VALUE IN HEALTH REGIONAL ISSUES 2 (2013) 405–412

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PREFERENCE-BASED OUTCOMES

Societal Preferences for EQ-5D Health States from a Brazilian Population Survey

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ABSTRACT

Objective: To elicit preference weights for a subset of EuroQol five-dimensional (EQ-5D) questionnaire health states from a representative sample for the state of Minas Gerais, Brazil, using a time trade-off (TTO) method and to analyze these data so as to estimate social preference weights for the complete set of 243 states. **Methods:** Data came from a valuation study with 3362 literate individuals aged between 18 and 64 years living in urban areas. The present study was based on quota sampling by age and sex. Face-to-face interviews were conducted in participants' own homes. A total of 99 EQ-5D questionnaire health states were selected, presorted into 26 blocks of six unique health states. Each participant valued one block together with the full health, worst health, and dead states. Each health state was evaluated by more than 100 individuals. TTO data were modeled at both individual and aggregate levels by using ordinary least squares and random effects methods. **Results:** Values estimated by different models yielded very similar results with satisfactory goodness-of-fit statistics: the mean absolute error was around 0.03 and fewer than 25% of the states had a mean absolute error greater than 0.05. Dummies coefficients for each level within the EQ-5D questionnaire dimensions of health displayed an internally consistent ordering, with the mobility dimension demonstrating the largest value decrement. The values of mean observed transformed TTO values range from 0.869 to −0.235. **Conclusions:** The study demonstrates the feasibility of conducting face-to-face interviews using TTO in a Brazilian population setting. The estimated values for EQ-5D questionnaire health states based on this Minas Gerais survey represent an important first step in establishing national Brazilian social preference weights for the EQ-5D questionnaire.

Keywords: cost-effectiveness, cost-utility, EQ-5D, health states, time trade-off.

Introduction

Health technology assessment (HTA) is important in supporting health policy decisions designed to allocate resources efficiently and in defining criteria for the introduction of new technologies. In Brazil, HTA has been a concern since the 1980s with important government initiatives being introduced since 2004 with the creation of the Department of Science and Technology (Departamento de Ciência e Tecnologia) [1]. Departamento de Ciência e Tecnologia is responsible for formulating and promoting HTA for the Unified Health System (Sistema Único de Saúde). In 2008, the Brazilian Network for HTA (Rede Brasileira de Avaliação de Tecnologias em Saúde) was created to subsidize the government in formulating HTA regulation and producing HTA research in Brazil.

Some developed countries such as the United Kingdom, Germany, and The Netherlands have a long history of using cost-effectiveness analysis to inform this type of high-level decision making. Cost-effectiveness analysis requires cost and health outcome information related to the alternatives that are being evaluated. The representation of health benefits in terms of quality-adjusted life-years (QALYs) has been adopted by many national regulatory agencies, usually with the stipulation that the quality-adjustment factor should be based on the social preferences of the relevant population [2]. The EuroQol five-dimensional (EQ-5D) questionnaire is probably the most widely used generic measure of health status used in measuring benefits for economic evaluation. The instrument defines health in terms of five dimensions (mobility, usual activities, self-care activities, pain/discomfort, and anxiety/depression), each

Conflicts of interest: The authors have indicated that they have no conflicts of interest with regard to the content of this article.

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http://dx.doi.org/10.1016/j.vhri.2013.01.009

divided into three levels of severity. National value sets exist for many countries, enabling health benefits to calibrate in terms of domestic social preferences [3–12]. In Latin America, only two countries (Argentina and Chile) have so far established their own national value sets for EQ-5D questionnaire health states [13,14].

This article reports an EQ-5D questionnaire valuation study conducted in Minas Gerais, a large and heterogeneous state in the southeast region of Brazil. Minas Gerais has a population of 20 million inhabitants accounting for just over 10% of the country's total population, the majority residing in urban areas [15]. Belo Horizonte, the state capital, has a population of some 4 million. The state has the second largest economy of Brazil but presents great heterogeneity in terms of both economic development and standards of living. According to the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística), in 2008, Minas Gerais's gross domestic product per capita was US $7635 compared with Brazil's US $8690 while average years of schooling (around 7 years) and income inequality (Gini coefficient equal to 0.51) were very similar to those of the whole country. The analysis of the Human Development Index shows evidence of how similar are the social economic disparities in Minas Gerais compared with those observed in Brazil: in 2000, the values of the Human Development Index for Minas Gerais cities ranged from 0.57 (northeast of the state) to 0.84 (southeast of the state), while in Brazil, the range was 0.64 (northeast of Brazil, state of Maranhão) and 0.82 (South of Brazil, state of Santa Catarina) [16]. Because of its great diversity, Minas Gerais is considered to be representative of Brazilian heterogeneity.

Methods

The EQ-5D questionnaire descriptive classification defines a total of 243 distinct health states, each of which is labeled with a unique five-digit code. For example, 11111 represents the full health state defined as having no problems in any dimension while 33333 represents the worst health state with extreme problems on all five dimensions. The EQ-5D questionnaire's Brazilian language version was culturally adapted and provided by the EuroQoL Group.

The interview protocol followed a revised version [17] of the original Measurement and Value of Health (MVH) study [18]. This protocol has already been applied in deriving French population values for the EQ-5D questionnaire [5] and in a Korean valuation study [11]. The present study was designed so as to obtain values for 102 health states selected from the complete set of 243 states, covering three broad severity categories defined by their proximity to the best possible health state. Mild states contain no level 3 problem on any dimension; severe states contain no level 1 problem on any dimension; moderate states lie within these two boundaries. More information about the choice of health states is described in the revised version of the MVH protocol [17]. States were grouped into 26 blocks, with six health states in each comprising two mild, two moderate, and two severe states. A block of six was chosen to reduce interview length because of budget constraints. Because the sample size is large, more than 100 observations by health state are guaranteed. Each individual evaluated one block of health states together with the logically best and worst health states (states 11111 and 33333, respectively) and the state "dead"—a total of nine states. Health state descriptions were presented on a printed set of cards that were handed to the participant.

Individuals were first asked to describe their own health in terms of the EQ-5D questionnaire classification system and to rate it by using a visual analogue scale with end points of 0 and 100 corresponding to the worst and best imaginable health states. They were then asked to rank order the set of nine printed cards containing the health state descriptions from the best to worst. The cards were then shuffled, and individuals were asked to rate them on the same 0 to 100 visual analogue scale used to rate their own health. Respondents were instructed that each health state would last for 10 years followed by death. These exercises were performed before time trade-off (TTO) to familiarize individuals with the description of health states.

The TTO elicitation protocol has been fully described elsewhere [18]. It essentially involves presenting participants with choices between two alternatives that comprise varying levels of quantity and quality of life. Health states can be evaluated as either better or worse than death. A double-sided time board is used, with one side for health states considered better than dead and the other side for health states considered worse than dead. For states evaluated better than dead, individuals establish the number of years ($x < 10$) in full health that provides them the same expected utility level as living 10 years experiencing some specific health condition. The TTO value (V) is obtained by dividing the length of time in full health by 10: $V = x/10$. For states considered to be worse than dead, individuals compare death with a choice that gives them $10 - x$ years in some specific health state followed by x years ($x < 10$) in full health. In this case, the TTO value is given by $V = -x/(10 - x)$. Indifference points in the TTO protocol were effectively established in terms of 6-month increments, yielding a range of values from −19 to 1. To treat the asymmetric distribution of negative values, a monotonic transformation $V_t = V/(1 - V)$ was performed where V and V_t are pre- and posttransformation values so as to alter the range of values to be −1 to 1 [19].

Study Design

The target population was literate individuals aged between 18 and 64 years living in urban areas of Minas Gerais. A sample-size definition was based on the 2010 Brazilian Demographic Census with a margin of error equal to 3%. In total, 3362 individuals were recruited, of whom 1115 lived in Belo Horizonte (capital), 626 in the metropolitan area, and 1621 in the nonmetropolitan area. The sample was selected on the basis of quota sampling by age and sex. Face-to-face interviews were conducted in households in which one individual was selected. Sociodemographic information was recorded on all participants, including socioeconomic status, religious beliefs, happiness, health, and social work experience. Economic incentives were not offered to interviewees. All health states were evaluated by more than 100 individuals as recommended by Chuang and Kind [20]. Test retest evaluation was not conducted.

A total of 13 interviewers were recruited through a commercial market research agency; all interviewers received 3 days training delivered by experienced university researchers. Fieldwork was carried out between October and December 2011. Twenty percent of questionnaires were checked by phone call to detect possible fraud by interviewers. All field research was supervised by the university team to guarantee quality in data collection and minimize any systematic errors by interviewers in applying the protocol. In the presence of systematic errors, the interviewer was retrained; however, during the fieldwork, three interviewers were excluded. All respondent data were double-entered into a Microsoft Excel file.

Modeling

Regression analysis was used to estimate social preference values for all 243 possible EQ-5D questionnaire health states. Estimated values for the 99 health states plus 33333 were compared with the directly observed values obtained from the TTO procedure. It should be noted that the states 11111 and dead are defined by virtue of the TTO procedure as having values of 1 and 0, respectively. No inconsistent respondent data were excluded in estimating social preference values for EQ-5D questionnaire health states. Both aggregate- and individual-level models were estimated by using the ordinary least square (OLS) method. To take into account the individual database structure, panel data regression models were also used.

Two tests were performed to assist the final choice of the estimation. The Hausman test compares the fixed effects model against the random effect (RE) model. The null hypothesis in this case is that individual effects are not correlated with other covariates in the model. The Breush-Pagan test was performed to compare OLS and RE models. The null hypothesis here is that cross-sectional variance components are zero. If this hypothesis is rejected, then panel models should be estimated to take into account the heteroscedasticity of the residuals [21]. Both mean absolute error (MAE) and the number of health states with absolute residuals over 0.05 were computed as goodness-of-fit statistics. The robustness of the final model was assessed by using a split-half strategy: a subset of 50% of health states was randomly selected and used to reestimate the model. The estimated coefficients were then used to generate predicted values for the remaining half of health states, which were then compared with the observed values. Statistical analyses were conducted by using Stata 11.0.

Dependent variable of all models was defined as 1 minus the transformed TTO response ($1 - V_t$). A set of 10 dummy variables for each level of severity and health dimensions was defined as follows:

- MO2 is equal to 1 if the mobility dimension is on level 2;
- MO3 is equal to 1 if the mobility dimension is on level 3;
- SC2 is equal to 1 if the self-care dimension is on level 2;
- SC3 is equal to 1 if the self-care dimension is on level 3;
- UA2 is equal to 1 if the usual activities dimension is on level 2;
- UA3 is equal to 1 if the usual activities dimension is on level 3;
- PD2 is equal to 1 if the pain/discomfort dimension is on level 2;
- PD3 is equal to 1 if the pain/discomfort dimension is on level 3;
- AD2 is equal to 1 if the anxiety/depression dimension is on level 2;
- AD3 is equal to 1 if the anxiety/depression dimension is on level 3;
- In all cases, the default value for these dummy variables was zero.
- Other models including interaction terms were also tested:
- N2 is equal to 1 if any dimension is on level 2 (N2 model);
- N3 is equal to 1 if any dimension is on level 3 (N3 model);
- C3sq is equal to the square of the number of dimensions at level 3 (C3sq model);
- X5 is equal to 1 if five dimensions are on level 2 or 3 (X5 model).

Results

The sociodemographic and health characteristics of the achieved sample were broadly comparable to other representative household surveys for Minas Gerais (Table 1). The distribution of age and sex is also quite similar between the surveys, indicating that the achieved sample successfully represents the distribution of these variables for the literate population of Minas Gerais aged from 18 to 64 years.

Interviews lasted for an average of 44 minutes. The study sample comprised 3362 individuals, of whom 177 respondents evaluated fewer than seven states in the TTO exercise and 2 individuals had all health states with missing values. In the majority of the cases, these missing values were due to mistakes made by the interviewers such as the repetition of cards or errors in recording the board marker. These individuals were included in the data analysis, but their nonvalid responses were omitted.

Table 1 – Sociodemographic and health characteristics of the achieved sample (figures are percentages).

Characteristics	Achieved sample	FJP	IBGE
Sex			
Men	51.58	52.43	52.08
Women	48.42	47.57	47.92
Age group (y)			
18–34	43.3	47.23	46.2
35–49	33.95	32.5	33.37
50–59	16.25	15.29	15.9
>60	6.5	4.98	5.13
Educational level (y)			
<3	4.86	–	5.62
4–10	48.93	–	45.21
11	37.64	–	36.43
12+	8.54	–	12.74
Marital status			
Married	45.85	56.12	–
Widowed	2.95	2.83	–
Divorced	6.71	7.92	–
Single	44.41	33.13	–
Private health insurance			
Yes	31.36	28.34	35.38
No	68.64	71.28	64.62
Self-reported health			
Very good	25.35	29.17	31.18
Good	52.01	49.41	48.99
Fair	20.49	18.32	17.12
Bad	1.58	2.4	2.14
Very bad	0.49	0.65	0.57

Sources. IBGE, Instituto Brasileiro de Geografia e Estatistica (2008); FJP, Fundação João Pinheiro (2009).

Mean observed transformed TTO values range from 0.869 to −0.235 for the 11121 and 33333 health states, respectively. For mild health states, TTO values vary from 0.869 to 0.615, while for severe health states, the maximum value is 0.332 and the minimum is −0.235. Values for moderate health states overlap both mild and severe ranges. Seven cards are given negative values indicating states worse than dead. The SD of transformed TTO values increases with the severity of the health state, indicating greater heterogeneity in individual scores in poorer health states.

Table 2 displays the results using OLS and RE models for both aggregate and individual data. These results relate to the most parsimonious model specification based on main effects and include only dummy variables for each health dimension and level of severity. Because the Hausman test was not significant ($\text{Prob} > \chi^2 = 0.2453$), the null hypothesis was not rejected and the RE model can be safely accepted.

The estimated coefficients are very similar irrespective of the estimation method used, indicating very stable predictions. All dummy coefficients are positive and significant at the 1% level. The coefficients behave as expected, showing a monotonic increase in value decrement with increasing severity for all health dimensions. The largest decrement is observed for severe

Table 2 – Results of aggregate and individual models.

Variables	Aggregate level (OLS) without constant		Aggregate level (OLS) with constant		Individual level (OLS) without constant		Individual level (OLS) with constant		Individual level RE	
	Coef.	SD	Coef.	SD	Coef.	SD	Coef.	SD	Coef.	SD
Mobility, 2	0.152*	0.011	0.131*	0.012	0.150*	0.006	0.129*	0.008	0.127*	0.007
Mobility, 3	0.420*	0.015	0.406*	0.013	0.417*	0.010	0.405*	0.010	0.403*	0.008
Self-care, 2	0.137*	0.012	0.121*	0.012	0.137*	0.006	0.119*	0.007	0.121*	0.007
Self-care, 3	0.248*	0.013	0.242*	0.012	0.256*	0.009	0.248*	0.009	0.246*	0.008
Usual activities, 2	0.116*	0.011	0.095*	0.012	0.105*	0.007	0.085*	0.007	0.095*	0.007
Usual activities, 3	0.204*	0.013	0.186*	0.013	0.208*	0.009	0.194*	0.009	0.205*	0.008
Pain/discomfort, 2	0.086*	0.010	0.069*	0.011	0.084*	0.006	0.068*	0.007	0.067*	0.007
Pain/discomfort, 3	0.199*	0.015	0.193*	0.012	0.205*	0.009	0.200*	0.009	0.200*	0.008
Anxiety/depression, 2	0.076*	0.011	0.059*	0.012	0.083*	0.007	0.063*	0.008	0.061*	0.007
Anxiety/depression, 3	0.127*	0.013	0.114*	0.012	0.131*	0.009	0.116*	0.009	0.113*	0.008
Intercept			0.057*	0.015	0.059*	0.009	0.054*	0.012		
R^2 adjusted	0.995		0.971		0.729		0.365			
R^2 overall									0.364	
Mean absolute error	0.037		0.034		0.038		0.034		0.035	
No. (of 102) > 0.05	29		25		28		23		25	

Coef., coefficient; OLS, ordinary least squares; RE, real effect.
* Significant at the 1% level.

mobility problems. The smallest decrement is for anxiety/depression. The goodness-of-fit statistics are satisfactory and quite similar among the five models: the MAE is around 0.03, which is lower than the prespecified threshold of 0.05. In addition, the percentage of states with an absolute error greater than 0.05 is virtually identical among the models with a constant term: 23% in the OLS individual model and 25% in the OLS aggregate model and the RE model. OLS models excluding a constant term present a higher percentage of health states with MAE greater than 0.05 (28% and 29%).

Because the results are quite similar across models, the model definition is not a significant issue. To take into account that each individual can have different patterns of responses, the RE model was chosen. The Breush-Pagan test rejects the null hypothesis of homoscedasticity (χ^2 $P < 0.001$). The presence of heteroscedasticity favors the use of RE models.

More complex forms of the RE model were tested involving the introduction of additional dummy variables to account for the presence of any dimension with moderate or extreme problems. All these models displayed similar results to the initial main effects specification with virtually identical goodness-of-fit statistics and the same number of states with an MAE exceeding 0.05. Figure 1 presents TTO-predicted values estimated through parsimonious and interaction models. Because the results were very similar among the models, the basic specification of including only dummy variables for each health dimension and level of severity was selected. Some of the interaction models presented inconsistencies: N2 and N3 terms were negative.

To test the robustness of the RE model, EQ-5D questionnaire health states were randomly split into two groups and the TTO observed values of one half were used to estimate the TTO values of the second half. Because the data were included on the basis of

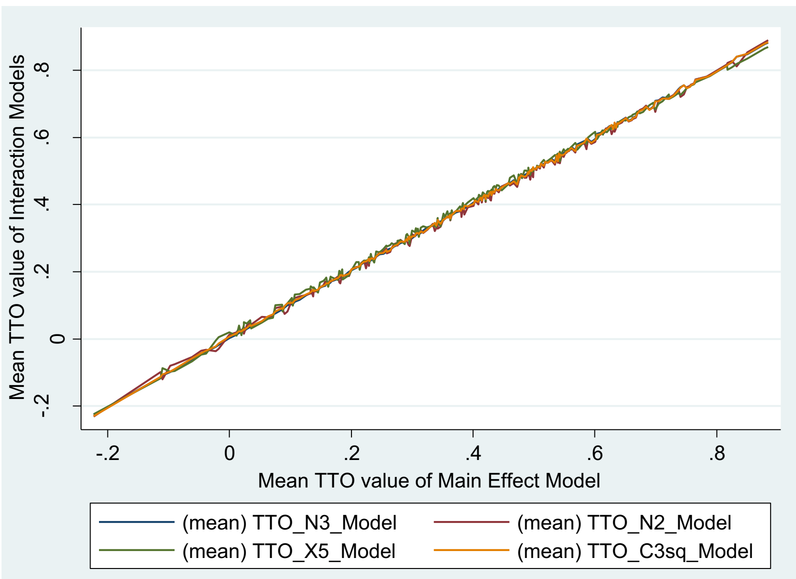

Fig. 1 – Predicted TTO values estimated by interaction models compared with the main effects model. TTO, time trade-off.

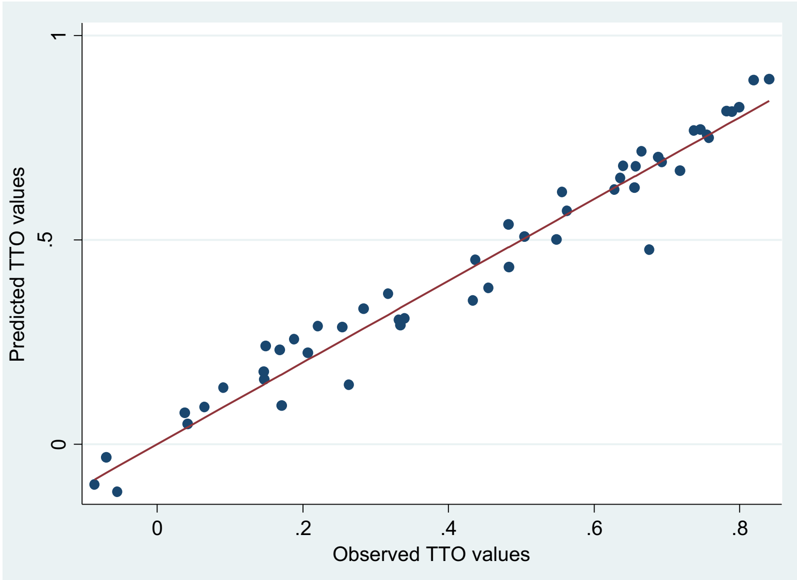

Fig. 2 – Robustness test: observed and estimated mean TTO values for the half-sample of EQ-5D questionnaire states not included in the estimation model. EQ-5D, EuroQol five-dimensional; TTO, time trade-off.

the selected EQ-5D questionnaire states, individual respondents contributed a varying number of health states. Some 70% of the respondents contributed data for four or more states.

Figure 2 presents the mean observed and estimated TTO values for the second subset of health states, namely, the subset of excluded health states. This comparison shows that the model is successful in predicting values for the nonobserved health states.

The estimated values are based on the RE model. Fig. 3 shows these estimated values plotted against the mean observed TTO values for the EQ-5D questionnaire health states used in this study. The proximity of TTO values to the diagonal evidences once more the extent to which the model successfully represents the observed data.

Observed and predicted mean for transformed TTO value estimated by using the final model can be supplied on request from the authors. The full set of preference weights for the 243 EQ-5D questionnaire health states is given in Table 3.

Estimated TTO values from this study were compared with similar values generated in three different national valuation studies (Argentina, Chile, and US Hispanics) [13,14,22]. For illustrative purposes, health benefits computed by using these values were compared with results obtained by using the Minas Gerais values as indicative results for Brazil. Movement between seven selected pairs of EQ-5D questionnaire health states is given in Table 4. The smallest difference in the EQ-5D questionnaire health state value based on the Chilean weights (state 11111 - 11211) was more than double that produced using the Argentine weights. The

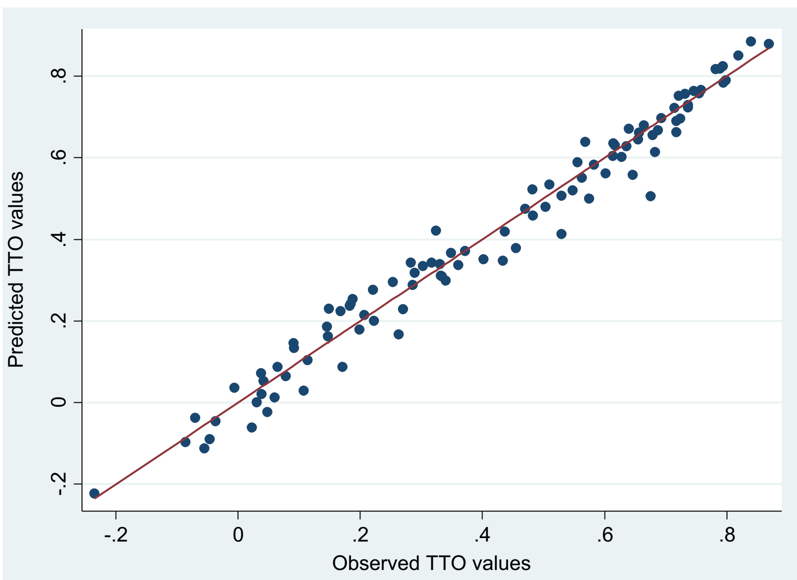

Fig. 3 – Minas Gerais estimated and observed TTO values for all EQ-5D questionnaire health states (using the RE model). EQ-5D, EuroQol five-dimensional; RE, real effect; TTO, time trade-off.

Table 3 – Estimated mean preferences weights for 243 EQ-5D questionnaire health states based on the RE model (main effects model).

EQ-5D questionnaire state	TTO value	95% CI lower bound	95% CI upper bound	EQ-5D questionnaire state	TTO value	95% CI lower bound	95% CI upper bound	EQ-5D questionnaire state	TTO value	95% CI lower bound	95% CI upper bound	EQ-5D questionnaire state	TT Ovalue	95% CI lower bound	95% CI upper bound
11111	1.000	1.000	1.000	12331	0.419	0.394	0.445	22221	0.534	0.513	0.555	31311	0.337	0.313	0.361
11112	0.884	0.865	0.903	13123	0.519	0.498	0.540	22232	0.339	0.319	0.360	31313	0.224	0.203	0.245
11121	0.879	0.860	0.898	13211	0.604	0.584	0.623	22233	0.288	0.267	0.308	32111	0.421	0.397	0.445
11122	0.817	0.798	0.836	13222	0.475	0.453	0.496	22313	0.378	0.359	0.398	32123	0.241	0.219	0.262
11123	0.766	0.746	0.785	13232	0.342	0.319	0.365	22323	0.311	0.291	0.331	32223	0.145	0.124	0.167
11211	0.850	0.834	0.867	21111	0.818	0.798	0.838	22332	0.230	0.209	0.251	32232	0.064	0.041	0.086
11212	0.789	0.772	0.805	21112	0.756	0.736	0.777	22333	0.178	0.159	0.198	32233	0.012	−0.009	0.033
11221	0.783	0.765	0.802	21121	0.751	0.730	0.772	23113	0.458	0.438	0.478	32322	0.087	0.064	0.110
11222	0.722	0.704	0.739	21122	0.689	0.669	0.710	23131	0.371	0.347	0.396	32323	0.036	0.015	0.057
11223	0.670	0.651	0.689	21123	0.638	0.617	0.659	23132	0.309	0.284	0.335	32332	−0.046	−0.069	−0.023
11232	0.589	0.567	0.610	21133	0.505	0.479	0.530	23222	0.347	0.326	0.368	32333	−0.098	−0.117	−0.078
11312	0.679	0.661	0.697	21211	0.723	0.705	0.740	23223	0.295	0.275	0.316	33121	0.228	0.205	0.252
11313	0.628	0.610	0.645	21212	0.661	0.644	0.678	23231	0.276	0.254	0.297	33122	0.167	0.143	0.191
11323	0.561	0.542	0.579	21221	0.655	0.636	0.675	23232	0.214	0.193	0.235	33211	0.200	0.179	0.221
11332	0.479	0.457	0.501	21231	0.522	0.500	0.545	23233	0.162	0.143	0.182	33213	0.087	0.067	0.106
12111	0.824	0.806	0.843	21311	0.613	0.592	0.634	23311	0.366	0.345	0.387	33221	0.133	0.111	0.155
12112	0.763	0.744	0.781	21312	0.551	0.533	0.570	23313	0.253	0.235	0.271	33222	0.071	0.050	0.093
12121	0.757	0.738	0.777	21313	0.500	0.481	0.518	23321	0.299	0.276	0.322	33223	0.020	0.000	0.040
12122	0.696	0.677	0.714	21331	0.413	0.389	0.437	23322	0.237	0.216	0.259	33231	0.000	−0.022	0.022
12123	0.644	0.625	0.663	21332	0.351	0.329	0.373	23323	0.186	0.166	0.206	33232	−0.062	−0.083	−0.040
12211	0.729	0.709	0.749	22111	0.697	0.678	0.715	23332	0.104	0.083	0.126	33233	−0.113	−0.132	−0.095
12212	0.667	0.648	0.686	22112	0.635	0.617	0.653	23333	0.053	0.035	0.071	33312	0.029	0.007	0.051
12221	0.662	0.641	0.683	22113	0.583	0.565	0.602	31131	0.342	0.313	0.371	33313	−0.023	−0.042	−0.004
12312	0.558	0.537	0.578	22121	0.630	0.610	0.649	31213	0.334	0.312	0.355	33322	−0.038	−0.061	−0.016
12313	0.506	0.486	0.527	22211	0.601	0.582	0.621	31222	0.318	0.297	0.340	33323	−0.090	−0.109	−0.071
												33333	−0.223	−0.239	−0.206

CI, confidence interval; EQ-5D, EuroQol five-dimensional; RE, real effect; TTO, time trade-off.

Table 4 – Societal preferences differences among selected EQ-5D questionnaire health states by countries.

EQ-5D questionnaire states	US Hispanic	Chile	Argentina	MG (Brazil)
11111 - 11211	0.206 (3)	0.218 (1)	0.099 (1)	0.150 (1)
11111 - 11222	0.369 (6)	0.428 (5)	0.230 (3)	0.278 (2)
11121 - 22222	0.168 (2)	0.501 (6)	0.271 (4)	0.407 (6)
11122 - 22222	0.108 (1)	0.401 (4)	0.219 (2)	0.345 (5)
22222 - 33223	0.506 (7)	0.653 (7)	0.654 (7)	0.452 (7)
33222 - 33333	0.261 (5)	0.259 (2)	0.581 (6)	0.294 (3)
33311 - 33333	0.250 (4)	0.368 (3)	0.427 (5)	0.313 (4)

Note. Figures in parentheses are the rank order within country.
EQ-5D, EuroQol five-dimensional; MG, Minas Gerais.

largest difference in the EQ-5D questionnaire health state value in these selected states was of the same order of magnitude across the four value sets (state 22222 - 33223). A small variation in the benefit measurement in a cost/QALY ratio has a disproportionate effect on the final index. Had the Argentine values been used to assess the cost-effectiveness of a health benefit from the EQ-5D questionnaire state 11211 to 11111 (0.099) and assuming a marginal cost of (say) US $10,000, the cost/QALY would exceed US $100,000, whereas when Brazilian weights are applied to the same health gain, the cost/QALY is lower at around US $65,000.

Discussion

This is the first study that provides a set of weights for the 243 EQ-5D questionnaire health states based on the preferences of a sample of the Brazilian literate general population aged between 18 and 64 years living in an urban area.

In South America, although other countries have experience in organizing national HTA policies, only Argentina and Chile have thus far derived a set of social preference weights for use with the EQ-5D questionnaire [13,14]. The use of nondomestic value sets, even from continental or regional neighbors, may not be adequate for health policy decision makers in Brazil. Empirical evidence for US Hispanic population has already shown that variations in EQ-5D questionnaire valuations are present [22]. The comparison between values in the present study and those for other populations showed meaningful differences even for Brazil Latin-American neighbors, further highlighting the importance of country-specific value sets. In the lack of Brazilian valuation set, Latin American parameters would be the strongest candidate to HTA studies developed in Brazil. As a result, cost-effectiveness analysis would be biased not reflecting Brazilian preferences. Brazil is very heterogeneous with cultural background different from those of Argentina and Chile. Besides, it is the only country in this continent whose official language is Portuguese. For the Brazilian case, neighbor countries would not provide the best proxy for parameters valuation set.

This study takes several steps forward from the design of the original MVH protocol [18]. To the best of our knowledge, only a Korean valuation study has incorporated a relatively large subset of EQ-5D questionnaire health states [11]. Other studies have tended to replicate the same selection of health states adopted in the original UK national survey. While this has the advantage of allowing for direct comparison of observed values in such circumstances, such comparisons are rarely reported in practice. The use of an enlarged subset of the 243 EQ-5D questionnaire health states may have contributed to the successful construction of simple estimation models in this study, obviating the need for more complex models of the type reported elsewhere [13,14,22]. This study was based around a valuation protocol that requires respondents to handle nine health states, a somewhat lower number of states than specified in the original MVH protocol. This makes the evaluation exercise less demanding, and individuals appear more likely to give responses that are not subject to fatigue or loss of attention. This has important consequences for valuation studies conducted in countries in which the engagement and participation of the general population may be problematic.

Value decrements for each dimension and severity level and average MAE were quite similar regardless of the level of data aggregation and the estimation method applied. Part of the stability of results may be credited to the sample design that yielded a larger volume of data; the number of observations is very large (23,300 individuals-health states), with each health state being evaluated more than 127 times. Each respondent evaluated only nine health states, thereby reducing the importance of individual heterogeneity in the mean predicted value of each health state.

Conclusions

This study was based on a sample of the general population aged between 18 and 64 years in the urban area of the state of Minas Gerais, and the results indicate that a robust, stable estimation model has been achieved. The extent to which these results can be safely generalized to the Brazilian population as a whole is a matter of conjecture at this stage because no comparable value data for the EQ-5D questionnaire exist for other regions or states within the country. Given the heterogeneity of the Minas Gerais population, however, it may well be the case that these initial results are broadly indicative of what might be expected from a wider national survey that included data from a larger sample drawn from across Brazil.

Source of financial support: These findings are the result of work supported by Minas Gerais State Research Foundation (Fundação de Apoio a Pesquisa do Estado de Minas Gerais), Belo Horizonte, Minas Gerais, Brazil. The views expressed in this article are those of the authors, and no official endorsement by the Minas Gerais State Research Foundation is intended or should be inferred.

Supplemental Materials

Supplemental material accompanying this article can be found in the online version at http://dx.doi.org/10.1016/j.vhri.2013.01.009. or, if a hard copy of article, at www.valueinhealthjournal.com/issues (select volume, issue, and article).

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