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PREFERENCE-BASED ASSESSMENT

Estimating an EQ-5D Value Set for Malaysia Using Time Trade-Off and Visual Analogue Scale Methods

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ABSTRACT

Objectives: To estimate a EQ-5D value set for Malaysia by using time trade-off (TTO) and visual analogue scale (VAS) valuation methods. **Methods:** TTO and VAS valuations were obtained from face-to-face surveys of a convenience sample of patients, caregivers, and health professionals conducted at nine government hospitals in 2004 and 2005. Forty-five EQ-5D questionnaire health states were valued, divided into five sets of 15 health states. Analysis was conducted by using linear additive regression models applying N3 and D1 specifications. Model selection was based on criteria of coefficient properties, statistical significance, and goodness of fit. **Results:** One hundred fifty-two respondents were interviewed, yielding 2174 TTO and 2265 VAS valuations. Respondents found TTO valuations to be more difficult than VAS valuations, and there were more inconsistencies in TTO valuations. All the independent variables in the models were statistically significant and consistent with expected signs and magnitude, except for the D1 specification modeled on TTO valuations. The N3 model provided the best fit for the VAS valuation data, with a mean absolute error of 0.032. **Conclusion:** This study provides a Malaysian EQ-5D questionnaire value set that can be used for cost-utility studies despite survey limitations.

Keywords: EQ-5D, health state preference, time trade-off, visual analogue scale.

Introduction

Quality-adjusted life-years are a widely accepted measure of utility used in health economic evaluation studies [1,2]. The EuroQol EQ-5D questionnaire, a general measure of health status developed by the EuroQol group [3], is a frequently used instrument that allows the measurement of quality-adjusted life-years. Using the EQ-5D questionnaire, the first population-based health preference value set was developed for the United Kingdom in 1997 [4].

Although the UK value set has been widely used in cost-utility studies, studies have shown that valuation can be systematically different between populations, possibly due to fundamental differences in culture [5–7]. This divergence in health preferences between countries has led to recommendations that call for national value sets to be developed for conducting cost-utility analysis [8].

Malaysia is a middle-income developing Southeast Asian country. Because of its multiracial population with a Muslim majority, it is culturally different from the other Asian countries where national EQ-5D value sets have been developed so far. It is debatable whether the value sets currently available can adequately reflect the health preferences of Malaysians in particular or Southeast Asians in general.

Therefore, our study sought to develop a value set for EQ-5D health states by using preferences elicited from time trade-off (TTO) and visual analogue scale (VAS) methods from a convenience sample of the Malaysian population.

Methods

Data collection

The EQ-5D questionnaire descriptive system measures health status in five dimensions of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three levels of severity, namely, 1) no problem, 2) some problem, and extreme problem 3). The descriptive system contains a total of 243 theoretically possible combinations of EQ-5D questionnaire domains and problem levels, referred to as *health states*.

This study analyzed previously elicited health state preferences to produce a Malaysian EQ-5D value set. Preferences were elicited through convenience sampling from three categories of respondents—patients undergoing dialysis, patients' carers, and dialysis center staff—in nine Ministry of Health (MoH) hospitals throughout Peninsular Malaysia. Responses were elicited through face-to-face interviews conducted in 2004 to 2005 by three trained

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interviewers from the Clinical Research Centre of Kuala Lumpur Hospital. The health state preference data for this study were collected as part of an economic study on erythropoietin use in the MoH dialysis program [9].

The valuation process was similar to the method used in the Measure and Valuation in Health study that first derived the UK value set [4,10]. Forty-five health states were valued in the survey by using ranking, VAS, and TTO elicitation methods. These were the health states of "death" and "unconscious" as well as 43 of the 243 EQ-5D questionnaire health states.

During the survey, respondents were taken through a four-step valuation process, as illustrated in Appendix 1 in Supplemental Materials found at doi:10.1016/j.jval.2011.11.024. They were first asked to describe their own health state on the day of the interview by filling the standard EQ-5D health assessment questionnaire. This comprised the EQ-5D questionnaire descriptive system where the respondents selected, in multiple-choice fashions, one of the three severity levels for each of the five health dimensions. Respondents then proceeded to make a single mark on a 20-cm long VAS, which ranged from a value of 100 for the "best imaginable health state" to 0 for the "worst imaginable health state." Upon completion of the own health rating exercise, respondents were assigned one of five sets of health states to value. Each set contained four common states (best health state, worst health state, death, and unconscious), two very mild, three mild, three moderate, and three severe health states following the approach adopted by Shaw et al. [11], as shown in Appendix 2 in Supplemental Materials found at doi:10.1016/j.jval.2011.11.024.

First, respondents ranked the 15 health states in their set from best to worst. They were permitted to place health states on an equal rank if they so chose. Second, the respondents were asked to value the 15 states on a 20-cm long VAS. This formed the data used for modeling the VAS value set. Third, in the TTO value elicitation part, respondents valued 13 health states, with the best health state 11111 and death excluded. 11111 and death were excluded because these were the comparator states by which the respondents performed the TTO valuation. Respondents were asked to make a choice between living 10 years in a health state 11111 or in another health state, followed by death at the end of 10 years. The amount of life in 11111 was adjusted on a TTO prop until the respondent felt that the two scenarios were indifferent. For states considered worse than death, the scenario was altered to a choice between immediate death or a number of years in a health state followed by 10 years in health state 11111 followed by death. The prop used in the above TTO valuation was a two-sided TTO valuation board procured from Dr. Stephen Coons of The University of Arizona, USA.

The study used two similar questionnaires in English and Malay languages for the study. The EQ-5D questionnaires obtained from EuroQol were the Malay language version validated for Malaysia and the English version validated for Singapore, a neighboring country with many historical, cultural, and demographic similarities with Malaysia. The Singapore English version was used because a Malaysian-validated English version was not available at the time of the survey. Subsequent research has demonstrated the reliability and validity of the EQ-5D questionnaire used in the health preference elicitation survey [12].

Malaysia is a multiracial and multilingual country with Malay, English, Mandarin, various Chinese dialects, and Indian languages (particularly Tamil) used by substantial numbers of the population in the Peninsular region of the country. The study team, however, did not pursue translations in Chinese or Indian languages because of resource constraints. It was felt that questionnaires in English and Malay would suffice to cover the vast majority of the population in Peninsular Malaysia because most Malaysians are fluent in either or both Malay and English because these are the languages used in education, commerce, government, and public discourse. Nevertheless, the few potential respondents who were only monolingual speakers of Chinese or Indian languages were not selected for the valuation elicitation survey. Those excluded would typically be elderly Malaysians of Chinese or Indian ethnic descent.

The original study that collected the health preference data was approved by the Medical Research and Ethics Committee of the MoH, Malaysia, and was funded by a research grant from the MoH as part of a larger economic study on dialysis in MoH hospitals. The funding from that project did not extend to the current analysis, which was conducted on the authors' own initiative. The health preference data were used with permission from the MoH.

Data transformation

Health preference valuations of 0 to 100 on the VAS were rescaled to 0 to 1, and valuations of other health states were rescaled against health state 11111 and death as valued by the same respondent.

TTO valuations were transformed to lie on the interval $(-1, 1)$. States regarded as better than death were calculated as $t/10$, where t is the number of years in 11111 (equivalent to 10 years), whereas states regarded as worse than death were calculated as $-t/10$.

Analysis

Inconsistencies in respondent preference valuations were evaluated in terms of the number of inconsistencies when using the TTO and VAS scoring methods. Inconsistencies occurred where respondents valued health states that are logically superior as worse than inferior health states. A respondent's entire set of valuations was excluded from analysis if 1) all health states were valued the same; 2) fewer than five health states were valued; or 3) death was valued higher than or equal to health state 11111. Valuations were not excluded on account of excessive inconsistencies unlike in other studies.

Linear additive regression was used to demonstrate the relationship between the rescaled VAS and TTO with health dimensions. Several model specifications were used in the modeling exercise. First, a main effects model was used, which consisted of a constant and 10 variables that captured the movement from severity 1 to 2 and from severity 2 to 3 for each of the five health dimensions [5,6]. Second, the N3 model from the original UK Measure and Valuation in Health study was used [4]. The N3 model includes all the variables from the main effects model and adds an N3 interaction variable to capture any health state with a severe (level 3) health state. Last, to compare the most appropriate model, the analysis also employed the D1 valuation model from the United States [11]. The model includes several interaction terms, which are D1 (an ordinal variable capturing the number of dimensions away from 11111 beyond the first and ranges from 0 to 4), I2 (an ordinal variable that captures the number of dimensions at level 2 beyond the first), I3 (an ordinal variable that captures the number of dimensions at level 3 beyond the first), as well as I2 squared and I3 squared.

The models were evaluated by criteria of 1) coefficient properties, 2) statistical significance, and 3) goodness of fit. The coefficients criterion evaluates the models by the signs of the coefficients and their magnitudes. All the main effects coefficients should be negative, with larger negative values for level 3 coefficients relative to their level 2 counterparts. This reflects the fact that any movement away from 11111 is a reduction in health and any movement to a severe problem (level 3) in a health dimension ought to reduce quality of life more than would a move to a moderate problem (level 2). Statistical significance was evaluated by examining the significance of individual coefficients (t test P values) and the significance of models as a whole (F test P values). Goodness of fit of models was evaluated by adjusted R^2 and the