health policy decisions, a better understanding of responses to TTO exercises, also in general public valuations, is important. Therefore, the present research used data derived from the general public of the Netherlands to investigate whether subgroups of TTO respondents can be identified and characterized in terms of their TTO responses.

Methods

A questionnaire was administered online by a professional sampling agency to a sample of the general public from the Netherlands, representative in terms of age (range 18–65 years) and sex. An age limitation was imposed on the sample because of the questionnaire being designed to address multiple research questions (e.g., Rappange et al. [26], van Nooten et al. [27], and Wouters et al. [28]). A minimum time limit of 15 minutes for survey completion was imposed upon the data, on the basis of a pilot test of the questionnaire. Thus, respondents who completed the survey in less than 15 minutes were excluded from the final sample used for analysis.

Measures

Time trade-off

Respondents were presented with six health states and asked to rank them from best to worst. After this, respondents were asked to individually rate each health state on a visual analogue scale (VAS), ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). Three of the six health states were imperfect health states specified using the dimensions of the EQ-5D (see Appendix 1 in Supplemental Materials found at http://dx.doi.org/10.1016/j.jval.2017.06.008). The three imperfect health states ranked on the basis of MVH_A1 scores are as follows: best, 21211; medium, 22221; and worst, 33312. The fourth health state was the respondents' own current health status, also specified using the EQ-5D, as mentioned earlier. The fifth was "dead" and the sixth "perfect health" (see Appendix 1 in Supplemental Materials for further details).

After ranking and rating the six health states, respondents solved three TTO exercises using a 10-year time horizon. These exercises used the three imperfect EQ-5D health states, which were presented to them in the order in which they had ranked them, from best to worst (see Appendix 2 in Supplemental Materials found at http://dx.doi.org/10.1016/j.jval.2017.06.008 for the exact TTO question provided to participants). Only the imperfect health states were used for the TTO exercise. Dead can be considered to have a quality of life of 0 and perfect health to have a quality of life of 1. The protocol did not include a separate valuation exercise for states ranked or rated lower than dead.

Characteristics

Background information collected from the respondents consisted of age, sex, marital status, education, and having children.