The reliability and stability of Slovenian population preferences for EQ-5D health states in time

Zanesljivost in stabilnost preferenc slovenske populacije do zdravstvenih stanj, definiranih po EQ-5D

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Abstract

Background: Subjective health states valuation has an increasing impact in the last decade and is used more and more in determining the quality of life of population. On its basis the quality adjusted life years (QALYs) are calculated that are used in economic cost utility analyses in health care field. Quite in a few countries such analyses are recommended or even demanded in the process of taking decisions on financing new health technology including medicines, equipments and medical procedures. The preferences of the population have therefore an enormous impact on the allocation of restricted health care budget and through this on the health care development. The question is whether population preferences for health care states or for separate health care states dimensions, that impact the health-related quality of life, change in time. The goal of the study is to examine the stability and reliability of preferences for the EQ-5D health states in Slovenian population at two points in time.

Methods: Two-stage random sample was selected from the adult Slovenian population in years 2000 and 2005. Each time, the respondents valued a subset out of the 243 EQ-5D health states. Regression analysis was used to get the valuations for all EQ-5D states in both years. First, we compared unadjusted and adjusted mean valuations among both groups. Second, we evaluated differences in mean valuations among the groups after adjusting for other sociodemographic characteristics: age and education.

Results: The valuations showed the stability of the preferences towards EQ-5D health states in Slovenian population.

Conclusions: Within Slovenia, the preferences of Slovenian population are stable in time and proper to use in economic analyses.

Izvleček

Izhodišča: Subjektivno vrednotenje zdravstvenih stanj se v zadnjem desetletju v vedno večji meri uporablja pri določanju kakovosti življenja populacije. Uporablja se pri izračunu kakovostnih zdravstveno prilagojenih let življenja v analizah stroškov in koristnosti. Te analize so v kar nekaj državah priporočljive ali pa že celo obvezne pri sprejemanju odločitev o financiranju novih zdravstvenih programov, opreme ali zdravil. Preference tako zelo vplivajo na razporejanje omejenih sredstev za zdravstvo ter posledično na razvoj zdravstva. Vprašanje, ki se postavlja, je, ali se preference prebivalstva do zdravstvenih stanj oz. do posameznih dimenzij zdravstvenega stanja, ki vplivajo na kakovost življenja, v času spreminjajo. Namen raziskave je preveriti stabilnost in s tem zanesljivost preferenc slovenske populacije do zdravstvenih stanj EQ-5D med dvema časovnima točkama.

Metode: Statistični urad Republike Slovenije je v dveh stopnjah izbral naključni vzorec odraslih Slovencev (18 let in več) v letih 2000 in 2005. Vsakič so anketirani vrednotili izbrana zdravstvena stanja izmed 243 (+2) zdravstvenih stanj EQ-5D. Preko regresijske analize smo kasneje pridobili vrednosti za vsa zdravstvena stanja EQ-5D v obeh letih. Po primerjavi neprilagojenih in prilagojenih srednjih vred-

nosti med skupinama smo vrednotili tudi razlike v srednjih vrednostih med skupinama po demografski prilagoditvi socialnodemografskih spremenljivk: starosti in spola.

Rezultati: Analiza vrednosti zdravstvenih stanj je pokazala visoko stabilnost preferenc slovenske populacije do zdravstvenih stanj EQ-5D.

Zaključki: V Sloveniji so preference slovenske populacije do zdravstvenih stanj stabilne v času in zato primerne za uporabo v ekonomskih analizah.

Introduction

Generic measures for health-related quality of life represent completely independent, subjective valuing of health care states. Their usage, especially in combination with disease-specific measures for valuing health states has been increasing rapidly in the last decades.

One of the generic measures for health-related quality of life is EQ-5D. The name of the instrument relates to the European quality of life and to 5 dimensions of the instrument. The instrument was built by EuroQol Group which is also the owner of the instrument. The group is an international group of experts from different fields and countries.[1] EQ-5D questionnaire is composed of five dimensions which describe health (mobility, self-care, usual activities, pain/discomfort, anxiety/depression), which are reported on three possible levels of difficulty (no problems, some problems, extreme problems). The five dimensions, included in EQ-5D questionnaire, are supposed to represent all fields of person's life that define the health-related quality of life.[2] The best possible EQ-5D health state can therefore be coded as 11111 (level 1 in all five dimensions), the worst imaginable health state can be on the other hand coded as 33333 (level 3 in all five dimensions).[3] The usefulness of the questionnaire was tested in the course of its formation in 3 pilot studies in United Kingdom, Sweden and Norway.[4-6] The results of the study were similar in all three countries and implied large usefulness of the questionnaire.

After 1988 EQ-5D became the most popular questionnaire in clinical as well as in economic and population studies measuring health-related quality of life and morbidity of the population.

The results of the valuation of health states can be presented in three different ways. The first one is the health profile of the individual, which shows the level of problems that individual has on all five dimensions. The second is with the help of "thermometer" which contains values from 0 to 100 and on which the individual marks the value of own health state. The third way is the calculation of health profile into health index through the use of previously acquired values for all hypothetically defined EQ-5D states.

The valuation of health states has been up till now carried out in many countries, also twice in Slovenia. A valuation, which tries to ascribe value to all 245 hypothetical health states with the help of statistical methods, would be extremely demanding task for the respondent and cannot be carried out within each clinical or economic study. This is why valuation study is performed separately, while the clinical, population and economic studies use its results for their own purposes. The first large valuation study of 245 health states was performed in 1993 at the Centre for Health Economics in York.[7]

EQ-5D questionnaire has been officially translated in 26 languages from its original English, among them into Slovene. There are two versions of the questionnaire; longer, which collects the population weights or values that they attach to defined health states – the valuations that are a result of the longer version are mostly meant for further use of valuations of health states in cost utility analyses – and shorter one, where the respondent describes his/her own health state and reports own demographic and socio-economic variables. The shorter version is used in clinical studies for the purpose of monitoring or supervise the health-related quality of life of

[1] The researchers in the group come from Canada, USA, Germany, Denmark, Finland, Italy, Belgium, Greece, Slovenia, New Zealand, Spain, Netherlands, Norway, Sweden and England (1).

Table 1: Number of questionnaires, 2000 and 2005

	2000	2005
Total sample	3000	1000
No. of contacted inhabitants	n.a.	675
Returned questionnaires, number of interviews	712	225
No. of excluded questionnaires due to logical inconsistencies	341	0
No. of questionnaires used in the calculation of value set	371	225

patients/patient groups in different time periods (e.g. before and after the medical procedure); in economic researches, that represent the basis for health care policy priority setting and; in population studies as general population quality of life measurement at a defined time point. The number of studies using EQ-5D that are collected in EuroQol database has exceeded 700 studies. The instrument is most widely used in England and continental Europe, its use has been rising also in Canada and USA. Eight out of ten biggest pharmaceutical companies are using EQ-5D as a generic instrument; it is also recommended for use in costs-effectiveness studies by Washington Panel on Cost Effectiveness in Health and Medicine[8] and since 2008 NICE recommends EQ-5D as the preferred measure of HRQoL in adults.[9]

In a case that national valuation set of EQ-5D health states does not exist, the use of valuation set that is judged to be most similar to the country in question is recommended. If none of the available set is considered proper for use, then the use of the largest of the sets is recommended. This is United Kingdom so-called »MVH set« in a case of cost effectiveness studies, which uses TTO[2] methodology, and so-called United Kingdom VAS[3] A3 or EuroQol-net VAS set, that uses VAS methodology for studies that do not include cost-effectiveness studies. These EuroQol recommendations take into account the geographical proximity and affinity of the culture between different nations and at the same time prioritize the English values since they are defined on the basis of the biggest sample until now. However, they do not touch the question of time and obsoleteness of the values – UK TTO valuation set was established in 1988. The question that is to be answered explores the stability of health states valuation in time. Are the population preferences in time stable? Should the valuation process be repeated every now and then and new valuation sets established?

The main purpose of our study was therefore to find out whether the ascribed weights or valuations of health states that reflect the preferences of the population towards health states, change in time. For this purpose we compared the valuation sets from two different Slovenian studies conducted in 2000 and 2005.

Methods

To compare the values attached to EQ-5D defined health states we used two Slovenian studies. The first study from Slovenia included the random sample of 3.000 people aged over 18. The sampling was done by the Statistical Office of the Republic of Slovenia . The questionnaires were mailed to selected addresses and a phone number was offered in a case when help was needed. Answers were given to all questions that the respondents had in connection to the questionnaire. The response rate was expectedly low (23.7 %) and only 52 % of the returned questionnaires were logically consistent enough to be included in into the calculation of the health state valuation set (Table 1).[4]

The second set was acquired in 2005/2006 on a random sample of 1.000 people aged

[2] TTO – Time-Trade-Off (TTO)

[3] VAS – Visual Analogue Scale (VAS)

[4] The standards for sufficient logical consistency for the inclusion into the questionnaire are internationally defined and taken into consideration in our study.

over 18. This time the valuations were acquired in direct interviews and the respondents could express their questions as well as dilemmas on the spot. We could not reach 325 people in the sample (they were not at home or they changed the residential address). The further 450 respondents in the sample did not want to take part in the interview (as a main reason for non-cooperation they stated their opinion that "an act of sale" will follow the questionnaire). The valuation set for 2005/2006 is based on 225 questionnaires. The response rate was again low, but as expected in comparison to similar studies abroad.[10]

The valuation set based on the sample represents the preferences of all adult Slovenians; therefore it should be as closely as possible representative for the whole Slovenian population. Dolan[11] states, that the most important variable that affects the health states valuation, is education, followed by age. Other variables like gender, smoking, employment status do not have a statistically significant impact on the valuations. The accordance of both samples with Slovenian population is shown in Table 2. The characteristics of Slovenian population are from year 2000 and hence more directly comparable to sample from year 2000. From the presented tables it can be seen

Table 2: Distribution of sociodemographic characteristics of general population in Slovenia and samples (questionnaires used for value set), 2000 and 2005

	Slovene population		Sample 2000		Sample 2005	
	Number	%	Number	%	Number	%
Gender						
All (above 19)	1585199	100	423	100	225	100
Male	765300	48.3	177	41.8	101	44.9
Female	819899	51.7	246	58.2	124	55.21
Age (in years)						
All	1585199	100	420	100	225	100
(18)20–24	142413	8.9	85	20.2	26	11.6
25–34	296733	18.7	92	21.9	48	21.3
35–44	306629	19.3	91	21.7	42	17.8
45–54	310745	19.6	66	15.7	40	17.9
55–64	222195	14.0	41	9.9	29	12.9
65+	306484	19.3	44	10.6	40	17.8
Education						
All	n.a.	100.0	423	100	225	100
Up to 8 years of schooling	n.a.	45.3	34	8.0	56	24.9
9–12 years of schooling	n.a.	44.8	261	61.7	144	64.0
13+ years of schooling	n.a.	9.9	128	30.3	25	11.1

Slovenian population according to age and gender on December 31, 1998, number of enrolled students in the 1998-1999 school year, number of employed in year 1998, number of all pensions in 1998.
In the education category only inhabitants aged 25+ were included, while the sample comprises inhabitants aged 18+. In the sample 18-year-old students in the last year of high schools are counted. However, they are not counted among all population. This is why there might be some differences in comparisons. All other data refer to the population aged 18+.
Source: Statistical Yearbook of the Republic of Slovenia, 1999; Kraigher Tomaž, Drofenik Olga: The goals of the national program of adult education – the presentation and quantification. Ljubljana, Andragogic Center of Slovenia, 1998,, Table D2

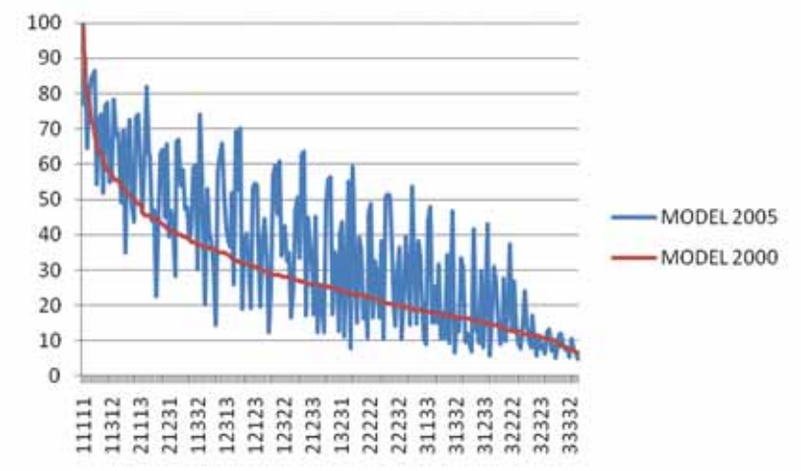

Figure 1: Comparison of estimated health states in years 2000 and 2005, sorted by year 2000

that the selected sample is representative for Slovenian population and that in the returned questionnaires women, younger and more educated are slightly over-represented.

For the estimation purposes health states values were rescaled, so that the value of health state 11111 was equal to 1 and 33333 was equal to 0 and later transformed using natural logarithm. Transformation thus changes the linear additive model in to a multiplicative model. Hence, calculation of a value of any health state is given by (Equation 1):

$$Value\ of\ health\ state\ (i,i,i,i,i) = Constant \times Mobility_i \times \times Self-care_i \times Usual\ activites_i \times Pain_i \times Depression_i \times 100$$

Equation 1.

In the estimation, health states 11111 and 33333 were not included, since they have fixed values (Equation 2).

$$X_1 i = \ln[(((X_1 i - X_1 33333\ ))/((\{(X\square_\downarrow 11111 - X_1 33333))]$$

Equation 2.

In health states valuations comparison between 2000 and 2005 we adapted the sample from 2005 to the sample from 2000 and equalized the differences in education and age structure. The age and education level are factors that have a high impact on value that people attach to a certain health state.[11] For the reason of adaptation we divided sample in three age groups: up to 39 years, 40 to 59 years and over 60 years. Population was also divided into three groups according to the education level: finished primary school, high school and more than high school. The weights for year 2005 were acquired by dividing share of the population in a certain age-educational group in 2000 by share of the same group in 2005.

Results

When comparing valuation sets from 2000 and 2005 it is evident that the mean values of health states are very similar among both sets (Figure 1). The values of the best health states have higher values attached in 2000 than in 2005 while medium and worse health states are valued lower in 2000 than in 2005.

Pearson correlation index among directly valued states from both sets is high (0.986) which shows a high correlation among both valuation sets. The average absolute difference between directly valued health states from year 2000 and 2005 is 7.9, the highest difference in value belong to health state 33333 and amounts to 16.3.

Also the correlation between estimated values in both valuation sets is rather high. Pearson correlation coefficient amounts to 0.78 and the average absolute difference among all 243 values in both valuation sets is 11. The lowest difference between both valuation sets is visible in 11233, where valuations from both years are the same, whereas highest difference can be noticed with health state 33133 and amounts to 18.4.

The adequacy of the 2000 model can be ascertained when it is compared to direct valuations of health states in 2005. The issue is in the assumption that a valuation model was set up in 2000 and now in 2005 we are only trying to get the estimate of health state of a research sample. Modelled values for 2005 based on values from 2000 can be then compared to measured valuations for the same health states from 2005. In such comparison we can see to what degree of accuracy the model from 2000 estimated the health states (in comparison to direct values of health states in year 2005). From Figure 2 it is evident that the values (model 2000 and measured values 2005) are very similar. Pearson's coefficient is again very high and amounts to 0.97. The average absolute difference is low (0.065) so that we can conclude that based on model 2000 the estimation of health states in 2005 would be very accurate.

The comparison of coefficients between studies from both years according to five dimensions is shown in Table 3. Coefficients

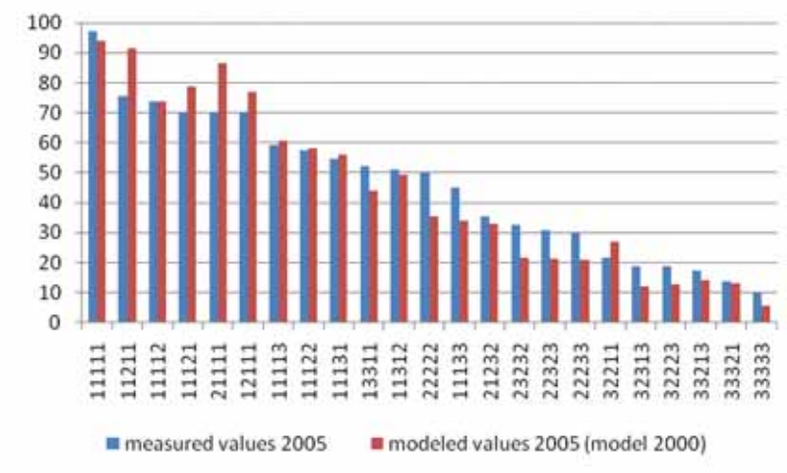

Figure 2: The comparison of average values of health states, model 2000 and direct values 2005

are already recalculated (anti-logarithms of estimated coefficients) so that their meaning is more straightforward.

If we assume or set the value of the constant term (health state 11111) to 1 then the constant can be left out of the equation, which is a reasonable assumption since the values were transformed so that recalculated health state 11111 has a fixed value of 1. Similar is true for any dimension with no problems. Such a dimension has an assigned value of 1 and can also be left out of equation. For example, if we want to calculate value of health state (12321):

$$Value\ of\ health\ state\ (1,2,3,2,1)_{2000} = 1 \times 1 \times 0.68 \times 0.80 \times 0.72 \times 1 \times 100 = \\ = 0.68 \times 0.80 \times 0.72 \times 100 = 39.17$$

The importance of dimensions in the valuations does slightly differ between years 2000 and 2005. The most important one (which has the smallest recalculated coefficient) in both years is Mobility (level 3), while the least important is Usual activities (level 2).

For the reason of sample equalization we adapted the sample from 2005 to the sample from 2000 according to education and age as described in the methods. The results showed, that an individual, who is younger than 40 years with primary school counted less than 1 individual in 2005 terms (he/she was equal to 0.933 individual), whereas the individual younger than 40 with education higher than high school, equalled to more than 2 individu als (2.130 individuals). Further comparisons of both valuation sets are shown through weighted data for year 2005 in Table 4.

While the ranking of directly measured health states is similar in both study years, the values of some health states differ – all bad health states in year 2005 are systematically valued higher than in year 2000. With better health states some states are valued higher and others are not.

Pearson's correlation coefficient is still high (0.979), the average absolute difference is 9.6. The maximum difference between two direct valuations appears in health state 22323 and it amounts to 19.4, which is high.

Table 3: The importance of the EQ-5D dimensions and comparison between 2000 and 2005

	2000	p-value	2005	p-value
Constant	1.03	0.653	0.77	0.000
Mobility_2	0.77	0.000	0.80	0.000
Mobility_3	0.45	0.000	0.22	0.000
Self-care_2	0.68	0.000	0.87	0.000
Self-care_3	0.45	0.000	0.82	0.000
Usual activities_2	0.82	0.003	0.90	0.007
Usual activities_3	0.8	0.035	0.65	0.000
Pain/discomfort_2	0.72	0.000	0.85	0.000
Pain/discomfort_3	0.65	0.000	0.54	0.000
Depression/anxiety_2	0.71	0.000	0.86	0.000
Depression/anxiety_3	0.63	0.000	0.74	0.000

Discussion

The main results of the research suggest that the preferences of the population in time do not vary and are rather stable.

However, in sampling procedure and in interview/mailing procedure in both compared samples certain differences were implemented that can affect the valuation set. In year 2000 the respondents did not rank the health states prior to the valuation process, they rather ascribed values to different health states directly. On the other hand, in year 2005/2006 the respondents did read and rank the health states prior to ascribing valuation to them. Sintonen (12) based his findings on eleven studies and came to conclusions that the differences in health state valuations are not a consequence of way of conducting research; the differences rather arise due to prior ranking or not. In a case of prior ranking the health states have higher valuation. Similarly, based on comparison of same 11 studies Greiner (13) discovers that prior ranking impacts the value of health state. VAS valuations differ among studies that used prior ranking and those which did not. The results of the studies where prior ranking was used are of higher consistency, this is why prior ranking is recommended in all VAS studies. The impact of the prior ranking is also evident in both Slovenian studies, where the consistency of the valuations is higher in 2005 when the prior ranking of health states was used (Figure 3).

Still we assume that the preferences to EQ-5D defined health states are so strong that they are not significantly impacted by the methodological differences.

In a close analysis of health states where the differences in values are highest between both years, we can see that those are the health states that are hard to imagine: e.g. 33133, 33132, 33221, 33132, 33333 etc. It is hard to imagine the health state where an individual is confined to bed, very depressed, cannot take care of himself/herself, is in extreme pain and discomfort and has no problems in performing usual activities. Such health states do not reflect the reality. Hence, it is doubtful that any respondent would classify his/her own health state in such a category. Consequently, the differences in those valuations have no practical meaning and should not distract our attention (Figure 1), while the estimated health state values from both sets appear in logically consistent order. From the comparison of both valuation sets we can conclude that in Slovenia the preferences towards health states are strong and that the preferences have not changed considerably in the last five years.

Table 4: Share (in %) according to age and education groups in the 2000 and 2005 samples

Education level		Age groups		
		< 40 years	40–59 years	60 years +
Primary school	2000	1.4	2.5	4.1
	2005	1.5	10.3	12.9
	Weight	**0.933**	**0.243**	**0.318**
High school	2000	36.4	18.4	7.2
	2005	31.4	21.1	10.3
	Weight	**1.159**	**0.872**	**0.699**
More than high school	2000	16.4	10.3	3.3
	2005	7.6	4.5	0.4
	Weight	**2.130**	**2.239**	**8.25**

** The calculation is based on the rescaled, directly valued data, which were included in the database for the calculation of the value set*

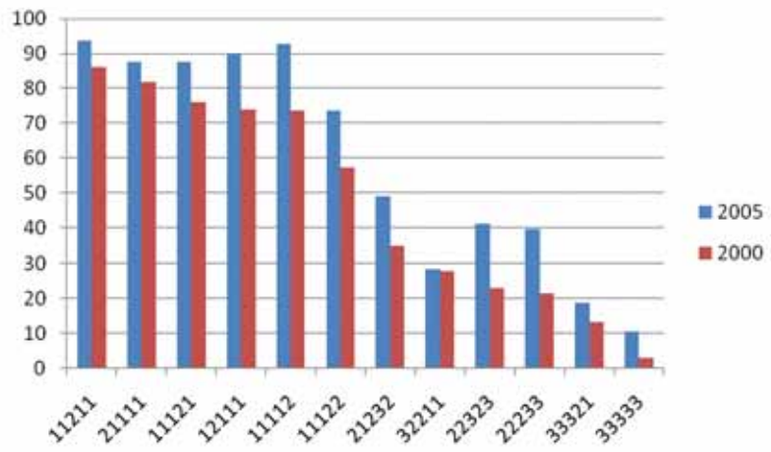

Figure 3: The comparison of health states between 2000 and 2005 (data adapted to the demographic structure from 2000 sample – age and education)

The other potential problem can be seen in the way that measured values are transformed for the means of OLS regression. Usually transformation is based on the value for being dead, while in this study they were transformed with the value for the worst health state (33333). We find the worst health state more appropriate since it is hard to imagine being dead (for a year) or even harder ascribing a value to it.

The further research should focus its attention on changes in preferences in dependency to proximity to death. The underlying assumption in the process of preference elicitation is the stability of preferences no matter in which age it is being performed. However, this may not be true – and in this case the trade-off methods that include trading time of living in defined health states, may not be appropriate for preference elicitation. Also, the international comparison of value sets could be carried out in countries that have more than one valuation set.

Conclusions

Subjective valuation of health state dimensions is a factor that has a strong impact on quality of life, since it is used to determine the orientation and allocation of financial resources in health care system. Allocation of healthcare funds based on the wrong economic analyses, which are influenced by the fuzzy or inconsistent preferences can direct the development of a healthcare system to an unwanted path. A path that is unwanted or not preferred by the public does not maximize the health system users' satisfaction and utility. Therefore it is of utmost importance to ensure the consistency and stability of preferences in time. For that reason preferences of Slovenian public were examined and compared between years 2000 and 2005. It has been found that preferences are rather stable and as such form a good factor or instrument for determining the future direction and setting the preferences in the Slovenian healthcare system.

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