

Electronic Supplementary Material (ESM)

ESM1

Article title: Experience-Based Swedish TTO and VAS Value Sets for EQ-5D-5L Health States

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SUPPLEMENTARY MATERIAL

Data

Sampling procedure, response rate, internal non-responders, exclusion criteria

Sampling procedure for the health survey Life & Health 2017 (ages 18-104 years)

The sampling frame for the population-based health survey Life & Health 2017 was based on Statistics Sweden's Total Population Register for the CDUST Region, representing 1.2 million of the Swedish population aged 18 years and above (the target population for this study) (CDUST Region, 2018). A representative random sample of 78,004 individuals was selected from the sampling frame. The response rate was 44% (34,313 individuals aged 18-104 years). The sampling frame was stratified by geographic area, sex and age to allow analyses by these strata for the regions'/county councils' public health work. For example the youngest age group, 18-29 years, was oversampled. In order to consider the overrepresentation in some strata weighted response rates have been calculated making the response rate in the CDUST survey comparable to the response rate in the National Public Health Survey. The weighted response rate was nearly 46%.

Self-administered postal questionnaires, tailored due to content into the three age groups 18-29, 30-69, and 70 years and above, were sent out to the representative sample of 78,004 individuals, with two reminders, with answering options to use either paper or a web version. Data were linked to Statistics Sweden's (SCBs) Longitudinal Integrated Database for Health Insurance and Labour Market Studies (LISA) to obtain sociodemographic characteristics for each respondent.

Response rate for data used in the present study (ages 30-104 years)

In the age group 30-104 years, the questionnaires were administrated to 56,866 individuals; 36,638 individuals aged 30-69 years; 20,228 individuals aged 70-104 years. The response rate was 47.1%, yielding a sample of 26,789 individuals; 14,337 individuals aged 30-69 years; 12,452 individuals aged 70-104 years. The response rate was highest among those aged 70-84 years (70%), followed by those aged 85 years and above (55%), 50-69 years (53%) and 30-49 years (34%) (CDUST Region, 2018). The response rate was higher among women compared to men in most age groups, except in those 70 years and above where men had a slightly higher response rate than women. The response rate was lower among those born outside Sweden compared to those born in Sweden. The response rate was higher

among those with highest educational level compared to those with low or medium educational level. Among men the lowest response rate was found among those with medium level education whereas among women the lowest was among those with lowest educational level. The paper version of the questionnaire was used by 70% (30-49 years), 77% (50-69 years), 89% (70-84 years), and 96% (85 years and above).

Internal non-responders to TTO and VAS questions and exclusion criteria for data used in the present study

Of the 26,789 responses in the age group 30-104 years, 922 individuals (3.4%) had missing responses on at least one of the EQ-5D-5L dimensions and 2,338 individuals (8.7%) did not answer the VAS question. Of the 14,337 responses in the age group 30-69 years, 764 individuals (5.3%) did not answer the TTO question.

After exclusion of the individuals who had missing answer on at least one of the EQ-5D-5L dimensions, 25,867 individuals were included in the sample.

The sample used for analyses on the TTO question included 14,056 individuals (age group 30-69 years) and after exclusion of missing answers and values higher than 1 on the TTO question the total sample used for the TTO analyses was 13,381 individuals (Online Resource Figure S1). The sample used for the VAS analyses (age group 70-104 years) included 25,867 individuals and after exclusion of missing answers on the VAS question the total sample used for the VAS analyses was 23,899 individuals (Online Resource Figure S2).

The internal non-responders to the TTO question (5.3%) had a significantly higher age, worse health status, lower educational level, lower income and a higher proportion of women compared to those who answered the TTO question (data now shown). However, the effect size shows weak level of strength of association between the specified variables and the response status. In terms of VAS the strength is of moderate level.

The internal non-responders to the VAS question (8.7%) show the same pattern as the non-responders to the TTO question, except for the moderate level of strength of association between age and the response status (data not shown).

CDUST Region (2018). Liv & hälsa 2017 i Mellansverige – Resultat från en undersökning om livsvillkor, levnadsvanor och hälsa (In Swedish). (Life & Health 2017 – Results from a survey on living conditions, health-related behaviors and health. Assessed 12 July 2019. https://www.regionorebrolan.se/Files-sv/Örebro%20läns%20landsting/Vård%20och%20hälsa/Folkhälsa/Liv%20och%20hälsa%20vuxna/Rapporter/Liv_halsa_i_Mellansverige%202017.pdf?epslanguage=sv.

Categorisation of age, educational level, occupation and income

Age was categorised into the following age groups: 30-34; 35-39; 40-44; 45-49; 50-54; 55-59; 60-64; 65-69; 70-74; 75-79; 80-84; 85-89; 90-94; 95+ years (reference group: 30-34 years).

Educational level was categorised into low (elementary school 9-10 years), medium (secondary school 3-4 years), and high (more than 3-4 years secondary school). Low educational level was used as reference group.

Occupation was categorised into employed, studying, unemployed, retired, sickness leave, and parental leave. Employed was used as reference group.

Income was based on disposable individualised annual income. The individualised income was a result of adjustment of household disposable income for household size through a weighting system. According to Statistics Sweden, in calculating equivalised income of members of a household, a value of 1 will be assigned to the head of a household as per the weighting system. Spouse/partner is given a value of 0.51 while other adults will receive 0.6. A first child up to the age of 19 years will be assigned 0.52 and other children up to 19 years old get 0.42 (Statistics Sweden, 2018). The annual equivalised income of the respondents in this study was ranked from lowest to highest by their annual income and divided into five groups of equal size. In the sample used for VAS analyses (n=23,899) the first (lowest) income group had an income less than or equal to 138,710 SEK; the second group from 138,715 to 180,490 SEK; the third group from 180,497 to 246,651 SEK; the fourth group from 246,652 to 328,387 SEK; the fifth (highest) income group 328,405 SEK and higher. In the sample used for TTO analyses (n=13,381) the first (lowest) income group had an income less than or equal to 178,123 SEK; the second group from 178,129 to 243,662 SEK; the third group from 243,669 to 294,998 SEK, the fourth group from 295,001 to 365,388 SEK; the fifth (highest) income group 365,400 SEK or higher. (1 SEK = 9.63 Euro, 2017 prices, Swedish Riksbank). First (low) income group was used as reference group.

Statistics Sweden. Income Mobility Statistics in Sweden Background facts – Households' economy 2018:1. Assessed 12 July 2019. https://www.scb.se/contentassets/7ad934d0c3794707984de372bd90f45e/he0110_2016a01_br_he80br1801.pdf

Swedish Riksbank. Annual average exchange rates, December, 2017. Assessed 12 July 2019. <https://www.riksbank.se/en-gb/statistics/search-interest--exchange-rates/annual-average-exchange-rates/?y=2017&m=12&s=Dot&f=y>

Table S1. Sociodemographic characteristics of the populations in Sweden and the CDUST Regions, census data 2017

Variable	Sweden		Uppsala		Södermanland		Västmanland		Värmland		Örebro	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Proportion of men and women (%)	50.2	49.8	50.0	50.0	50.1	49.9	50.3	49.7	50.3	49.7	50.1	49.9
Average age (years)	41.2		40.1		42.3		49.7		43.5		41.6	
Educational level												
Low	21.2	19.0	19.3	16.5	24.6	23.2	22.8	21.6	22.3	21.5	23.2	21.0
Medium	44.8	40.2	41.9	37.1	49.8	43.6	48.8	43.0	50.8	47.1	49.2	42.7
High	31.1	38.6	36.1	44.4	23.4	31.2	26.0	33.2	24.2	35.1	25.6	34.4
No information	2.9	2.1	2.7	1.9	2.3	1.9	2.3	1.9	2.7	2.1	2.1	1.8
Income (median equivalised) (SEK) ^a	256,600		260,700		244,100		250,200		235,500		240,800	

^a 1 SEK = 9.63 Euro (2017 prices) (Swedish Riksbank)

Swedish Riksbank. Annual average exchange rates, December, 2017. Assessed 12 July, 2019. <https://www.riksbank.se/en-gb/statistics/search-interest--exchange-rates/annual-average-exchange-rates/?y=2017&m=12&s=Dot&f=y>

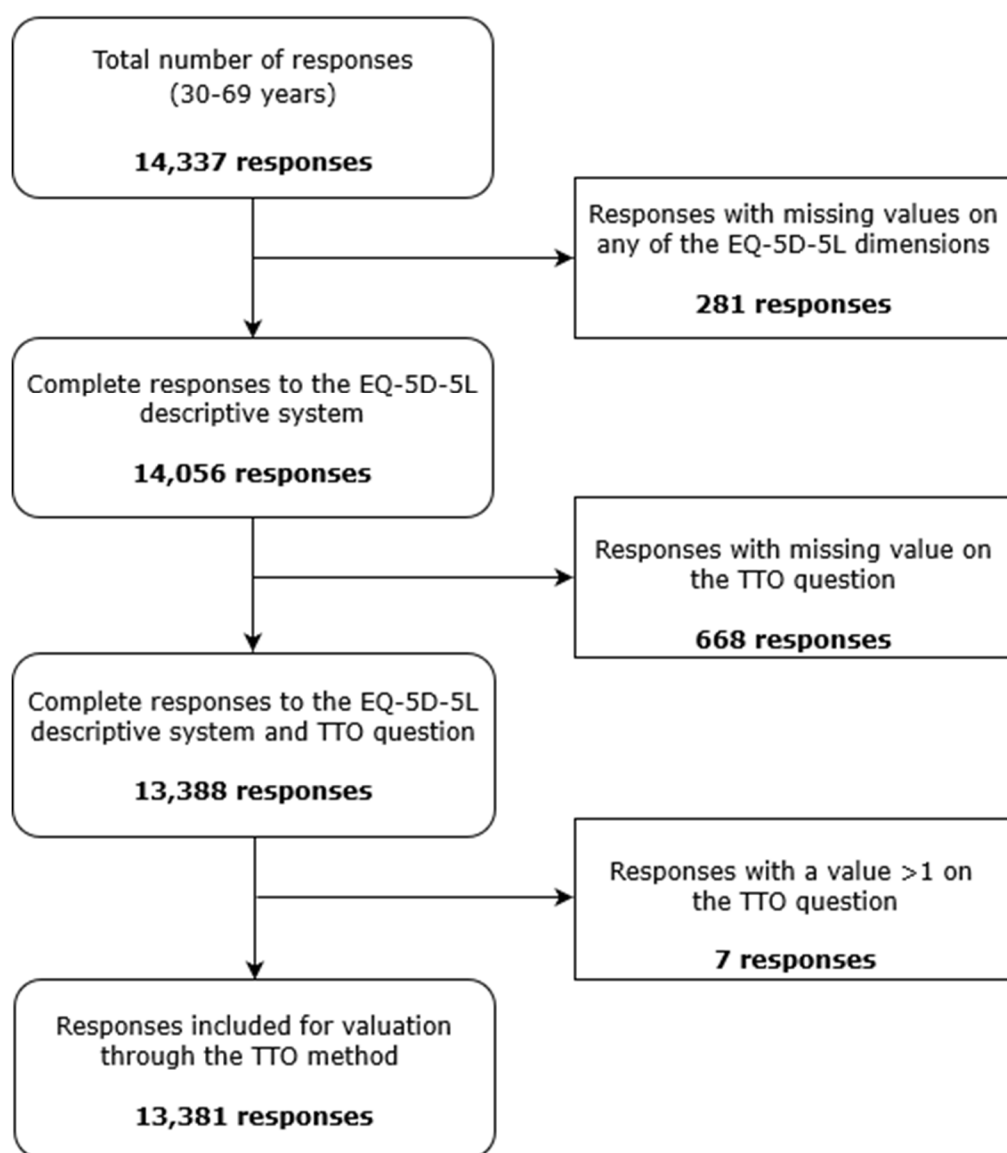


Figure S1. Sample for the TTO value set development

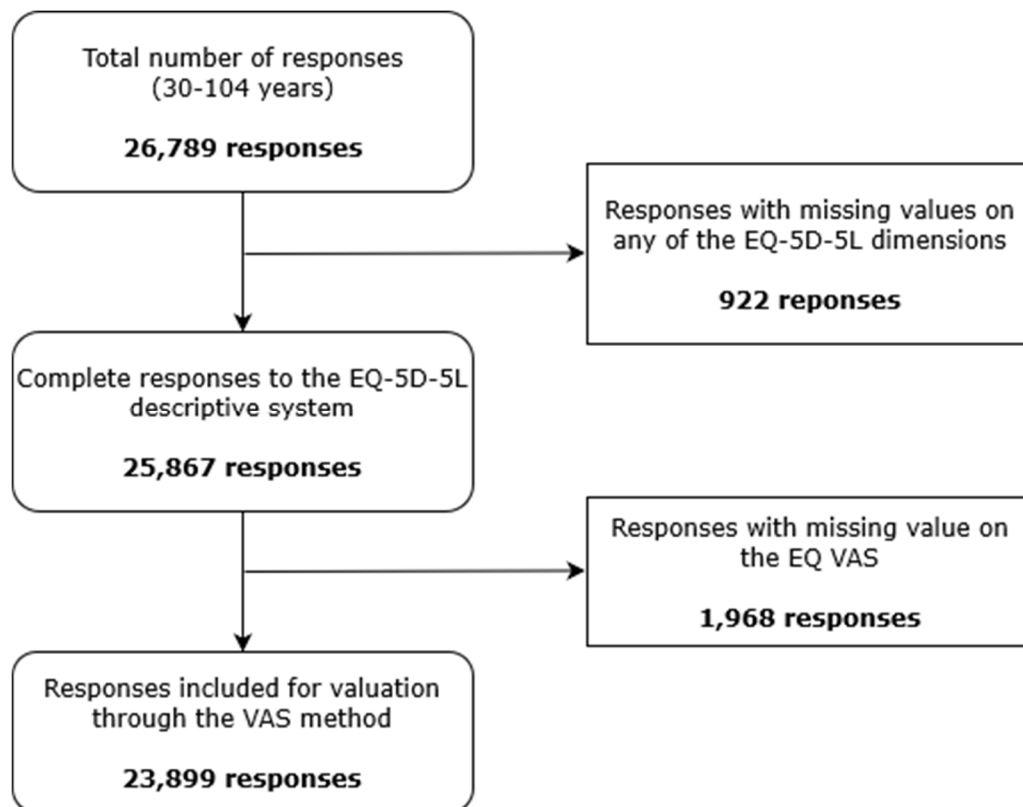


Figure S2. Sample for the VAS value set development

Supplementary analyses

Split sample validation of candidate TTO value sets

Table S2. Root Mean Square Error (RMSE), Mean Absolute Error (MAE) and correlation (Spearman's) between observed and predicted (through the models) TTO values in the testing component of the split samples

Number (n) of health states	RMSE			MAE			Correlation (Spearman's)		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (394) (sample=6,690)	0.1647	0.1647	0.1653	0.0944	0.0944	0.0951	0.4742	0.4741	0.4737
n>=5 (84) (sample=6,200)	0.1539	0.1539	0.1544	0.0850	0.0850	0.0856	0.4021	0.4021	0.4013
n>=10 (35) (sample=5,862)	0.1484	0.1484	0.1489	0.0797	0.0797	0.0804	0.3541	0.3540	0.3527

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Bootstrap analysis of candidate TTO models

Table S3. Root Mean Square Error (RMSE) and Mean Absolute Error (MAE) between observed and predicted (through the models) TTO values

Number (n) of health states	RMSE (95% CI)			MAE (95% CI)		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (531) (sample=13,381)	0.1600 (0.1548-0.1651)	0.1600 (0.1548-0.1651)	0.1601 (0.1549-0.1652)	0.0938 (0.0916-0.0960)	0.0938 (0.0916-0.0960)	0.0940 (0.0918-0.0962)
n>=5 (138) (sample=12,714)	0.1530 (0.1474-0.1584)	0.1530 (0.1474-0.1584)	0.1531 (0.1475, 0.1585)	0.0878 (0.0856-0.0900)	0.0878 (0.0856-0.0900)	0.0879 (0.0858-0.0901)
n>=10 (77) (sample=12,329)	0.1491 (0.1433-0.1548)	0.1491 (0.1433-0.1548)	0.1493 (0.1435-0.1550)	0.0843 (0.0822-0.0865)	0.0843 (0.0822-0.0865)	0.0845 (0.0824-0.0867)

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Table S4. Correlation (Spearman's) between observed and predicted (through the models) TTO values

Number (n) of health states	Correlation (Spearman's)		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (531) (sample=13,381)	0.4647	0.4647	0.4635
n>=5 (138) (sample=12,714)	0.4154	0.4154	0.4140
n>=10 (77) (sample=12,329)	0.3828	0.3828	0.3812

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Split sample validation of candidate VAS value sets

Table S5. Root Mean Square Error (RMSE), Mean Absolute Error (MAE) and correlation (Spearman's) between observed and predicted (through the models) VAS values in the testing component of the split samples

Number (n) of health states	RMSE			MAE			Correlation		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (626) (sample=11,949)	0.1252	0.1247	0.1249	0.0925	0.0919	0.0920	0.6869	0.6876	0.6875
n>=5 (165) (sample=11,162)	0.1216	0.1211	0.1213	0.0898	0.0892	0.0893	0.6434	0.6442	0.6441
n>=10 (91) (sample=10,656)	0.1199	0.1194	0.1196	0.0885	0.0878	0.0879	0.6126	0.6134	0.6133

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Bootstrap analysis of candidate VAS models

Table S6. Root Mean Square Error (RMSE) between observed and predicted (through the models) VAS values

Number (n) of health states	RMSE (95% CI)			MAE (95% CI)		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (831) (sample=23,899)	0.1255 (0.1235-0.1274)	0.1250 (0.1230-0.1269)	0.1251 (0.1232-0.1271)	0.0929 (0.0918-0.0939)	0.0922 (0.0912-0.0933)	0.0923 (0.0912-0.0934)
n>=5 (279) (sample=22,939)	0.1228 (0.1208-0.1249)	0.1224 (0.1203-0.1244)	0.1226 (0.1205-0.1246)	0.0910 (0.0899-0.0920)	0.0903 (0.0893-0.0914)	0.0904 (0.0894-0.0915)
n>=10 (163) (sample=22,201)	0.1211 (0.1190-0.1231)	0.1210 (0.1186-0.1227)	0.1209 (0.1188-0.1229)	0.0898 (0.0887-0.0909)	0.0892 (0.0881-0.0903)	0.0893 (0.0882-0.0903)

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Table S7. Correlation (Spearman's) between observed and predicted (through the models) VAS values

Number (n) of health states	Correlation (Spearman's)		
	Model 3 (OLS)	Model 5 (OLS)	Model 7 (GLM)
All (531) (sample=13,381)	0.6871	0.6880	0.6874
n>=5 (138) (sample=12,714)	0.6635	0.6645	0.6638
n>=10 (77) (sample=12,329)	0.6418	0.6428	0.6421

GLM: Generalised Linear Model; OLS: Ordinary Least Squares

Sensitivity analyses

Models based on weighted values

Inverse probability weighting approach was followed for the weighting procedure (Wooldridge, 2002). For the TTO models, the data set including participants who were presented with the TTO question (n=14,337) was used. Of these 764 did not respond to the TTO question. Of those who answered, seven provided answers with values higher than the maximum of 1.

Using a respondent vs. non-respondent binary classification, a Probit model was developed based on the sociodemographic variables sex, age, educational level and income. On the basis of the model, predicted probability of providing response was determined. In this analysis, 14,218 respondents were used in the analysis after exclusion of respondents who had missing on educational level or income. The inverse of the predicted probabilities were then calculated to get the weights for each respondent.

The weighting produced was employed to compare OLS standard 21 parameter model (Model 1) and the final TTO model (Model 5). In the comparisons, a final sample size of 13,293 was used in both the unweighted and weighted versions after exclusions of observation for missing values in the EQ-5D-5L dimensions, TTO values, educational level and income. Table S8 shows the comparison of Model 1 and Model 5, unweighted and weighted.

For the VAS models, the sample including participants who were presented with the VAS question (n=26,789). Of those, 2,338 did not respond to the VAS. Similar to the TTO analyses, based on a respondent vs. non-respondent binary classification, a Probit model was developed based on the sociodemographic variables sex, age, educational level and income. The weighting for all observations was done in the same way as for the TTO analyses. Table S9 shows the comparison of OLS VAS Model 1 and Model 5, unweighted and weighted.

Table S10 shows the descriptive statistics of the unweighted and weighted versions of the final TTO and VAS value sets. Scatter plots of the unweighted and weighted values are presented for the TTO analysis (Figure S3) and VAS analysis (Figure S4).

Table S8. Unweighted and weighted Ordinary Least Squares (OLS) models for the EQ-5D-5L TTO value set, incremental estimates

Variable	Model 1 TTO (OLS) (21 parameters)						Model 5 TTO (OLS) chosen model (Levels 4 and 5 in MO, SC, and UA dimensions combined; N5)					
	UNWEIGHTED			WEIGHTED			UNWEIGHTED			WEIGHTED		
EQ-5D-5L dimension	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value
Intercept	0.9761	0.0017	<.0001	0.9761	0.0017	<.0001	0.9761	0.0017	<.0001	0.9761	0.0017	<.0001
MO_2	-0.0289	0.0059	<.0001	-0.0289	0.0059	<.0001	-0.0287	0.0059	<.0001	-0.0287	0.0059	<.0001
MO_3	-0.0051	0.0118	0.6677	-0.0052	0.0118	0.6588	-0.0050	0.0118	0.6702	-0.0052	0.0118	0.6609
MO_4	-0.0184	0.0205	0.3697	-0.0175	0.0205	0.3948	-0.0179	0.0197	0.3643	-0.0170	0.0198	0.3897
MO_5	0.0111	0.0488	0.8205	0.0111	0.0488	0.8205						
SC_2	-0.0290	0.0118	0.0140	-0.0292	0.0118	0.0136	-0.0288	0.0118	0.0146	-0.0290	0.0118	0.0142
SC_3	-0.0519	0.0246	0.0347	-0.0517	0.0246	0.0355	-0.0511	0.0245	0.0375	-0.0509	0.0246	0.0384
SC_4	-0.0274	0.0490	0.5753	-0.0276	0.0487	0.5712	-0.0033	0.0459	0.9431	-0.0035	0.0458	0.9386
SC_5	0.1307	0.1052	0.2141	0.1303	0.1046	0.2127						
UA_2	-0.0546	0.0059	<.0001	-0.0547	0.0059	<.0001	-0.0546	0.0059	<.0001	-0.0548	0.0059	<.0001
UA_3	-0.0602	0.0124	<.0001	-0.0601	0.0124	<.0001	-0.0602	0.0124	<.0001	-0.0600	0.0124	<.0001
UA_4	-0.0505	0.0189	0.0074	-0.0505	0.0189	0.0075	-0.0513	0.0184	0.0053	-0.0512	0.0184	0.0054
UA_5	0.0055	0.0350	0.8751	0.0066	0.0349	0.8512						
PD_2	-0.0115	0.0028	<.0001	-0.0115	0.0028	<.0001	-0.0115	0.0028	<.0001	-0.0115	0.0028	<.0001
PD_3	-0.0312	0.0051	<.0001	-0.0313	0.0051	<.0001	-0.0312	0.0051	<.0001	-0.0312	0.0051	<.0001
PD_4	-0.0580	0.0134	<.0001	-0.0586	0.0135	<.0001	-0.0583	0.0134	<.0001	-0.0589	0.0134	<.0001
PD_5	-0.0887	0.0419	0.0342	-0.0885	0.0419	0.0349	-0.0828	0.0492	0.0926	-0.0831	0.0492	0.0915
AD_2	-0.0319	0.0034	<.0001	-0.0320	0.0034	<.0001	-0.0320	0.0034	<.0001	-0.0321	0.0034	<.0001
AD_3	-0.0551	0.0085	<.0001	-0.0550	0.0086	<.0001	-0.0550	0.0085	<.0001	-0.0549	0.0086	<.0001
AD_4	-0.1134	0.0178	<.0001	-0.1129	0.0178	<.0001	-0.1136	0.0178	<.0001	-0.1131	0.0178	<.0001
AD_5	-0.0538	0.0372	0.1481	-0.0546	0.0371	0.1405	-0.0479	0.0465	0.3030	-0.0492	0.0464	0.2895
N5	-	-	-	-	-	-	-0.0022	0.0308	0.9434	-0.0015	0.0308	0.9602
Adjusted R²	0.2742			0.2757			0.2740			0.2755		
RMSE	0.1594			0.1597			0.1594			0.1597		

RSE: Robust Standard Error; **RMSE:** Root Mean Square Error

: the colour indicates larger decrements in magnitude for the weighted models compared to respective unweighted models

Table S9. Unweighted and weighted Ordinary Least Squares (OLS) models for the EQ-5D-5L VAS value set, incremental estimates

Variable	Model 1 VAS (OLS) (21 parameters)						Model 3 VAS (OLS) (chosen model) (Levels 4 and 5 in MO dimension combined; N2; N3; N4)					
	UNWEIGHTED			WEIGHTED			UNWEIGHTED			WEIGHTED		
	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value	Estimate Increment.	RSE	P-value
Intercept	88.20	0.1343	<.0001	88.18	0.1355	<.0001	88.84	0.1409	<.0001	88.85	0.1416	<.0001
MO_2	-3.72	0.2750	<.0001	-3.80	0.2779	<.0001	-3.35	0.2749	<.0001	-3.41	0.2776	<.0001
MO_3	-3.06	0.4199	<.0001	-3.08	0.4236	<.0001	-2.15	0.4309	<.0001	-2.15	0.4344	<.0001
MO_4	-4.26	0.6835	<.0001	-4.26	0.6849	<.0001	-3.47	0.7603	<.0001	-3.48	0.7607	<.0001
MO_5	3.78	1.7174	0.0279	3.84	1.6989	0.0238						
SC_2	-2.02	0.4599	<.0001	-2.02	0.4646	<.0001	-2.20	0.4555	<.0001	-2.19	0.4602	<.0001
SC_3	-0.28	0.7796	0.7196	-0.23	0.7824	0.7686	-0.51	0.7736	0.5138	-0.44	0.7760	0.5679
SC_4	-3.26	1.2940	0.0117	-3.22	1.2920	0.0126	-3.20	1.2970	0.0136	-3.16	1.2975	0.0149
SC_5	-4.28	2.0195	0.0342	-4.39	2.0072	0.0289	-2.17	1.8634	0.2441	-2.26	1.8675	0.2254
UA_2	-5.65	0.2884	<.0001	-5.68	0.2907	<.0001	-5.18	0.2880	<.0001	-5.20	0.2902	<.0001
UA_3	-5.52	0.4689	<.0001	-5.49	0.4719	<.0001	-4.95	0.4748	<.0001	-4.92	0.4777	<.0001
UA_4	-4.26	0.7361	<.0001	-4.20	0.7403	<.0001	-4.00	0.7791	<.0001	-3.96	0.7831	<.0001
UA_5	-3.90	1.2405	0.0017	-3.79	1.2418	0.0023	-3.14	1.2263	0.0105	-3.02	1.2218	0.0133
PD_2	-3.62	0.1868	<.0001	-3.66	0.1891	<.0001	-1.61	0.3540	<.0001	-1.62	0.3582	<.0001
PD_3	-5.71	0.2623	<.0001	-5.69	0.2655	<.0001	-2.79	0.4945	<.0001	-2.80	0.4996	<.0001
PD_4	-5.82	0.5500	<.0001	-5.81	0.5515	<.0001	-5.76	0.6950	<.0001	-5.79	0.6986	<.0001
PD_5	-5.53	2.1005	0.0084	-5.67	2.0639	0.006	-6.55	2.1449	0.0023	-6.66	2.1091	0.0016
AD_2	-5.74	0.1945	<.0001	-5.71	0.1970	<.0001	-5.00	0.2199	<.0001	-4.97	0.2226	<.0001
AD_3	-7.20	0.4508	<.0001	-7.15	0.4549	<.0001	-5.77	0.4889	<.0001	-5.76	0.4933	<.0001
AD_4	-6.36	0.9111	<.0001	-6.22	0.9185	<.0001	-6.05	0.9712	<.0001	-5.95	0.9831	<.0001
AD_5	-10.48	2.0927	<.0001	-10.52	2.0787	<.0001	-10.31	2.0532	<.0001	-10.31	2.0423	<.0001
N2							-2.75	0.3886	<.0001	-2.80	0.3926	<.0001
N3							-4.20	0.5227	<.0001	-4.18	0.5278	<.0001
N4							-1.84	0.7855	0.0193	-1.78	0.7868	0.0235
N5												
Adjusted R ²	0.5480			0.5513			0.5514			0.5543		
RMSE	12.54			12.61			12.49			12.56		

RSE: robust standard error; **RMSE**: Root Mean Square Error

: the colour indicates larger decrements in magnitude for the weighted models compared to respective unweighted models

Table S10. Descriptive statistics of predicted values for EQ-5D-5L based on unweighted and weighted models on TTO and VAS values

Value set	n	Mean	SD	Minimum	Maximum	Correlation (Pearson's)
EQ-5D-5L, TTO, unweighted	13,293	0.9117	0.0981	0.2407	0.9761	1.0000
EQ-5D-5L, TTO, weighted	13,293	0.9117	0.0981	0.2403	0.9761	
EQ-5D-5L, VAS, unweighted	23,731	76.12	13.85	2.44	88.84	0.9999
EQ-5D-5L, VAS, weighted	23,731	76.09	13.85	2.02	88.85	

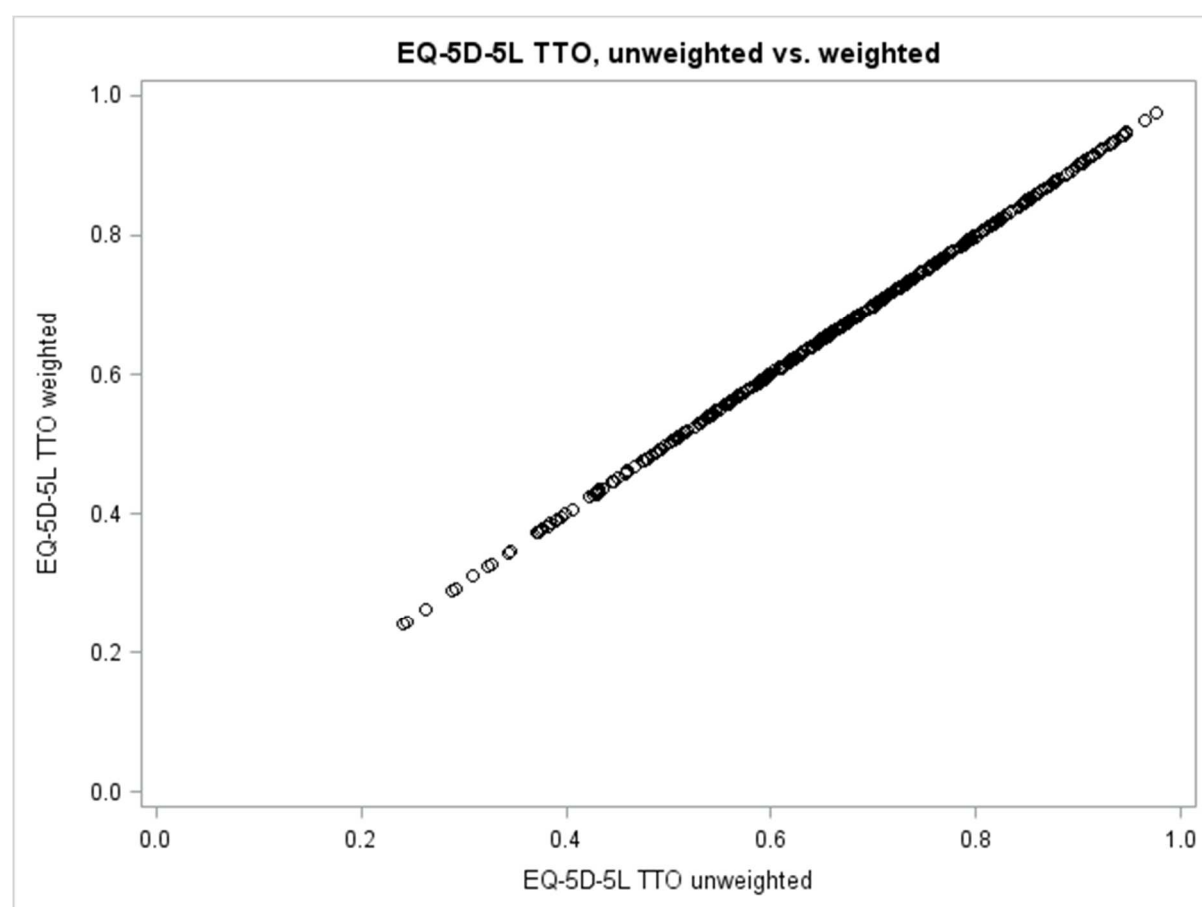


Figure S3. Scatter plot of unweighted vs. weighted predicted TTO values

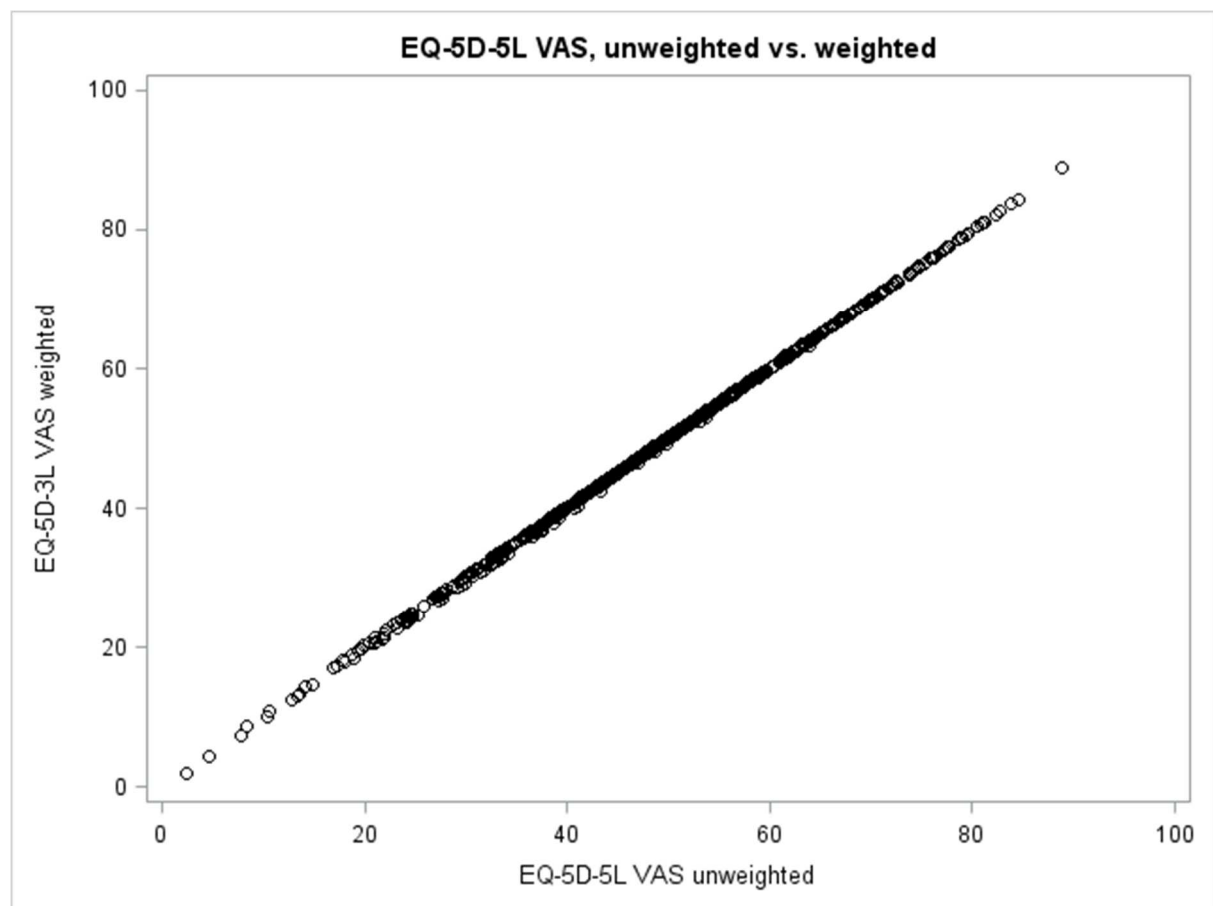


Figure S4. Scatter plot of unweighted vs. weighted predicted VAS values

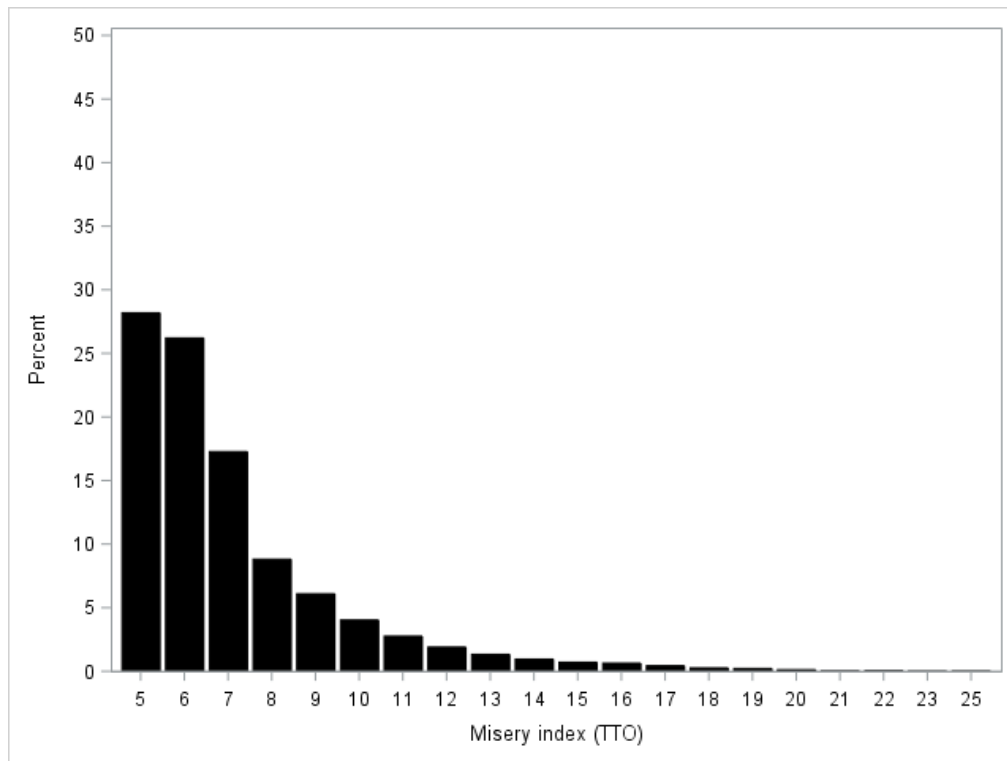


Figure S5. The Misery Index distribution for the TTO data set (n=13,381)

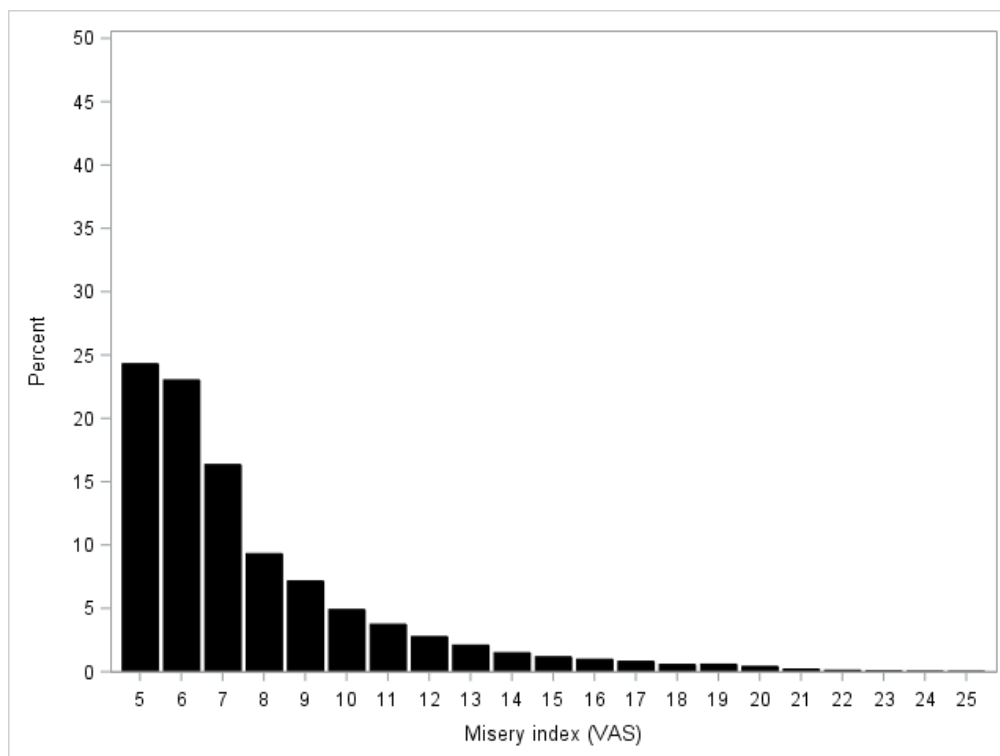


Figure S6. The Misery Index distribution for the VAS data set (n=23,899)

Table S11. Final TTO model (OLS Model 5) adjusted for age, sex, educational level, occupation and income

Variable	Model 5+ age (n=13,381)		Model 5+age+sex (n=13,381)		Model 5+ age+ sex+ education (n=13,333)		Model 5+ age+ sex+ education+ occupation (n=13,226)		Model 5+ age+ sex+ education+ occupation+ income (n=13,186)	
	Estimate ^a	RSE	Estimate ^a	RSE	Estimate ^a	RSE	Estimate ^a	RSE	Estimate ^a	RSE
EQ-5D-5L dimension										
Intercept	0.9684*	0.0052	0.9612*	0.0055	0.9527*	0.0073	0.9603*	0.0074	0.9467*	0.0081
MO_2	-0.0299*	0.0059	-0.0300*	0.0059	-0.0299*	0.0059	-0.0289*	0.0059	-0.0280*	0.0059
MO_3	-0.0067	0.0118	-0.0059	0.0118	-0.0057	0.0118	-0.0063	0.0118	-0.0054	0.0118
MO_45	-0.0186	0.0196	-0.0182	0.0196	-0.0187	0.0197	-0.0234	0.0197	-0.0223	0.0197
SC_2	-0.0257*	0.0118	-0.0245*	0.0118	-0.0277*	0.0118	-0.0233*	0.0116	-0.0234*	0.0116
SC_3	-0.0565*	0.0242	-0.0561*	0.0242	-0.0516*	0.0243	-0.0507*	0.0247	-0.0470	0.0248
SC_45	-0.0028*	0.0452	-0.0035	0.0453	-0.0035	0.0461	0.0005	0.0469	-0.0019	0.0470
UA_2	-0.0550*	0.0059	-0.0550*	0.0059	-0.0538*	0.0059	-0.0529*	0.0059	-0.0530*	0.0059
UA_3	-0.0590*	0.0123	-0.0596*	0.0123	-0.0609*	0.0123	-0.0546*	0.0123	-0.0546*	0.0123
UA_45	-0.0497*	0.0184	-0.0494*	0.0184	-0.0498*	0.0184	-0.0477*	0.0183	-0.0496*	0.0183
PD_2	-0.0118*	0.0028	-0.0125*	0.0029	-0.0119*	0.0028	-0.0121*	0.0028	-0.0121*	0.0028
PD_3	-0.0326*	0.0051	-0.0334*	0.0051	-0.0314*	0.0051	-0.0311*	0.0051	-0.0309*	0.0051
PD_4	-0.0589*	0.0134	-0.0598*	0.0134	-0.0576*	0.0134	-0.0521*	0.0133	-0.0519*	0.0133
PD_5	-0.0947*	0.0477	-0.0929	0.0477	-0.0872	0.0491	-0.0899	0.0494	-0.0833	0.0498
AD_2	-0.0310*	0.0034	-0.0321	0.0035	-0.0321*	0.0035	-0.0310*	0.0035	-0.0298*	0.0034
AD_3	-0.0533*	0.0085	-0.0532	0.0085	-0.0543*	0.0085	-0.0521*	0.0084	-0.0517*	0.0084
AD_4	-0.1132*	0.0177	-0.1135	0.0177	-0.1132*	0.0178	-0.1107*	0.0179	-0.1105*	0.0179
AD_5	-0.0342	0.0467	-0.0326*	0.0465	-0.0455	0.0466	-0.0472	0.0470	-0.0479	0.0469
N5	-0.0010	0.0307	-0.0021*	0.0307	-0.0024	0.0309	0.0080	0.0312	0.0079	0.0313
Age group										
35-39	0.0020	0.0070	0.0023	0.0070	0.0007	0.0070	-0.0004	0.0070	-0.0011	0.0069
40-44	0.0080	0.0065	0.0084	0.0065	0.0083	0.0065	0.0065	0.0064	0.0030	0.0065
45-49	0.0026	0.0065	0.0033	0.0065	0.0042	0.0064	0.0019	0.0064	-0.0013	0.0065
50-54	0.0021	0.0064	0.0027	0.0064	0.0041	0.0064	0.0006	0.0064	-0.0028	0.0065
55-59	0.0116	0.0065	0.0123	0.0065	0.0134*	0.0065	0.0110	0.0065	0.0077	0.0066
60-64	0.0150*	0.0063	0.0158*	0.0063	0.0174*	0.0063	0.0186*	0.0064	0.0151*	0.0064
65-69	0.0104	0.0061	0.0114	0.0061	0.0134*	0.0061	0.0133	0.0075	0.0104	0.0076
Sex										
Women			0.0135*	0.0029	0.0119*	0.0029	0.0131*	0.0029	0.0157*	0.0031

Educational level										
Medium					0.0030	0.0054	0.0000	0.0054	-0.0024	0.0054
High					0.0148*	0.0054	0.0107	0.0055	0.0063	0.0056
Occupation										
Studying							-0.0536*	0.0124	-0.0422*	0.0129
Unemployed							-0.0346*	0.0115	-0.0273*	0.0121
Retired							-0.0098	0.0061	-0.0048	0.0062
Sickness leave							-0.0460*	0.0092	-0.0364*	0.0094
Parental leave							-0.0035	0.0127	-0.0033	0.0127
Income quintile										
Second quintile									0.0158*	0.0051
Third quintile									0.0179*	0.0051
Fourth quintile									0.0224*	0.0051
Fifth quintile									0.0225*	0.0051
Adjusted R ²	0.2724		0.2736		0.2756		0.2809		0.2826	
RMSE	0.1601		0.1599		0.1594		0.1586		0.1582	

^a: estimates for the EQ-5D-5L dimensions and N terms are incremental; *P-value <0.05; **Reference groups**: 30-34 years, Male; Low educational level, Employed, First income quintile, **RSE**: Robust Standard Error; **RMSE**: Root Mean Square Error

Table S11 shows the variation of TTO value by educational level, occupation and income group controlling for age and sex. There was a modest influence of sociodemographic variables. There was no significant effect of education when entering occupation and income into the model. Those studying, being unemployed or at sick leave had significantly lower TTO value and those in higher income quintiles had significantly higher TTO values than those in the lowest income quintile. The TTO value was relatively constant with age, and only the age coefficient for 60-64 years was significant with a positive sign. Women had a significantly higher TTO value.

Table S12. Final VAS model (OLS Model 5) adjusted for age, sex, educational level and income

Variable	Model 5+ age (n=23,899)		Model 5+age+sex (n=23,899)		Model 5+ age+ sex+ education (n=23,777)		Model 5+ age+ sex+ education+ occupation+ income (n=23,731)	
	Estimate ^a	RSE	Estimate ^a	RSE	Estimate ^a	RSE	Estimate ^a	RSE
EQ-5D-5L dimension								
Intercept	89.36*	0.3656	88.95*	0.3747	88.09*	0.4331	87.10*	0.4795
MO_2	-3.01*	0.2777	-3.00*	0.2777	-2.94*	0.2773	-2.92*	0.2771
MO_3	-1.88*	0.4288	-1.84*	0.4290	-1.86*	0.4303	-1.85*	0.4294
MO_45	-3.48*	0.7602	-3.43*	0.7597	-3.41*	0.7612	-3.41*	0.7612
SC_2	-2.18*	0.4513	-2.10*	0.4515	-2.05*	0.4535	-2.05*	0.4522
SC_3	-0.15	0.7722	-0.20	0.7720	-0.08	0.7783	-0.02	0.7777
SC_4	-3.05*	1.2950	-3.05*	1.2945	-3.05*	1.3147	-3.16*	1.3174
SC_5	-1.86	1.8792	-1.92	1.8760	-2.36	1.8650	-2.46	1.8729
UA_2	-5.08*	0.2868	-5.09*	0.2871	-5.03*	0.2873	-4.99*	0.2873
UA_3	-4.72*	0.4709	-4.73*	0.4708	-4.79*	0.4726	-4.78*	0.4717
UA_4	-4.02*	0.7733	-4.01*	0.7733	-4.04*	0.7782	-4.07*	0.7790
UA_5	-2.89*	1.2292	-2.89*	1.2289	-3.03*	1.2386	-2.95*	1.2396
PD_2	-1.84*	0.3543	-1.89*	0.3544	-1.84*	0.3554	-1.84*	0.3562
PD_3	-3.16*	0.4904	-3.21*	0.4905	-3.15*	0.4935	-3.17*	0.4937
PD_4	-6.08*	0.7035	-6.12*	0.7028	-6.15*	0.7007	-6.09*	0.7011
PD_5	-6.99*	2.0755	-6.98*	2.0791	-6.68*	2.1249	-6.45*	2.1442
AD_2	-4.97*	0.2207	-5.04*	0.2217	-5.07*	0.2221	-5.01*	0.2223
AD_3	-5.97*	0.4867	-5.97*	0.4867	-5.97*	0.4887	-5.95*	0.4888
AD_4	-5.90*	0.9846	-5.91*	0.9836	-6.17*	0.9762	-6.07*	0.9773
AD_5	-10.93*	2.0455	-10.92*	2.0451	-10.39*	2.0539	-10.37*	2.0545
N2	-2.57*	0.3872	-2.56*	0.3870	-2.57*	0.3877	-2.56*	0.3889
N3	-3.93*	0.5187	-3.93*	0.5186	-3.96*	0.5214	-3.92*	0.5214
N45	-1.76*	0.7823	-1.77*	0.7817	-1.76*	0.7857	-1.75*	0.7866
Age group								
35-39	-1.72*	0.4961	-1.71*	0.4968	-1.69*	0.4994	-1.76*	0.5057
40-44	-1.07*	0.4801	-1.05*	0.4810	-1.07*	0.4822	-1.20*	0.4863
45-49	-1.08*	0.4530	-1.04*	0.4537	-1.02*	0.4554	-1.18*	0.4620
50-54	-0.41	0.4563	-0.38	0.4571	-0.30	0.4594	-0.47	0.4656
55-59	0.08	0.4513	0.12	0.4517	0.20	0.4539	0.04	0.4600

60-64	0.50	0.4404	0.54	0.4405	0.67	0.4436	0.55	0.4488
65-69	0.77	0.4361	0.82	0.4365	0.98*	0.4406	1.00*	0.4445
70-74	0.22	0.3981	0.31	0.3987	0.55	0.4044	0.78	0.4111
75-79	-1.33*	0.4287	-1.24*	0.4297	-0.94*	0.4375	-0.56	0.4474
80-84	-2.52*	0.4970	-2.44*	0.4978	-2.18*	0.5050	-1.74*	0.5147
85-89	-3.75*	0.5458	-3.60*	0.5460	-3.23*	0.5559	-2.80*	0.5648
90-94	-3.32*	0.7596	-3.22*	0.7607	-2.62*	0.7791	-2.19*	0.7868
95+	0.53	1.5435	0.51	1.5369	1.25	1.5615	1.68	1.5650
Sex								
Women			0.78*	0.1628	0.74*	0.1640	0.96*	0.1720
Educational level								
Medium					0.70*	0.2352	0.51*	0.2363
High					1.02*	0.2473	0.65*	0.2533
Income quintile								
Second quintile							0.28	0.2810
Third quintile							1.49*	0.2765
Fourth quintile							1.41*	0.2924
Fifth quintile							1.40*	0.3029
Adjusted R ²	0.5565		0.5560		0.5563		0.5570	
RMSE	12.45		12.44		12.42		12.41	

^a: estimates for the EQ-5D-5L dimensions and N terms are incremental; *P-value <0.05; **Reference groups**: 30-34 years, Male, Low educational level, Employed, First income quintile, **RSE**: Robust Standard Error; **RMSE**: Root Mean Square Error

Table S12 shows the variation of VAS value by educational level and income group controlling for age and sex. There was a modest influence of sociodemographic variables. There was a significant effect of education. Those in higher income quintiles had significantly higher VAS values than those in the lowest income quintile; however, there was not difference between the two lowest income quintiles. There was no clear age gradient, but the younger and older age groups had significantly lower VAS value than the youngest, with exception of the oldest that had no significant difference compared to the youngest. Women had significantly higher VAS value.

Table S13. Sociodemographic characteristics and self-reported health status of participants who were presented with the TTO question (n=14,056)

Variable	%	n
Sex		
Men	43.7	6,147
Women	56.3	7,909
Mean age(years) [SD]		52.5 [11.3]
Age group (years)		
30-34	8.0	1,127
35-39	8.6	1,202
40-44	10.5	1,473
45-49	12.3	1,722
50-54	13.0	1,824
55-59	13.6	1,917
60-64	15.3	2,144
65-69	18.8	2,647
Educational level		
Low	10.5	1,478
Medium	46.4	6,525
High	42.7	6,000
Missing	0.4	53
Occupation		
Employed	72.4	10,172
Studying	1.9	260
Unemployed	2.8	394
Retired	15.1	2,124
Sick leave	5.9	835
Parental leave	1.0	143
Missing	0.9	128
Income quintile		
First quintile	19.9	2,797
Second quintile	19.9	2,798
Third quintile	19.9	2,798
Fourth quintile	19.9	2,798
Five quintile	19.9	2,798
Missing	0.5	67
Self-rated health (SRH)		
Very good	20.1	2,829
Good	52.7	7,412
Neither good or bad	21.5	3,091
Bad	4.4	621
Very bad	0.7	100
Missing	0.5	75
Problem in at least one EQ-5D-5L dimension	72.2	(10,154)
Problem at level 5 in at least one EQ-5D-5L dimension	1.56	(219)
Mean EQ VAS value [SD]		78.6 [17.1]
Mean TTO value [SD]		0.91 [0.19]

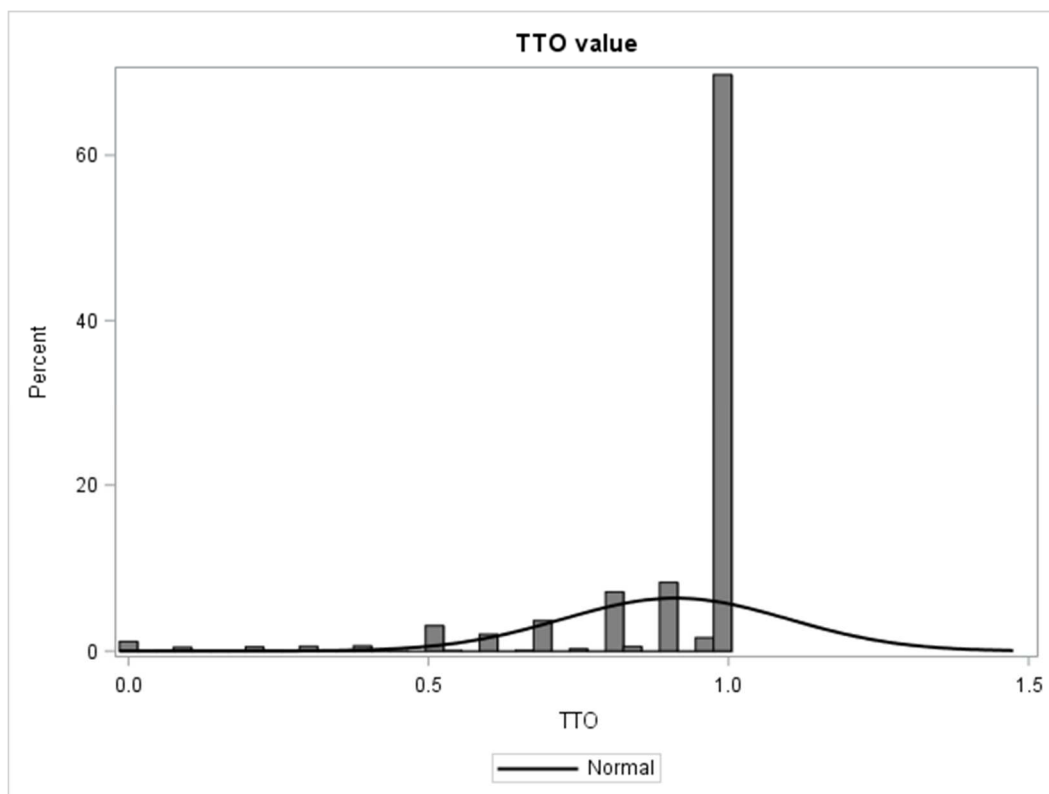


Figure S7. Distribution of TTO values (n=13,381)

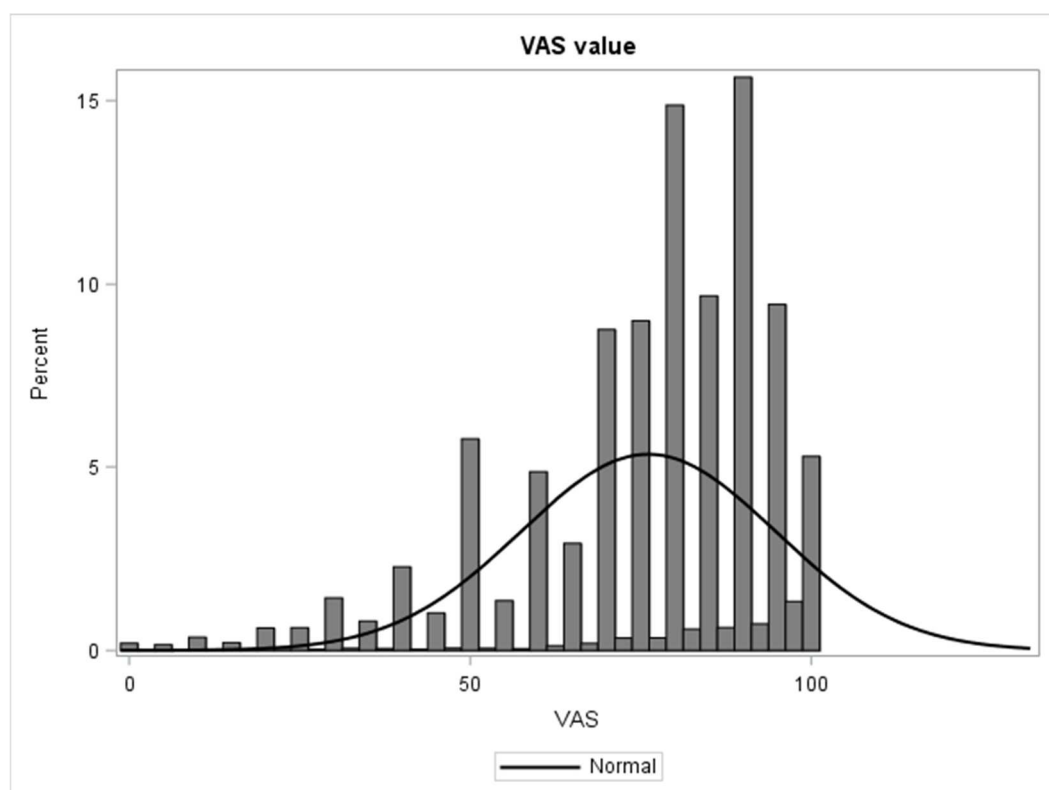


Figure S8. Distribution of VAS values (n=23,899)

Characteristics of respondents with TTO=0

Table S14. Sociodemographic characteristics of respondents with TTO=0 compared to TTO>0

Variable	TTO =0 (n=155)		TTO >0 (n=13,226)		Chi square test (p-value)	Cramer's V
	%	n	%	n		
Sex					0.0385	-0.0179
Men	52.3	81	44.0	5,814		
Women	47.7	74	56.0	7,412		
Age group					0.9527	0.0126
30-34	7.1	11	8.1	1,071		
35-39	9.7	15	8.6	1,143		
40-44	9.7	15	10.6	1,403		
45-49	12.9	20	12.2	1,616		
50-54	14.2	22	12.9	1,710		
50-59	16.1	25	13.6	1,795		
60-64	14.2	22	15.3	2,027		
65-69	16.1	25	18.6	2,461		
Educational level					0.9440	0.0029
Low	10.3	16	10.3	1,363		
Medium	47.1	73	46.3	6,126		
High	41.3	64	43.0	5,691		
Missing	1.3	2	0.4	46		
Income quintile					0.2373	0.0204
First quintile	19.8	41	26.4	2624		
Second quintile	19.9	32	20.6	2633		
Third quintile	20.0	24	15.5	2641		
Fourth quintile	19.9	28	18.1	2637		
Fifth quintile	19.9	28	18.1	2637		
Missing	0.4	2	1.3	54		

Table S15. The ten most frequent health states among respondents with TTO=0

Health state	%	n
11121	14.8	23
11111	11.6	18
11122	10.3	16
11112	7.7	12
11131	3.9	6
21231	3.9	6
31231	3.2	5
21232	2.6	4
11221	1.9	3
11222	1.9	3

Of the 13,381 respondents to the TTO question 155 respondents (1.2%) had a TTO value of 0. Table S14 shows that there were no statistically significant difference in age, educational level or income between those who reported a TTO value of 0 and those who reported a TTO value higher than 0. There was a significant difference between the proportion of men and women between the two groups. However, the effect size of this difference was negligible (Rea and Parker, 2014).

Characteristics of respondents with TTO=1

Table S16. Sociodemographic characteristics of respondents with TTO=1 compared to TTO <1

Variable	TTO=1 (n=9,333)		TTO <1 (n=4,048)		chi square test (p-value)	Cramer's V
	%	n				
Sex					0.0472	-0.0172
Men	44.6	4,164	42.8	1,731		
Women	55.4	5,169	57.2	2,317		
Age group					0.1033	0.0298
30-34	8.0	748	8.2	334		
35-39	8.9	830	8.1	328		
40-44	10.8	1,010	10.1	408		
45-49	12.1	1,131	12.5	505		
50-54	12.6	1,171	13.9	561		
50-59	13.3	1,239	14.3	581		
60-64	15.5	1,449	14.8	600		
65-69	18.8	1,755	18.1	731		
Educational level					<0.0001	0.0809
Low	9.5	884	12.2	495		
Medium	44.7	4,168	50.2	2,031		
High	45.6	4,255	37.1	1,500		
Missing	0.3	26	0.5	22		
Income quintile					<0.0001	0.1550
First quintile	16.4	1,531	28.0	1,134		
Second quintile	19.3	1,804	21.2	861		
Third quintile	20.2	1,885	19.3	780		
Fourth quintile	21.4	2,001	16.4	664		
Fifth quintile	78.0	2,079	14.5	586		
Missing	0.4	33	0.6	23		

Table S17. The ten most frequent health states among respondents with TTO=1

Health state	%	n
11111	36.1	3,371
11121	22.8	2,127
11122	9.7	905
11112	7.5	697
11131	3.1	291
21121	2.0	182
11132	1.8	165
11221	1.3	120
21221	1.0	91
11222	0.9	88

Of the 13,381 respondents to the TTO question 9,333 respondents (69.8%) had a TTO value of 1. Table S16 shows that there were no statistically significant difference in age between those who reported a TTO value of 1 and those who reported a TTO value lower than 1. There was a significant difference in the proportion of men and women, educational level and income between the two groups. However, the effect sizes of these differences were shown to be from negligible to weak (Rea and Parker, 2014).

Characteristics of respondents with VAS=0

Table S18. Sociodemographic characteristics of respondents with VAS=0 compared to VAS>0

Variable	VAS=0 (n=42)		VAS>0 (n=23,857)		Chi square test (p-value)	Cramer's V
	%	n	%	n		
Sex					0.9920	-0.0001
Men	47.6	20	47.5	11,342		
Women	52.4	22	52.5	12,515		
Age group					0.0639*	0.0289
30-34	-	-	4.5	1,075		
35-39	4.8	2	4.9	1,159		
40-44	4.8	2	5.9	1,408		
45-49	2.4	1	6.8	1,632		
50-54	7.1	3	7.2	1,730		
50-59	9.5	4	7.5	1,797		
60-64	7.1	3	8.3	1,984		
65-69	9.5	4	10.2	2,446		
70-74	19.1	8	17.6	4,209		
75-79	9.5	4	11.4	2,728		
80-84	-	-	6.3	1,500		
85-89	19.1	8	6.2	1,480		
90+	7.1	3	3.0	709		
Educational level					0.0323	0.0170
Low	38.1	16	22.2	5,301		
Medium	40.5	17	42.7	10,180		
High	21.4	9	34.6	8,254		
Missing	-	-	0.5	122		
Income quintile					0.0070	0.0242
First quintile	35.7	15	19.9	4,752		
Second quintile	28.6	12	19.9	4,755		
Third quintile	21.4	9	20.0	4,759		
Fourth quintile	4.8	2	20.0	4,765		
Fifth quintile	9.5	4	20.0	4,763		
Missing	0.0	0	0.3	63		

* Likelihood ratio chi square p-value (46% of the cells had expected counts less than 5)

Table S19. The ten most frequent health states among respondents with VAS=0

Health state	%	n
11111	14.3	6
11115	2.4	1
11121	2.4	1
11331	2.4	1
12122	2.4	1
21121	2.4	1
21122	2.4	1
21131	2.4	1
21213	2.4	1
21222	2.4	1

Of the 23,899 respondents to the VAS question 42 respondents (0.2%) had a VAS value of 0. Table S18 shows that there were no statistically significant difference in proportion of men and women or age between those who reported a VAS value of 0 and those who reported a VAS value higher than 0. There was a significant difference in educational level and income between the two groups. However, the effect sizes of these differences were negligible (Rea and Parker, 2014).

Characteristics of respondents with VAS=100

Table S20. Sociodemographic characteristics of respondents with VAS=100 compared to VAS<100

Variable	VAS=100 (n=1,123)		VAS<100 (n=22,776)		Chi square test p-value	Cramer's V
	%	n				
Sex					0.0050	0.0182
Men	43.5	488	47.7	10,874		
Women	56.5	635	52.3	11,902		
Age group					<0.0001	0.0508
30-34	3.8	43	4.5	1,032		
35-39	4.5	50	4.9	1,111		
40-44	5.3	59	5.9	1,351		
45-49	5.5	62	6.9	1,571		
50-54	8.0	90	7.2	1,643		
50-59	8.3	93	7.5	1,708		
60-64	8.5	95	8.3	1,892		
65-69	14.1	158	10.1	2,292		
70-74	21.5	241	17.5	3,976		
75-79	10.4	117	11.5	2,615		
80-84	5.5	62	6.3	1,438		
85-89	3.3	37	6.4	1,451		
90+	1.4	16	3.1	696		
Educational level					0.0198	0.0182
Low	21.6	243	22.3	5,074		
Medium	46.2	519	42.5	9,678		
High	31.1	349	34.8	7,914		
Missing	1.1	12	0.5	110		
Income quintile					0.0536	0.0198
First quintile	19.7	221	20.0	4546		
Second quintile	16.8	189	20.1	4578		
Third quintile	22.4	251	19.8	4517		
Fourth quintile	20.4	229	19.9	4538		
Fifth quintile	20.0	225	19.9	4542		
Missing	0.7	8	0.2	55		

Table S21. The ten most frequent health states among respondents with VAS=100

Health state	%	n
11111	83.3	935
11121	9.7	109
11112	1.9	21
11122	0.7	8
21111	0.7	8
11131	0.6	7
21121	0.4	4
11221	0.3	3
12111	0.3	3
11113	0.2	2

Of the 23,899 respondents to the VAS question 1,123 respondents (4.7%) had a VAS value of 100. Table S20 shows that there were no statistically significant difference in income between those who reported a VAS value of 100 and those who reported a value lower than 100. There was a significant difference in the proportion of men and women, age and educational level between the two groups. However, the effect sizes of these differences were negligible (Rea and Parker, 2014).

Table S22. Relationship between status of health state 11111 and TTO=1

Health state	TTO value			
	1		< 1	
	%	n	%	n
11111	36.1	3,371	9.9	401
All other	63.9	5,962	90.1	3,647
	100.0	9,333	100.0	4,048
Chi square test, p-value			<0.0001	
Cramer's V			0.2676	

Table S22 shows that there was a statistically significant difference between those who reported a health state of 11111 and those who reported problem on at least one dimension in terms of reporting a TTO value of 1 or a TTO value lower than 1. The effect size of the association was at a moderate level of strength (Rea and Parker, 2014).

Table S23. Relationship between status of health state 11111 and VAS=100

Health state	VAS value			
	100		< 100	
	%	n	%	n
11111	83.3	935	21.4	4,872
All other	16.7	188	78.6	17,904
	100,0	1,123	100,0	22,776
Chi square test, p-value			<0.0001	
Cramer's V			0.3053	

Table S23 shows that there was a statistically significant difference between those who reported a health state of 11111 and those who reported problem on at least one dimension in terms of reporting a VAS value of 100 or a VAS value lower than 100. The effect size of the association was at a moderate level of strength (Rea and Parker, 2014).