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From Health to Wellbeing: Toward a Monetary Valuation of a Wellbeing-Adjusted Life-Year

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ABSTRACT

Objectives: Economic evaluations using broader measures to capture benefits beyond improved health can inform policy making, but only if the monetary value of gains measured using these instruments is understood. This study explored contingent valuation as a method to estimate the monetary value of a wellbeing-adjusted life-year (WALY) as measured by ICEpop Capability Measure for Adults (ICECAP-A).

Methods: In a large online survey of representative samples from 7 European countries, participants valued a change in the ICECAP-A from their current health state to a randomly assigned hypothetical state. Participants were instructed that an unspecified treatment could avoid a loss or produce a gain in wellbeing and were asked for their willingness to pay (WTP) for this treatment. WTP per WALY was calculated using an aggregated approach that used ICECAP-A tariffs from the United Kingdom.

Results: We analyzed a sample of 7428 observations, focusing on avoided losses (n = 6002) because the results for gains were not theoretically valid. Different cutoff points for a marginal change were explored. Depending on the definition of a marginal change, WTP per WALY averaged between €13 323.28 and €61 375.63 for avoided losses between [0, 0.5] and [0, 0.1], respectively, for 1 month. Mean WTP per WALY varied across the countries as follows: Denmark (€17 867.93-€88 634.14), France (€10 278.35-€45 581.28), Germany (€12 119.39-€54 566.56), Italy (€11 753.69-€52 161.25), The Netherlands (€14 612.88-€58 951.74), Spain (€11 904.12-€57 909.17), and United Kingdom (€13 133.75-€68 455.85).

Conclusion: Despite the inherent limitations of our study, it offers valuable insights into methods for eliciting the WTP for changes in capability wellbeing as measured with ICECAP-A.

Keywords: ICECAP, quality of life, wellbeing, willingness to pay.

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Highlights

- It is increasingly recognized that health and social care interventions may have benefits beyond health. Moreover, instruments to capture such wellbeing gains have been developed, of which the ICEpop Capability Measure for Adults (ICECAP-A), measuring capability wellbeing, is a prominent example. However, its use in economic evaluations ultimately requires knowledge about the monetary value of gains in capability wellbeing as measured with the ICECAP-A.
- As a part of a larger online survey, conducted in 7 European countries, we measured the willingness to pay of individuals for a gain or avoided loss of wellbeing via the ICECAP-A. Focusing on the theoretically valid avoided losses group, we provide insight into the monetary value of a wellbeing-adjusted life-year for these 7 European countries.
- We identified several shortcomings of the current study, which warrant caution in the interpretation of our results and may help to design new studies aiming to investigate the willingness to pay for wellbeing changes. Given the increased attention for broader outcome measures and their potential relevance in decision making, further investigation of the monetary value of a wellbeing-adjusted life-year remains highly important.

Introduction

There is growing recognition that both health and social care interventions can yield benefits that extend beyond those captured by common health-related quality of life (QOL) measures, such as the EQ-5D.[1,2] As the scope of economic evaluations broadens to include service provision in areas such as social care, public health, and mental health, it will become especially important to measure these additional benefits. This raises questions about whether health-related QOL measures adequately capture the full spectrum of benefits that can be achieved.[1]

Numerous new, broader measures are available,[3] such as the ICEpop Capability Measure (ICECAP) series,[4-7] the Adult Social Care Outcomes Toolkit (ASCOT),[8,9] the Well-Being of Older People (WOOP),[10] the EQ Health and Wellbeing instrument (EQ-HWB),[2] and the 10-item Well-being instrument (WiX).[11] These instruments differ in the constructs they aim to capture and are embedded in different theoretical schools of thought.[11] The broadest among these instruments aim to capture individuals' overall QOL, often referred to as wellbeing.

There is no gold standard for measuring wellbeing at present. One of the most widely adopted instruments is the ICECAP for Adults (ICECAP-A). It attempts to capture individuals' capabilities with regard to their ability to do and be the things in life that are important to them in 5 dimensions: stability, attachment, autonomy, achievement, and enjoyment.[5,12] A link observed between EQ-5D and ICECAP-A suggests that both instruments may be seen as complements rather than substitutes,[13] also because the ICECAP may not fully capture physical health.[14,15]

Value sets, often referred to as "tariffs," have been established using best-worst scaling techniques for the United Kingdom (UK), Hungary, and The Netherlands.[16-18] These tariffs allow the well-being states (WBS) described by the ICECAP-A to be transformed into "preference" or "utility" scores ranging from 0 (worst) to 1 (best). Although the corresponding outcomes capture a different construct of health than quality-adjusted life-years (QALYs) and the preference scores are not anchored at "dead," this transformation into "preference" or "utility" scores allows the ICECAP-A to be used in economic evaluations, thus broadening the QALY framework to include concepts such as *year in full capability (wellbeing)* (YFC)[19,20] or—if the normative aim is not full capability but reaching a sufficient level of capability[21]—*year in sufficient capability (wellbeing)*.[22,23] Next to this, labels such as *wellbeing-adjusted life-years* (WALYs,[24] also termed WELBYs[1]) and *capability-adjusted life-years*[25-27] are proposed. In this article, we use the more general term WALY, given that the ICECAP-A is used here especially as an example of broader wellbeing measures. We note that for the ICECAP-A specifically YFC would conform more directly with the concept measured and terminology proposed by the developers.

The ICECAP instruments have been used in economic evaluations and other policy-guiding studies.[13] When the results of such evaluations are expressed in terms of costs per WALY gained (using the ICECAP or another wellbeing measure), questions arise as to how these results can be used following the general decision rule expressed in equation (1):

$$v_q \Delta Q - \Delta c_t > 0 \quad (1)$$

in which v_q denotes the consumption value of the outcome Q and c_t denotes total costs, indicating that the value of the gains minus the costs required to produce that value should be larger than zero. Equation (1) can be rewritten as:

$$\frac{\Delta c_t}{\Delta Q} < v_q. \quad (1)$$

which highlights that the costs per gained unit of outcome should not exceed its worth, where ΔQ refers to the number of WALYs gained and v_q to the consumption value of a WALY.

To base decisions on incremental cost-per-WALY ratios, decision makers need information on the monetary value of a WALY, just as they do for QALYs. This information enables them to assess whether a given cost-per-WALY ratio is cost-effective. Because WALYs measure a broader concept than QALYs, it is unlikely that their value is equal.

To the best of our knowledge, few attempts have been made to arrive at a monetary value for a WALY. Himmler et al[20] reported a base-case estimate for the monetary value of a YFC wellbeing of £66 597 for the UK (compared with £30 786 for the QALY obtained in the same sample), whereas Kinghorn and Afentou,[23] using a deliberative valuation approach, also in the UK, reported a value for a year of *sufficient* capability wellbeing to be £33 500.

Our study aim to contribute to this discussion by exploring a method to elicit the monetary value of a WALY measured using the ICECAP-A as part of an ongoing online survey administered in 7 European countries. Due to constraints related to the number and nature of questions posed, as well as our study design, this came with clear limitations. Our focus was on the valuation of marginal changes, thus offering additional evidence regarding the measurement and magnitude of willingness to pay (WTP) per WALY in Europe.

Methods

Data and Study Design

This study was part of the 11th and final wave of the European Covid Survey (ECOS), allowing us to reach large representative samples comprising approximately 1000 adults in each country (Denmark, France, Germany, Italy, The Netherlands, Spain, the UK). The cross-sectional data were collected between November 18 and December 7, 2022. Our questions followed the initial sociodemographic section of the overall ECOS questionnaire. Further information on the ECOS panel can be found elsewhere.[28-30]

We measured wellbeing using the ICECAP-A.[5] We valued changes relative to participants' current WBS. Given the setup of the ECOS questionnaire and space restrictions, we were unable to use an interactive design or explain probabilities, which posed a challenge in valuing marginal changes.

After completing ICECAP-A to measure their current wellbeing, each participant was randomized twice to 1 of 13 WBS (Appendix found at https://doi.org/10.1016/j.jval.2024.02.015). These 13 WBS included full wellbeing (the best ICECAP-A state), as well as the 12 WBS with the highest utility scores among the 16 WBS used by Flynn et al[16] in their ICECAP-A valuation study. We omitted the 4 WBS with the lowest utility scores because we (1) expected relatively favorable current WBS in our sample based on observations in previous waves[31] and (2) aimed to value relatively marginal changes (ie, no. 1/4/8/9 in Flynn et al[16]).

Each valuation round started by asking participants to express their preference between their current WBS and the randomly assigned WBS. If a participant indicated indifference, a valuation was not possible because no change in wellbeing was perceived. If the participant preferred the assigned WBS over their current one, a hypothetical scenario was presented, asking the participant to imagine the opportunity to purchase a treatment. This treatment—approved, painless, and without side effects—would result in a gain in wellbeing to match the assigned WBS for 1 month. Conversely, if the participant preferred their current WBS over the assigned one, they were presented with a hypothetical scenario asking them to imagine facing a sudden illness that would result in a loss of wellbeing to the assigned WBS for 1 month. In this scenario, the treatment would avoid that loss (Appendix found at https://doi.org/10.1016/j.jval.2024.02.015).

Participants were informed that the treatment was not covered by public health insurance or their national health service. Instead, it could be purchased out of pocket in 12 monthly installments to achieve the gain or avoid the loss in wellbeing. This longer duration of payments compared with the duration of the wellbeing change aimed to mitigate the potential influence of personal budget constraints on the WTP estimates.

To measure WTP, we followed a 3-step approach previously used to elicit the WTP for a QALY.[32] Before the exercise, participants were reminded to consider their household income.[33] First, we asked for the amount the participant would surely be willing to pay per installment, using a predefined payment scale. Second, we asked about the amount the participant would not be willing to exceed on the same scale. Third, we asked for the maximum WTP amount within the interval set in the 2 previous steps. In each step, the participant's WBS and assigned WBS were displayed again.

To detect hypothetical bias, a follow-up question assessed the certainty of the stated amount on a scale of 0 (very unsure) to 100 (very sure).[32,34,35] We opted for payment scales ranging from €0 to €1000 for the first and second steps, with visual anchoring points every €125. For the third step and for individuals wishing

Table 1. Theoretical validity of losses group with raw WTP as dependent variable.

Explanatory variables	Small avoided losses between [0, 0.1] (n = 997)						Small avoided losses between [0, 0.2] (n = 2258)					
	Model I a			Model I b			Model II a			Model II b		
	Est	SD	*P* value	Est	SD	*P* value	Est	SD	*P* value	Est	SD	*P* value
Intercept	5.59	0.09	<.0001	6.16	0.25	<.0001	5.59	0.06	<.0001	6.30	0.15	<.0001
Utility difference	0.02	1.46	.9898	0.02	1.54	.9873	0.18	0.52	.7265	−0.19	0.56	.7304
Level of making ends meet												
Easily				.						.		
Fairly easily				−0.15	0.18	.4092				−0.31	0.10	.0022
With some difficulty				−0.53	0.18	.0026				−0.57	0.10	<.0001
With great difficulty				−0.34	0.22	.1188				−0.34	0.14	.0116
Male				0.29	0.10	.0023				0.18	0.06	.0035
Age category in years												
18-24				.						.		
25-34				−0.10	0.20	.6281				−0.04	0.13	.7562
35-44				−0.30	0.19	.1159				−0.22	0.13	.0818
45-54				−0.34	0.19	.0767				−0.42	0.13	.0010
55-64				−0.75	0.20	.0002				−0.81	0.13	<.0001
65+				−0.83	0.19	<.0001				−0.78	0.12	<.0001

	Small avoided losses between [0, 0.3] (n = 3273)						Small avoided losses between [0, 0.4] (n = 4856)					
	Model III a			Model III b			Model IV a			Model IV b		
	Est	SD	*P* value	Est	SD	*P* value	Est	SD	*P* value	Est	SD	*P* value
Intercept	5.61	0.05	<.0001	6.24	0.12	<.0001	5.60	0.04	<.0001	6.28	0.10	<.0001
Utility difference	−0.04	0.29	.8879	−0.09	0.31	.7783	0.09	0.17	.5904	0.05	0.18	.7784
Level of making ends meet												
Easily				.						.		
Fairly easily				−0.31	0.08	.0002				−0.30	0.07	<.0001
With some difficulty				−0.51	0.08	<.0001				−0.56	0.07	<.0001
With great difficulty				−0.29	0.11	.0079				−0.27	0.09	.0028
Male				0.21	0.05	<.0001				0.22	0.04	<.0001
Age category in years												
18-24				.						.		
25-34				−0.02	0.11	.8400				−0.12	0.09	.1815
35-44				−0.25	0.10	.0163				−0.30	0.09	.0007
45-54				−0.44	0.11	<.0001				−0.55	0.09	<.0001
55-64				−0.76	0.11	<.0001				−0.79	0.09	<.0001
65+				−0.72	0.10	<.0001				−0.71	0.09	<.0001

	Avoided losses between [0, 0.5] (n = 6002)					
	Model V a			Model V b		
	Est	SD	*P* value	Est	SD	*P* value
Intercept	5.54	0.04	<.0001	6.19	0.09	<.0001
Utility difference	0.46	0.13	.0003	0.25	0.13	.0658
Level of making ends meet						
Easily				.		
Fairly easily				−0.26	0.06	<.0001
With some difficulty				−0.51	0.06	<.0001
With great difficulty				−0.11	0.08	.1640
Male				0.24	0.04	<.0001
Age category in years						
18-24				.		
25-34				−0.12	0.08	.1459
35-44				−0.28	0.08	.0005
45-54				−0.56	0.08	<.0001
55-64				−0.80	0.08	<.0001
65+				−0.69	0.08	<.0001

Est indicates estimate; WTP, willingness to pay.

to indicate amounts >€1000, open-ended questions were offered. Payment scales for the UK and Denmark were modified to the local currency.

If participants indicated a WTP of €0 in the third step, we inquired about their motivation as a means to detect protest answers. Response options included (1) inability to pay, (2) belief that the treatment was not worth >€0 (indicating a lack of desire for treatment), (3) belief that the cost of treatment should be covered by the government or health insurance, (4) other reason, with an open-ended text field. We assumed a true WTP of €0 when options 1 or 2 were selected and a protest answer when option 3 was selected. Responses to option 4 were analyzed on a case-by-case basis independently by 3 researchers.

In addition to the sociodemographic questions at the beginning of the survey, including age and gender, as well as the level of "making ends meet" as a proxy for income, the questionnaire measured health literacy using the HLS_{19}-Q12,[36,37] and depression and anxiety disorders using the Patient Health Questionnaire-4.[38] Conditional pathways, dynamic validation, and piped text facilitated the monetary valuation. Speeders, identified as those observations investing less than a third of the median answering time in each country, were excluded to improve data quality.

Analysis of the WTP per WALY Data

We used ICECAP-A population tariffs from the UK for the whole sample to compute utilities,[16] because tariffs were not available for all countries. Local currencies were converted to euros where necessary using the exchange rate of the European Central Bank from December 7, 2022. WTP values were adjusted for purchasing power parity (PPP) based on the 2021 Eurostat purchasing power–adjusted gross domestic product per capita.[39]

As is common in such studies,[40] we excluded observations that met the following criteria: (1) utility inconsistencies, which encompassed observations where participants preferred a scenario resulting in a utility loss or avoiding a utility gain when population tariffs were applied, or perceived a change in utility when there was none (indicating potential misalignment of individual preferences with population preferences); (2) extreme WTP values, defined as values above the 99th percentile; and (3) protest answers.

We tested for theoretical validity as recommended by Bobinac et al[41] by regressing WTP on the utility difference while controlling for the level of "making ends meet" (ie, a proxy for income in 4 categories), gender (binary), and age (in 6 categories) using a generalized linear model with a gamma distribution and a log-link. The results for the cohort valuing a gain were implausible because there was no clear increasing trend for WTP along with increasing gain (Appendix found at https://doi.org/10.1016/j.jval.2024.02.015). Therefore, we focus on the cohort that valued an avoided loss when presenting our results (gain group results in Appendix found at https://doi.org/10.1016/j.jval.2024.02.015).

The WTP per WALY was calculated using an aggregated approach.[42] We estimate a generalized linear model using a gamma distribution and a log-link to investigate the association between the individual WTP per WALY and the utility change and level of "making ends meet," controlling for gender, age, country, and health literacy. Average marginal effects facilitated the interpretation.

We report the results for all observations and for observations valuing a relatively small utility loss. The test for theoretical validity did not provide a conclusive basis for selecting a subgroup that defined a small utility change—ie, we observed an absence of a clear association between WTP and utility difference in the subgroups (Table 1). Thus, we present our results for different definitions of marginality in the subgroups of utility changes, including those between [0, 0.1] for 1 month (equivalent to between 0 and 0.0083 WALY per year) and between [0, 0.2], [0, 0.3], [0, 0.4], and [0, 0.5] also for 1 month.

The robustness checks and sensitivity analyses involved calculating the WTP per WALY in the following ways: (1) we took the certainty of WTP answers into account by analyzing the subsamples of observations reporting a certainty level of at least 51% or 80%; (2) we analyzed the subgroups with excellent or sufficient health literacy scores[37]; (3) we analyzed the subgroup of observations in which the preferred WBS dominated the nonpreferred WBS; (4) we included protest answers as zeros in the analysis; (5) and we recalculated the WTP per WALY using UK population tariffs[16] for countries with a Beveridge-type health system (ie, Denmark, Italy, Spain, the UK) and Dutch population tariffs[18] for countries with a Bismarck-type system (ie, Germany, France, The Netherlands).

Results

After excluding speeders, cases of utility indifference, utility inconsistencies, WTP protest answers, and WTP extreme values, our sample consisted of 7428 observations (Fig. 1). Among these, 6002 observations (80.8%) valued an avoided loss, presumably reflecting the high current WBS of European residents (Fig. 2, Appendix found at https://doi.org/10.1016/j.jval.2024.02.015). Within this group, 51.3% were female and 24% were 65 years or older (Table 2). Approximately half of the sample (54.3%) reported being able to make ends meet easily or fairly easily, and 35.6% reported having excellent or sufficient health literacy. The characteristics of the subgroups were similar (Table 2).

The results for theoretical validity indicated a trend toward a positive association between WTP and the utility difference when valuing avoided losses (P = .0658) (Table 1). In addition, WTP showed a positive association with being male and a negative association with increasing difficulty in making ends meet (ie, the income proxy) and with several age categories. In all subsamples of small avoided losses, we found no association with the utility difference.

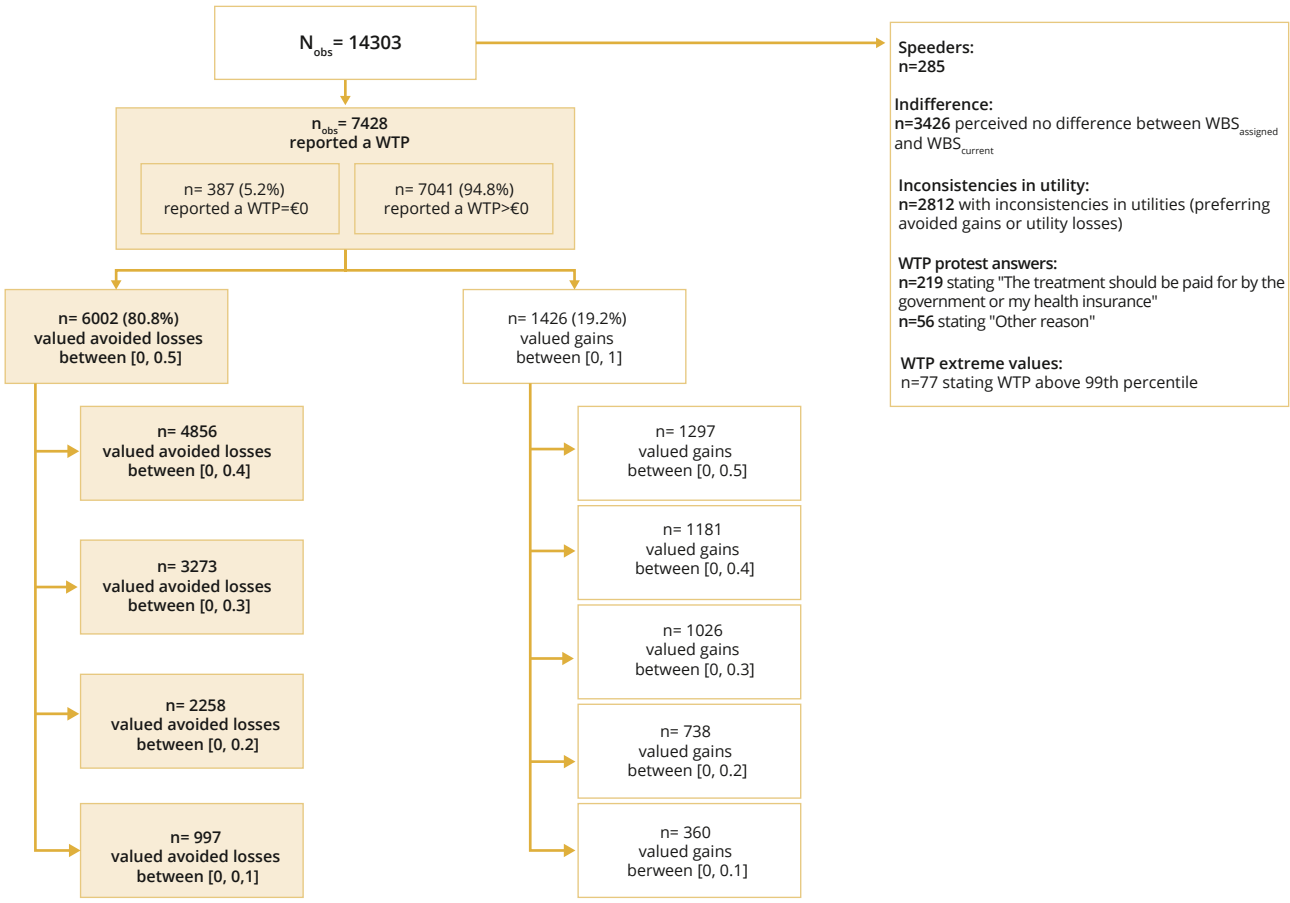
WTP per WALY

European residents were willing to pay €13 323.28 for a WALY on average when valuing avoided losses between 0 and 0.5 for 1 month (Table 3). Mean WTP seemed to increase with increasing mean utility difference. The WTP per WALY showed a concave relationship with increasing utility. This relationship became steeper when stratifying the utility change further. Therefore, we looked at different cutoffs for a marginal change and found an increasing WTP per WALY with lower cutoff points. European residents reported a WTP of €61 375.63 per WALY for small avoided losses between [0, 0.1] for 1 month and €30 969.21, €21 803.26, and €15 350.79 for small avoided losses between [0, 0.2], [0, 0.3], and [0, 0.4], respectively.

The WTP per WALY was negatively associated with the utility change and the level of "making ends meet," but positively associated with gender, age, country, and health literacy when valuing an avoided loss between [0, 0.5] (Table 4). These associations were less clear for the smaller subgroups valuing an avoided loss between [0, 0.4], [0, 0.3], [0, 0.2], and [0, 0.1]; that is, they could only be observed in a few categories.

Cross-country comparisons for avoided losses between [0, 0.5] for 1 month showed that the mean WTP per WALY adjusted for PPP varied between €10 278.35 in France (unadjusted, €9 883.03) and €17 867.93 in Denmark (unadjusted, €13 688.97) (Table 3).

Figure 1. Sample flow chart.



The increase of the WTP per WALY was observed in all countries when we lowered the cutoff point of marginal changes. For instance, the WTP per WALY for small avoided losses between [0, 0.1] for 1 month adjusted for PPP varied between €45 581.28 in France (unadjusted, €43 828.15) and €88 634.14 in Denmark (unadjusted, €66 642.21).

In our sensitivity analysis and robustness checks, we observed higher WTP per WALY results for individuals with a certainty level of at least 51% and for individuals with a certainty level of at least 80% than the full sample (Table 5). All other sensitivity analyses yielded similar results to those of the main analysis.

Discussion

In this study, we explored a method to estimate the WTP for a WALY using a sample of approximately 7000 participants from 7 European countries. Participants were asked to provide valuations under certainty for the difference between their current WBS and a randomly assigned hypothetical WBS that had been previously used to elicit population preferences.[16–18] For the full sample valuing avoided losses between 0 and 0.5 for 1 month, the average WTP per WALY was €13 323.28. This value increased for smaller changes, reaching €61 375.63 per WALY for avoided losses up to 0.1 for 1 month.

When ranking the WTP per WALY values across countries and subgroups, Denmark, Spain, and the UK rank the highest, followed by Italy always at rank 4, and The Netherlands, Germany, and France rank the lowest. This ranking may be related to the type of healthcare systems, with countries with a Beveridge-type healthcare systems among the 4 highest ranks and countries with a Bismarck-type healthcare system among the 3 lowest ranks. Moreover, there may be a connection with the percentage of out-of-pocket health expenditure of gross domestic product, although in that context Denmark is an exception.[43]

Our results are reasonably consistent with previously published estimates. By applying a net benefit regression for valuation, Himmler et al[20] found an estimated value of £66 597 in 2018 price levels for a YFC wellbeing with an incremental gain assumed to be 0.1 based on a UK sample. If adjusted to 2022 price levels, this figure of approximately €80 500 per YFC wellbeing is similar to our results for the group valuing a *gain* between [0, 0.1] from the UK, which stands at approximately €78 000 per WALY (Appendix found at https://doi.org/10.1016/j.jval.2024.02.015).

Applying common decision rules to WALYs leads to assuming a fixed value for a WALY. If we follow this, then the amount that individuals are WTP for a gain (or avoided loss) in WALYs should vary nearly proportionally with the magnitude of that change when valuing marginal changes in wellbeing. This means that the value assigned to a full WALY remains consistent, regardless of the size of the gain or avoided loss used in the valuation exercise. However, even if our results seem theoretically valid and are consistent with past findings, their theoretical plausibility is questionable,[44] indicating limitations of the study design and individuals' understanding of the task.

Table 2. Sample characteristics.

Characteristics	Small avoided losses between [0, 0.1] (n = 997)		Small avoided losses between [0, 0.2] (n = 2258)		Small avoided losses between [0, 0.3] (n = 3273)		Small avoided losses between [0, 0.4] (n = 4856)		Avoided losses between [0, 0.5] (n = 6002)	
	n	%	n	%	n	%	n	%	n	%
Utility difference										
[0, 0.1]			997	44.15	997	30.46%	997	20.49	997	16.61
[0, 0.02]	172	17.25								
[0.02, 0.04]	234	23.47								
[0.04, 0.06]	111	11.13								
[0.06, 0.08]	245	24.57								
[0.08, 0.1]	235	23.57								
[0.1, 0.2]			1261	55.85	1261	38.53	1261	25.92	1261	21.01
[0.2, 0.3]					1015	31.01	1015	20.86	1015	16.91
[0.3, 0.4]							1583	31.61	1583	26.37
[0.4, 0.5]									1146	19.09
Country										
Denmark	157	15.75	334	14.79	461	14.08	698	14.37	928	15.50
France	112	11.23	282	12.49	436	13.32	657	13.53	798	13.30
Germany	162	16.25	348	15.41	510	15.58	706	14.54	814	13.60
Italy	161	16.15	337	14.92	486	14.85	696	14.33	810	13.50
The Netherlands	147	14.74	364	16.12	527	16.10	805	16.58	1031	17.20
Spain	107	10.73	255	11.29	370	11.30	573	11.80	721	12.00
United Kingdom	151	15.15	338	14.97	483	14.76	721	14.85	900	15.00
Gender										
Female	560	56.17	1187	52.57	1758	53.71	2569	52.90	3077	51.27
Male	437	43.83	1071	47.43	1515	46.29	2287	47.10	2925	48.73
Age (years)										
18-24	90	9.03	195	8.64	283	8.65	385	7.93	456	7.60
25-34	138	13.84	335	14.84	475	14.51	725	14.93	895	14.91
35-44	200	20.06	437	19.35	645	19.71	922	18.99	1154	19.23
45-54	186	18.66	408	18.07	574	17.54	868	17.87	1071	17.84
55-64	154	15.45	360	15.94	538	16.44	797	16.41	978	16.29
65 or older	229	22.97	523	23.16	758	23.16	1159	23.87	1448	24.13
Ability to make ends meet										
Easily	87	8.73	274	12.13	417	12.74	631	12.99	901	15.01
Fairly easily	386	38.72	864	38.26	1216	37.15	1887	38.86	2357	39.27
With some difficulty	425	42.63	905	40.08	1328	40.57	1911	39.35	2205	36.74
With great difficulty	99	9.93	215	9.52	312	9.53	427	8.79	539	8.98
Current WBS (mean, SD)	0.79	0.13	0.82	0.13	0.83	0.12	0.85	0.1	0.87	0.11
PHQ-4 (mean, SD)	2.99	2.90	2.68	2.92	2.63	2.87	2.46	2.79	2.32	2.83
Certainty ≥51%	457	45.80	1042	46.15	1521	46.47	2313	47.63	2931	48.80
Certainty ≥80%	216	21.70	525	23.25	759	23.19	1118	23.02	1451	24.20
Health literacy										
Excellent	107	10.73	285	12.62	433	13.23	636	13.10	910	15.16
Sufficient	204	20.46	473	20.95	676	20.65	997	20.53	1224	20.39
Problematic	533	53.46	1161	51.42	1669	50.99	2496	51.40	2989	49.80
Inadequate	153	15.35	339	15.01	495	15.12	727	14.97	879	14.65

PHQ-4, Patient Health Questionnaire-4; WBS indicates wellbeing state.

Table 3. WTP per WALY.

Analyzed group	Utility per country	N	Adjusted for purchasing power parity: Mean WTP	Mean utility difference	Mean WTP per WALY	Unadjusted for purchasing power parity: Mean WTP	Mean utility difference	Mean WTP per WALY
Small avoided losses between [0, 0.1] (n = 997)	[0, 0.1]	997	€267.99	0.0524	€61 375.63	€239.24	0.0524	€54 781.89
	Denmark	157	€354.63	0.0480	€88 634.14	€266.64	0.0480	€66 642.21
	France	112	€197.35	0.0520	€45 581.28	€189.76	0.0520	€43 828.15
	Germany	162	€236.74	0.0521	€54 566.56	€197.28	0.0521	€45 472.13
	Italy	161	€222.82	0.0513	€52 161.25	€220.39	0.0514	€51 408.58
	The Netherlands	147	€270.63	0.0551	€58 951.74	€208.18	0.0551	€45 347.49
	Spain	107	€257.75	0.0534	€57 909.17	€285.17	0.0532	€64 292.10
	United Kingdom	151	€316.66	0.0555	€68 455.85	€310.46	0.0555	€67 113.58
	[0, 0.02]	172	€281.02	0.0055	€613 786.33	€255.22	0.0055	€557 428.73
	[0.02, 0.04]	234	€261.13	0.0318	€98 648.50	€223.44	0.0318	€84 297.56
	[0.04, 0.06]	111	€234.80	0.0488	€57 777.20	€222.49	0.0488	€54 750.04
	[0.06, 0.08]	245	€280.31	0.0697	€48 283.26	€246.05	0.0697	€42 391.07
	[0.08, 0.1]	235	€268.11	0.0910	€35 363.55	€244.06	0.0910	€32 191.27
Small avoided losses between [0, 0.2] (n = 2258)	[0, 0.2]	2258	€274.18	0.1062	€30 969.21	€246.69	0.1063	€27 850.12
	Denmark	334	€363.24	0.1014	€42 981.77	€273.12	0.1014	€32 317.12
	France	282	€248.51	0.1113	€26 784.48	€238.95	0.1113	€25 754.31
	Germany	348	€240.93	0.1044	€27 680.52	€200.77	0.1044	€23 067.10
	Italy	337	€221.40	0.1027	€25 874.86	€226.30	0.1029	€26 386.47
	The Netherlands	364	€303.71	0.1116	€32 647.74	€233.62	0.1116	€25 113.65
	Spain	255	€251.53	0.1076	€28 063.18	€292.43	0.1077	€32 585.22
	United Kingdom	338	€279.74	0.1054	€31 862.36	€274.25	0.1054	€31 237.61
Small avoided losses between [0, 0.3] (n = 3273)	[0, 0.3]	3273	€272.80	0.1501	€21 803.26	€247.03	0.1502	€19 734.32
	Denmark	461	€367.05	0.1410	€31 243.31	€287.23	0.1415	€24 361.99
	France	436	€229.86	0.1595	€17 298.45	€221.02	0.1595	€16 633.12
	Germany	510	€238.43	0.1508	€18 978.44	€198.69	0.1508	€15 815.37
	Italy	486	€240.52	0.1473	€19 591.78	€243.89	0.1474	€19 859.24
	The Netherlands	527	€294.50	0.1541	€22 926.72	€226.54	0.1541	€17 635.94
	Spain	370	€248.34	0.1514	€19 679.84	€284.52	0.1514	€22 551.56
	United Kingdom	483	€285.47	0.1473	€23 249.38	€279.87	0.1473	€22 793.51
Small avoided losses between [0, 0.4] (n = 4865)	[0, 0.4]	4856	€275.80	0.2156	€15 350.79	€250.46	0.2157	€13 935.14
	Denmark	698	€376.13	0.2115	€21 339.71	€290.22	0.2115	€16 462.78
	France	657	€224.89	0.2234	€12 077.16	€216.24	0.2234	€11 612.65
	Germany	706	€237.78	0.2064	€13 822.34	€204.64	0.2068	€11 873.67
	Italy	696	€227.37	0.2083	€13 101.33	€232.84	0.2085	€13 402.82
	The Netherlands	805	€303.95	0.2223	€16 406.07	€233.81	0.2223	€12 620.05
	Spain	573	€261.79	0.2234	€14 062.31	€301.38	0.2234	€16 186.83
	United Kingdom	721	€288.77	0.2147	€16 139.76	€283.10	0.2147	€15 823.29
Avoided losses between [0, 0.5] (n = 6002)	[0, 0.5]	6002	€287.45	0.2589	€13 323.28	€258.42	0.2589	€11 976.44
	Denmark	928	€401.09	0.2694	€17 867.93	€307.10	0.2692	€13 688.97
	France	798	€225.69	0.2635	€10 278.35	€217.01	0.2635	€9883.03
	Germany	814	€239.99	0.2376	€12 119.39	€205.62	0.2379	€10 372.72
	Italy	810	€235.72	0.2407	€11 753.69	€239.76	0.2407	€11 952.86
	The Netherlands	1031	€330.05	0.2710	€14 612.88	€255.96	0.2712	€11 324.49
	Spain	721	€264.73	0.2669	€11 904.12	€300.93	0.2666	€13 543.93
	United Kingdom	900	€283.94	0.2594	€13 133.75	€278.37	0.2594	€12 876.22
	[0, 0.1]	997	€267.99	0.0524	€61 375.63	€239.24	0.0524	€54 781.89
	[0.1, 0.2]	1261	€279.08	0.1488	€22 504.51	€252.56	0.1488	€20 366.35
	[0.2, 0.3]	1015	€269.75	0.2478	€13 061.73	€247.80	0.2477	€12 002.62
	[0.3, 0.4]	1583	€281.18	0.3493	€9659.96	€256.54	0.3493	€8813.73
	[0.4, 0.5]	1146	€337.97	0.4447	€9120.47	€293.59	0.4448	€7921.44

WALY indicates wellbeing-adjusted life-year; WTP, willingness to pay.

Table 4. Regression results with WTP per WALY as dependent variable.

Explanatory variables	Small avoided losses between [0, 0.1] (n = 997)								Small avoided losses between [0, 0.2] (n = 2258)							
	Model Ia				Model Ib				Model IIa				Model II b			
	Est	SD	*P* value	AME	Est	SD	*P* value	AME	Est	SD	*P* value	AME	Est	SD	*P* value	AME
Intercept	14.15	0.19	<.0001		13.61	0.30	<.0001		12.69	0.17	<.0001	.	12.32	0.27	<.0001	.
Wellbeing change																
[0, 0.1]												.	.			.
[0, 0.02]																
[0.02,0.04]	−2.41	0.15	<.0001	−1 052 100.00	−2.32	0.16	<.0001	−1 000 072.00								
[0.04,0.06]	−2.96	0.18	<.0001	−1 096 079.00	−2.86	0.20	<.0001	−1 045 240.00								
[0.06,0.08]	−3.17	0.15	<.0001	−1 107 481.00	−3.10	0.16	<.0001	−1 058 697.00								
[0.08,0.1]	−3.49	0.15	<.0001	−1 120 969.00	−3.47	0.16	<.0001	−1 074 372.00								
[0.1, 0.2]									−2.40	0.11	<.0001	−232 653.90	−2.30	0.11	<.0001	−217 684.30
[0.2, 0.3]																
[0.3, 0.4]																
[0.4, 0.5]																
Level of making ends meet																
Easily												.	.			.
Fairly easily	−0.08	0.18	.6663	−18 812.81	−0.12	0.19	.5196	−29 862.20	−0.16	0.18	.3617	−23 720.99	−0.25	0.17	.1487	−39 252.69
With some difficulty	−0.38	0.17	.0294	−91 809.83	−0.52	0.19	.0072	−120 806.00	−0.49	0.17	.0046	−62 396.42	−0.66	0.17	.0001	−85 988.89
With great difficulty	−0.08	0.22	.7113	−19 467.58	−0.37	0.24	.1268	−79 556.37	−0.02	0.23	.9347	−2982.92	−0.50	0.24	.0331	−70 316.12
Male					0.31	0.10	.0025	76 240.79					0.09	0.10	.3956	10 559.05
Age category																
18-24					0.80	0.21	.0001	206 842.10					0.70	0.21	.0009	84 331.14
25-34					0.58	0.18	.0012	134 049.30					0.73	0.18	<.0001	90 149.78
35-44					0.52	0.16	.0011	115 458.50					0.60	0.16	.0002	68 084.15
45-54					0.37	0.16	.0209	76 266.27					0.30	0.16	.0675	29 070.61
55-64					−0.04	0.17	.8255	−6154.48					−0.21	0.17	.2069	−15 827.19
65+													.			.
Country																
Denmark					0.19	0.18	.3045	53 781.23					0.36	0.19	.0613	53 445.70
France					−0.33	0.20	.1055	−72 224.31					−0.10	0.20	.6164	−11 876.98
Germany					−0.18	0.19	.3453	−41 544.45					−0.39	0.19	.0396	−39 866.09
Italy					−0.12	0.19	.5298	−28 947.16					−0.27	0.19	.1511	−29 481.65
The Netherlands					−0.10	0.19	.5854	−25 189.11					−0.04	0.19	.8407	−4566.00
Spain					−0.11	0.20	.5705	−27 926.51					−0.10	0.20	.6143	−12 147.33
United Kingdom													.			.
Health literacy																
Inadequate					0.23	0.20	.2598	53 614.16					0.40	0.20	.0447	52 253.09
Problematic					0.12	0.17	.4790	26 546.50					0.03	0.16	.8539	3224.01
Sufficient					0.25	0.19	.1839	60 469.64					0.13	0.18	.4822	14 759.62
Excellent																.

	Small avoided losses between [0, 0.3] (n = 3273)								Small avoided losses between [0, 0.4] (n = 4856)							
	Model IIIa				Model III b				Model IVa				Model IV b			
	Est	SD	*P* value	AME	Est	SD	*P* value	AME	Est	SD	*P* value	AME	Est	SD	*P* value	AME
Intercept	12.69	0.13	<.0001		12.32	0.20	<.0001		12.71	0.10	<.0001	.	12.40	0.15	<.0001	.
Wellbeing change																
[0, 0.1]													.			.
[0, 0.02]																
[0.02,0.04]																
[0.04,0.06]																
[0.06,0.08]																
[0.08,0.1]																
[0.1, 0.2]	−2.40	0.09	<.0001	−232 360.40	−2.32	0.10	<.0001	−214 985.00	−2.40	0.08	<.0001	−233 543.60	−2.34	0.09	<.0001	−217 073.60
[0.2, 0.3]	−2.95	0.10	<.0001	−242 185.00	−2.83	0.10	<.0001	−224 300.30	−2.95	0.09	<.0001	−243 390.80	−2.85	0.09	<.0001	−226 364.90
[0.3, 0.4]									−3.29	0.08	<.0001	−247 207.30	−3.21	0.08	<.0001	−230 626.70
[0.4, 0.5]																
Level of making ends meet																
Easily													.			.
Fairly easily	−0.19	0.13	.1279	−20 340.58	−0.26	0.13	.0440	−27 915.58	−0.20	0.09	.0277	−15 163.46	−0.25	0.09	.0067	−19 203.22
With some difficulty	−0.45	0.12	.0003	−42 227.78	−0.57	0.13	<.0001	−53 585.52	−0.49	0.09	<.0001	−31 977.75	−0.58	0.09	<.0001	−37 920.35
With great difficulty	−0.03	0.17	.8769	−2946.58	−0.41	0.18	.0183	−41 753.80	0.00	0.12	.9877	−159.17	−0.33	0.13	.0122	−24 101.23
Male					0.13	0.08	.0836	11 619.91					0.17	0.06	.0042	10 152.94

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Table 4. Continued

	Small avoided losses between [0, 0.3] (n = 3273)				Small avoided losses between [0, 0.4] (n = 4856)			
	Model IIIa				Model III b			
	Est	SD	*P* value	AME	Est	SD	*P* value	AME
Age category in years								
18-24					0.65	0.16	<.0001	58 200.63
25-34					0.67	0.13	<.0001	60 411.72
35-44					0.49	0.12	.0001	39 901.92
45-54					0.22	0.12	.0758	15 576.65
55-64					−0.18	0.13	.1586	−10 208.95
65+								
Country								
Denmark					0.30	0.15	.0369	31 715.54
France					−0.18	0.15	.2220	−14 837.49
Germany					−0.32	0.14	.0248	−24 301.75
Italy					−0.14	0.14	.3382	−11 482.43
The Netherlands					−0.04	0.14	.7608	−3725.05
Spain					−0.12	0.15	.4205	−10 386.79
United Kingdom								
Health literacy								
Inadequate					0.33	0.15	.0240	30 862.17
Problematic					0.03	0.12	.7786	2681.44
Sufficient					0.10	0.14	.4821	7886.61
Excellent								

	Small avoided losses between [0, 0.4] (n = 4856)				Avoided losses between [0, 0.5] (n = 6002)			
	Model IVa				Model Va			
	Est	SD	*P* value	AME	Est	SD	*P* value	AME
Intercept					12.67	0.09	<.0001	
Wellbeing change								
[0, 0.1]								
[0, 0.02]								
[0.02,0.04]								
[0.04,0.06]								
[0.06,0.08]								
[0.08,0.1]								
[0.1, 0.2]					−2.40	0.08	<.0001	−236 390.10
[0.2, 0.3]					−2.95	0.08	<.0001	−246 386.70
[0.3, 0.4]					−3.28	0.08	<.0001	−250 206.60
[0.4, 0.5]					−3.41	0.08	<.0001	−251 356.60
Level of making ends meet								
Easily								
Fairly easily					−0.18	0.07	.0150	−9585.13
With some difficulty					−0.44	0.07	<.0001	−22 489.85
With great difficulty					0.16	0.10	.1090	9350.16
Male								
Age category in years								
18-24								
25-34								
35-44								
45-54								
55-64								
65+								
Country								
Denmark								
France								
Germany								
Italy								
The Netherlands								
Spain								
United Kingdom								
Health literacy								
Inadequate								
Problematic								
Sufficient								
Excellent								

	Avoided losses between [0, 0.5] (n = 6002)			
	Model Vb			
	Est	SD	*P* value	AME
Intercept	12.30	0.13	<.0001	
Wellbeing change				
[0, 0.1]				
[0, 0.02]				
[0.02,0.04]				
[0.04,0.06]				
[0.06,0.08]				
[0.08,0.1]				
[0.1, 0.2]	−2.34	0.08	<.0001	−222 743.90
[0.2, 0.3]	−2.85	0.09	<.0001	−232 254.50
[0.3, 0.4]	−3.21	0.08	<.0001	−236 568.40
[0.4, 0.5]	−3.40	0.08	<.0001	−238 230.50
Level of making ends meet				
Easily				
Fairly easily	−0.22	0.08	.0030	−11 193.46
With some difficulty	−0.51	0.08	<.0001	−25 268.36
With great difficulty	−0.19	0.11	.0870	−8895.21
Male	0.18	0.05	<.0001	9550.55
Age category in years				
18-24	0.62	0.10	<.0001	34 560.85
25-34	0.55	0.08	<.0001	29 804.09
35-44	0.41	0.08	<.0001	20 437.91
45-54	0.10	0.08	.1900	4293.61
55-64	−0.19	0.08	.0170	−6947.02
65+				
Country				
Denmark	0.27	0.09	.0030	16 590.99
France	−0.25	0.09	.0070	−11 919.10
Germany	−0.29	0.09	.0020	−13 382.02
Italy	−0.16	0.09	.0750	−8027.29
The Netherlands	0.08	0.09	.3310	4687.51
Spain	−0.10	0.10	.3040	−4928.25
United Kingdom				
Health literacy				
Inadequate	0.26	0.09	.0040	13 883.11
Problematic	0.08	0.07	.3040	3615.18
Sufficient	0.10	0.08	.2140	5088.26
Excellent				

AME indicates average marginal effect; Est, estimate; WALY, wellbeing-adjusted life-year; WTP, willingness to pay.

Table 5. Sensitivity analysis.

Analyzed subgroup		Utility	n	Mean WTP	Mean utility difference	Mean WTP per WALY
Certainty ≥51%	Avoided losses between [0, 0.5] (n = 2931)	[0, 0.1]	457	€374.27	0.0549	€81 763.57
		[0.1, 0.2]	585	€381.09	0.1484	€30 818.46
		[0.2, 0.3]	479	€363.84	0.2472	€17 662.04
		[0.3, 0.4]	792	€368.71	0.3517	€12 579.22
		[0.4, 0.5]	618	€471.77	0.4440	€12 750.46
	Small avoided losses between [0, 0.1] (n = 457)	[0, 0.02]	72	€385.12	0.0055	€833 942.73
		[0.02, 0.04]	100	€343.91	0.0322	€128 204.74
		[0.04, 0.06]	48	€379.02	0.0490	€92 781.58
		[0.06, 0.08]	111	€424.18	0.0694	€73 301.72
		[0.08, 0.1]	126	€346.40	0.0907	€45 846.63
	Small avoided losses between [0, 0.1] (n = 457)	[0, 0.1]	457	€374.27	0.0549	€81 763.57
	Small avoided losses between [0, 0.2] (n = 1042)	[0, 0.2]	1042	€378.10	0.1074	€42 246.27
	Small avoided losses between [0, 0.3] (n = 1521)	[0, 0.3]	1521	€373.61	0.1514	€29 607.14
	Small avoided losses between [0, 0.4] (n = 2323)	[0, 0.4]	2323	€371.98	0.2208	€20 217.30
	Avoided losses between [0, 0.5] (n = 2931)	[0, 0.5]	2931	€392.98	0.2672	€17 646.15
Certainty ≥80%	Avoided losses between [0, 0.5] (n = 1451)	[0, 0.1]	216	€336.73	0.0522	€77 349.69
		[0.1, 0.2]	319	€369.56	0.1506	€29 452.03
		[0.2, 0.3]	224	€310.42	0.2470	€15 081.81
		[0.3, 0.4]	359	€343.60	0.3531	€11 676.89
		[0.4, 0.5]	333	€461.83	0.4450	€12 452.63
	Small avoided losses between [0, 0.1] (n = 216)	[0, 0.02]	36	€334.64	0.0061	€654 137.90
		[0.02, 0.04]	57	€313.85	0.0319	€118 018.94
		[0.04, 0.06]	26	€325.69	0.0488	€80 137.48
		[0.06, 0.08]	42	€418.43	0.0705	€71 222.03
		[0.08, 0.1]	55	€304.65	0.0912	€40 093.76
	Small avoided losses between [0, 0.1] (n = 216)	[0, 0.1]	216	€336.73	0.0522	€77 349.69
	Small avoided losses between [0, 0.2] (n = 535)	[0, 0.2]	535	€356.31	0.1109	€38 563.71
	Small avoided losses between [0, 0.3] (n = 759)	[0, 0.3]	759	€342.76	0.1510	€27 231.60
	Small avoided losses between [0, 0.4] (n = 1124)	[0, 0.4]	1124	€343.05	0.2169	€18 978.63
	Avoided losses between [0, 0.5] (n = 1451)	[0, 0.5]	1451	€370.30	0.2685	€16 548.95
Sufficient or excellent health literacy	Avoided losses between [0, 0.5] (n = 2134)	[0, 0.1]	311	€283.03	0.0545	€62 272.90
		[0.1, 0.2]	447	€273.28	0.1502	€21 834.08
		[0.2, 0.3]	351	€249.47	0.2505	€11 948.62
		[0.3, 0.4]	524	€273.90	0.3514	€9354.49
		[0.4, 0.5]	501	€316.67	0.4459	€8521.57
	Small avoided losses between [0, 0.1] (n = 311)	[0, 0.02]	51	€305.27	0.0041	€898 186.70
		[0.02, 0.04]	66	€236.21	0.0322	€88 079.49
		[0.04, 0.06]	30	€308.76	0.0495	€74 851.48
		[0.06, 0.08]	83	€279.96	0.0695	€48 350.98
		[0.08, 0.1]	81	€300.80	0.0911	€39 627.91
	Small avoided losses between [0, 0.1] (n = 311)	[0, 0.1]	311	€283.03	0.0545	€62 272.90
	Small avoided losses between [0, 0.2] (n = 758)	[0, 0.2]	758	€277.28	0.1109	€29 990.12
	Small avoided losses between [0, 0.3] (n = 1109)	[0, 0.3]	1109	€268.48	0.1551	€20 767.92
	Small avoided losses between [0, 0.4] (n = 1637)	[0, 0.4]	1637	€270.31	0.2185	€14 842.55
	Avoided losses between [0, 0.5] (n = 2134)	[0, 0.5]	2134	€281.13	0.2716	€12 421.44

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Table 5. Continued

Analyzed subgroup		Utility	n	Mean WTP	Mean utility difference	Mean WTP per WALY
Sample with dominated WBS	Avoided losses (n = 2413)	[0, 0.1]	55	€250.90	0.0789	€38 138.00
		[0.1, 0.2]	381	€328.03	0.1572	€25 047.89
		[0.2, 0.3]	374	€297.71	0.2541	€14 059.19
		[0.3, 0.4]	722	€291.36	0.3495	€10 003.33
		[0.4, 0.5]	881	€346.99	0.4508	€9237.24
	Small avoided losses between [0, 0.1] (n = 55)	[0, 0.02]	0	—	—	—
		[0.02, 0.04]	4	€455.94	0.0290	€188 665.61
		[0.04, 0.06]	2	€334.75	0.0535	€75 084.11
		[0.06, 0.08]	21	€227.47	0.0693	€39 370.51
		[0.08, 0.1]	28	€233.19	0.0951	€29 422.65
	Small avoided losses between [0, 0.1] (n = 55)	[0, 0.1]	55	€250.90	0.0789	€38 138.00
	Small avoided losses between [0, 0.2] (n = 436)	[0, 0.2]	436	€318.30	0.1473	€25 932.96
	Small avoided losses between [0, 0.3] (n = 810)	[0, 0.3]	810	€308.79	0.1966	€18 847.26
	Small avoided losses between [0, 0.4] (n = 1546)	[0, 0.4]	1546	€301.18	0.2699	€13 392.70
	Avoided losses between [0, 0.5] (n = 2413)	[0, 0.5]	2413	€317.52	0.3352	€11 368.64
Including protest answers	Avoided losses (n = 6225)	[0, 0.1]	1031	€259.15	0.0522	€59 560.51
		[0.1, 0.2]	1311	€266.42	0.1490	€21 453.97
		[0.2, 0.3]	1058	€258.78	0.2481	€12 518.61
		[0.3, 0.4]	1629	€273.24	0.3492	€9390.51
		[0.4, 0.5]	1196	€323.84	0.4446	€8741.28
	Small avoided losses between [0, 0.1] (n = 1031)	[0, 0.02]	180	€268.53	0.0055	€581 773.40
		[0.02, 0.04]	239	€255.67	0.0318	€96 506.22
		[0.04, 0.06]	117	€222.75	0.0485	€55 148.65
		[0.06, 0.08]	254	€270.37	0.0694	€46 725.56
		[0.08, 0.1]	241	€261.44	0.0910	€34 479.78
	Small avoided losses between [0, 0.1] (n = 1031)	[0, 0.1]	1031	€259.15	0.0522	€59 560.51
	Small avoided losses between [0, 0.2] (n = 2342)	[0, 0.2]	2342	€263.22	0.1064	€29 685.80
	Small avoided losses between [0, 0.3] (n = 3400)	[0, 0.3]	3400	€261.84	0.1505	€20 879.81
	Small avoided losses between [0, 0.4] (n = 5043)	[0, 0.4]	5043	€265.81	0.2154	€14 811.60
	Avoided losses between [0, 0.5] (n = 6225)	[0, 0.5]	6225	€276.73	0.2590	€12 822.74
System weights	Avoided losses (n = 6042)	[0, 0.1]	1032	€270.39	0.0546	€59 395.68
		[0.1, 0.2]	1251	€274.70	0.1483	€22 223.28
		[0.2, 0.3]	951	€266.85	0.2498	€12 817.62
		[0.3, 0.4]	1576	€284.36	0.3525	€9681.49
		[0.4, 0.5]	1232	€328.19	0.4385	€8981.35
	Small avoided losses between [0, 0.1] (n = 1032)	[0, 0.02]	162	€282.00	0.0067	€502 797.84
		[0.02, 0.04]	200	€272.00	0.0307	€106 182.56
		[0.04, 0.06]	146	€233.84	0.0502	€55 910.60
		[0.06, 0.08]	272	€271.66	0.0693	€47 009.56
		[0.08, 0.1]	252	€281.46	0.0911	€37 088.74
	Small avoided losses between [0, 0.1] (n = 1032)	[0, 0.1]	1032	€270.39	0.0546	€59 395.68
	Small avoided losses between [0, 0.2] (n = 2283)	[0, 0.2]	2283	€272.75	0.1060	€30 885.29
	Small avoided losses between [0, 0.3] (n = 3234)	[0, 0.3]	3234	€271.02	0.1483	€21 933.46
	Small avoided losses between [0, 0.4] (n = 4819)	[0, 0.4]	4819	€275.49	0.2155	€15 339.08
	Avoided losses between [0, 0.5] (n = 6042)	[0, 0.5]	6042	€286.15	0.2607	€13 171.08

WALY indicates wellbeing-adjusted life-year; WBS indicates wellbeing state; WTP, willingness to pay.

It is important to acknowledge limitations of our study. First, although piggybacking on an existing survey allowed us to conduct a large-scale, multicountry study, it also came with downsides related to the study design and length of the relevant section of the questionnaire. For instance, we had to estimate changes under certainty because incorporating probabilities was not considered feasible without providing participants with a proper introduction. Moreover, we had no opportunity to pretest the range of payment scale used in the WTP exercise. Furthermore, we were unable to implement an interactive design for selecting the assigned WBS, potentially resulting in a substantial gap between participants' current WBS and assigned WBS. These factors may have resulted in the valuation of larger average expected WALY gains and could have contributed to insensitivity to scale and susceptibility to budget constraints. Although we attempted to mitigate this by restricting the loss of wellbeing to 1 month, the restriction to 1 month might be difficult to imagine for some ICECAP-A dimensions such as the feeling of being loved, which may typically pertain to elements of wellbeing that are more stable over time. Given that this might also have increased the level of difficulty for participants, it may have contributed to more individuals expressing indifference between the 2 valued WBS. Furthermore, the randomization of WBS did not exclude the possibility that the change in wellbeing was not random; that is, individuals with a high level of current wellbeing were more likely to be presented with larger decreases in wellbeing than individuals with lower levels of current wellbeing. However, when adjusting regressions for current wellbeing, our results seemed robust.

Second, our participants reported high levels of current wellbeing, which is consistent with the literature on capability wellbeing.[45-47] This resulted in considerably more avoided losses being valued than gains, even though valuing gains may be more common in health-related valuation studies.[48]

Third, defining what constitutes a marginal change in the context of this study was challenging because there were no clear content-related or statistical indications to focus on a particular subgroup. Hence, we reported results for the full sample and for 4 subgroups with different cutoff points. The wide range of avoided WALY losses, combined with the lack of sensitivity to scale, affected the final estimates. Scale bias or insensitivity to scale is a well-known phenomenon in the WTP per QALY literature.[32,41,48-50] Previous studies on the WTP per QALY have been less detailed on the distribution behind their WTP estimates, making comparisons difficult.

Fourth, theoretical validity could not be asserted in the group valuing gains, where a larger gain was associated with a smaller WTP. This could be an indication for status quo bias, which is explained as a propensity toward inaction over action.[51] A contributing factor may have been that participants did not consider a hypothetical treatment to improve wellbeing to be realistic when the reason for their imperfect current WBS was not related to specific circumstances that could be treated. The same problem may also have been present when valuing avoided losses and may have manifested itself in some of the protest answers. Indeed, some of the participants stated a WTP of €0 because they could not imagine a "pill for feeling loved."

Another issue might arise from the cognitive burden of the valuation task. Lower capabilities (ie, lower current WBS and thus more likely to value a gain) have been shown to be associated with reduced mental health.[45] A cognitively straining and complex task may be relatively burdensome for these participants. Indeed, the mean Patient Health Questionnaire-4 score was 2.3 and 4.8 ($P < .0001$) for the group valuing an avoided loss and a gain, respectively, with a higher score indicating potential depression and anxiety disorders. The large number of observations stating indifference between current WBS and assigned WBS could be attributed to the same reason, implying that understanding the WBS descriptions may have been challenging for participants.

Fifth, we used population tariffs for the ICECAP-A from the UK to calculate WBS utilities for all countries. Therefore, our approach implicitly assumes that population preferences in the 7 European countries align with the population preferences in the UK, which is questionable. We tested this further, also in view of the observations that we had to exclude from our sample because of utility inconsistencies as possible outlier preferences for wellbeing, by conducting a robustness check using the Dutch population tariffs on the countries with Bismarck-type healthcare systems. However, this led to similar results (Table 5) and did not considerably reduce the number of inconsistencies. These findings suggest that the choice of population tariff was of low importance in our study. However, future research would benefit from eliciting individual preferences for utility weights alongside the WTP exercise to account for the natural heterogeneity in preference patterns.

Despite these limitations, our study provides valuable insights into the search for the value of a WALY and underscores the challenges in determining it. Given the importance of understanding this value when using broader outcome measures, research is clearly needed. In particular, this should focus on improving valuation methods and estimating the monetary value of a WALY. Moreover, because different instruments (eg, ICECAP, EQ Health and Wellbeing, WiX) may measure different concepts or operationalizations of wellbeing, studies comparing their respective WALY values, also in relation to QALYs, are encouraged.

Conclusions

We aimed to explore how the value of changes in capability wellbeing can be measured using the contingent valuation approach and ICECAP-A wellbeing measurement as part of a large survey in 7 European countries. Depending on the definition of a marginal change, the mean WTP per WALY ranged from €13 323.28 to €61 375.63 for avoided losses between [0, 0.5] and [0, 0.1], respectively. We observed several peculiarities in our results that might be due to the drawbacks of our study design, but our estimates add to the scarce evidence in this area. This is a first step toward a method for generating evidence that could ultimately be used to inform decisions based on economic evaluations incorporating broader outcome measures.

Given the methodical limitations of our study and its partly implausible results, the absolute size of estimates should be understood as the result of a first attempt to explore the proposed estimation method. Further research, also valuing different wellbeing or "beyond health" instruments, remains needed.

Author Disclosures

Links to the disclosure forms provided by the authors are available here.

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REFERENCES

1. Brazier J, Tsuchiya A. Improving cross-sector comparisons: going beyond the health-related QALY. *Appl Health Econ Health Policy*. 2015;13(6):557–565.
2. Brazier J, Peasgood T, Mukuria C, et al. The EQ-HWB: overview of the development of a measure of health and wellbeing and key results. *Value Health*. 2022;25(4):482–491.
3. Makai P, Brouwer WB, Koopmanschap MA, Stolk EA, Nieboer AP. Quality of life instruments for economic evaluations in health and social care for older people: a systematic review. *Soc Sci Med*. 2014;102:83–93.
4. Grewal I, Lewis J, Flynn T, Brown J, Bond J, Coast J. Developing attributes for a generic quality of life measure for older people: preferences or capabilities? *Soc Sci Med*. 2006;62(8):1891–1901.
5. Al-Janabi H, Flynn TN, Coast J. Development of a self-report measure of capability wellbeing for adults: the ICE CAP-A. *Qual Life Res*. 2012;21(1):167–176.
6. Sutton EJ, Coast J. Development of a supportive care measure for economic evaluation of end-of-life care using qualitative methods. *Palliat Med*. 2014;28(2):151–157.
7. Canaway A, Al-Janabi H, Kinghorn P, Bailey C, Coast J. Development of a measure (ICECAP-Close Person Measure) through qualitative methods to capture the benefits of end-of-life care to those close to the dying for use in economic evaluation. *Palliat Med*. 2017;31(1):53–62.
8. Netten A, Burge P, Malley J, et al. Outcomes of social care for adults: developing a preference-weighted measure. *Health Technol Assess*. 2012;16(16):1–166.
9. Malley J, Rand S, Netten A, Towers AM, Forder J. Exploring the feasibility and validity of a pragmatic approach to estimating the impact of long-term care: the 'expected' ASCOT method. *J Long-Term Care*. 2019:67–83.
10. Hackert MQ, van Exel J, Brouwer WB. Well-being of Older People (WOOP): quantitative validation of a new outcome measure for use in economic evaluations. *Soc Sci Med*. 2020;259:113109.
11. Voormolen DC, Bom J, Bekker-Grob EW de, Brouwer W, van Exel J. Development and content validation of the 10-item well-being instrument (WiX) for use in economic evaluation studies. *Appl Res Qual Life*. 2024;19:381–413.
12. Sen A. Capability and well-being. In: Nussbaum M, Sen A, eds. *The Quality of Life*. Oxford, United Kingdom: Oxford University Press; 1993:30–53.
13. Afentou N, Kinghorn P. A systematic review of the feasibility and psychometric properties of the ICEpop CAPability measure for adults and its use so far in economic evaluation. *Value Health*. 2020;23(4):515–526.
14. Hackert MQN, van Exel J, Brouwer WBF. Does the ICECAP-O cover the physical, mental and social functioning of older people in the UK? *Qual Life Res*. 2019;28(3):761–770.
15. Hackert MQ, van Exel J, Brouwer WB. Valid outcome measures in care for older people: comparing the ASCOT and the ICECAP-O. *Value Health*. 2017;20(7):936–944.
16. Flynn TN, Huynh E, Peters TJ, et al. Scoring the icecap-a capability instrument. Estimation of a UK general population tariff. *Health Econ*. 2015;24(3):258–269.
17. Farkas M, Huynh E, Gulácsi L, et al. Development of population tariffs for the ICECAP-A instrument for Hungary and their comparison with the UK tariffs. *Value Health*. 2021;24(12):1845–1852.
18. Rohrbach PJ, Dingemans AE, Groothuis-Oudshoorn CG, et al. The ICEpop capability measure for adults instrument for capabilities: development of a tariff for the Dutch General population. *Value Health*. 2022;25(1):125–132.
19. Goranitis I, Coast J, Day E, Copello A, Freemantle N, Frew E. Maximizing health or sufficient capability in economic evaluation? A methodological experiment of treatment for drug addiction. *Med Decis Mak*. 2016;37(5):498–511.
20. Himmler S, van Exel J, Brouwer W. Estimating the monetary value of health and capability well-being applying the well-being valuation approach. *Eur J Health Econ*. 2020;21(8):1235–1244.
21. Wouters S, van Exel N, Rohde K, Vromen JJ, Brouwer W. Acceptable health and priority weighting: discussing a reference-level approach using sufficientarian reasoning. *Soc Sci Med*. 2017;181:158–167.
22. Mitchell PM, Roberts TE, Barton PM, Coast J. Assessing sufficient capability: a new approach to economic evaluation. *Soc Sci Med*. 2015;139:71–79.
23. Kinghorn P, Afentou N. Eliciting a monetary threshold for a year of sufficient capability to inform resource allocation decisions in public health and social care. *Soc Sci Med*. 2021;279:113977.
24. Johnson R, Jenkinson D, Stinton C, et al. Where's WALY?: a proof of concept study of the 'wellbeing adjusted life year' using secondary analysis of cross-sectional survey data. *Health Qual Life Outcomes*. 2016;14(1):126.
25. Månsdotter A, Ekman B, Feldman I, Hagberg L, Hurtig AK, Lindholm L. We propose a novel measure for social welfare and public health: capability-adjusted life-years, CALYs. *Appl Health Econ Health Policy*. 2017;15(4):437–440.
26. Månsdotter A, Ekman B, Meili KW, et al. Towards capability-adjusted life years in public health and social welfare: results from a Swedish survey on ranking capabilities. *PLoS One*. 2020;15(12):e0242699.
27. Meili KW, Månsdotter A, Sundberg LR, Hjelte J, Lindholm L. An initiative to develop capability-adjusted life years in Sweden (CALY-SWE): selecting capabilities with a Delphi panel and developing the questionnaire. *PLoS One*. 2022;17(2):e0263231.
28. Sabat I, Neumann-Böhme S, Varghese NE, et al. United but divided: policy responses and people's perceptions in the EU during the COVID-19 outbreak. *Health Policy*. 2020;124(9):909–918.
29. Varghese NE, Sabat I, Neumann-Böhme S, et al. Risk communication during COVID-19: a descriptive study on familiarity with, adherence to and trust in the WHO preventive measures. *PLoS One*. 2021;16(4):e0250872.
30. Hajek A, Sabat I, Neumann-Böhme S, et al. Prevalence and determinants of probable depression and anxiety during the COVID-19 pandemic in seven countries: longitudinal evidence from the European COvid Survey (ECOS). *J Affect Disord*. 2022;299:517–524.
31. Himmler S, van Exel J, Brouwer W, et al. Braving the waves: exploring capability well-being patterns in seven European countries during the COVID-19 pandemic. *Eur J Health Econ*. July 6, 2023. https://doi.org/10.1007/s10198-023-01604-8.
32. Bobinac A, van Exel N, Rutten FF, Brouwer WB. Willingness to pay for a quality-adjusted life-year: the individual perspective. *Value Health*. 2010;13(8):1046–1055.
33. Arrow K, Solow R, Portney PR, Leamer EE, Radner R, Schuman H. *Report of the NOAA Panel on Contingent Valuation*; 1993. https://edisciplinas.usp.br/pluginfile.php/4473366/mod_folder/intro/Arow_WTP.pdf. Accessed July 3, 2023.
34. Blumenschein K, Blomquist GC, Johannesson M, Horn N, Freeman P. Eliciting willingness to pay without bias: evidence from a field experiment. *Econ J*. 2008;118(525):114–137.
35. Blomquist GC, Blumenschein K, Johannesson M. Eliciting Willingness to Pay without Bias using Follow-up Certainty Statements: comparisons between Probably/Definitely and a 10-point Certainty Scale. *Environ Resour Econ*. 2009;43(4):473–502.
36. Pelikan JM, Link T, Straßmayr C, et al. Measuring comprehensive, general health literacy in the general adult population: the development and validation of the HLS19-Q12 instrument in seventeen countries. *Int J Environ Res Public Health*. 2022;19(21):14129.

37. The HLS19-Q12 instrument to measure general health literacy. M-POHL. https://m-pohl.net/sites/m-pohl.net/files/inline-files/Factsheet%20HLS19-Q12.pdf. Accessed July 3, 2023.
38. Kroenke K, Spitzer RL, Williams JB, Löwe B. An ultra-brief screening scale for anxiety and depression: the PHQ–4. *Psychosomatics*. 2009;50(6):613–621.
39. Purchasing power adjusted GDP per capita (SDG_10_10). Eurostat. https://ec.europa.eu/eurostat/databrowser/bookmark/537e220d-7f66-45cf-8055-a20a469747e1?lang=en. Accessed May 30, 2023.
40. Nielsen JS, Gyrd-Hansen D, Kjær T. Sample restrictions and the elicitation of a constant willingness to pay per quality adjusted life year. *Health Econ*. 2021;30(5):923–931.
41. Bobinac A, van Exel NJA, Rutten FF, Brouwer WB. Pay more? An elaborate test of construct validity of willingness to pay per QALY estimates obtained through contingent valuation. *J Health Econ*. 2012;31(1):158–168.
42. Gyrd-Hansen D, Kjær T. Disentangling WTP per QALY data: different analytical approaches, different answers. *Health Econ*. 2012;21(3):222–237.
43. OECD. Health Spending (Indicator). 10.1787/8643de7e-en. Accessed December 8, 2023.
44. Olsen JA, Donaldson C, Pereira J. The insensitivity of 'willingness-to-pay' to the size of the good: new evidence for health care. *J Econ Psychol*. 2004;25(4):445–460.
45. Mitchell PM, Al-Janabi H, Richardson J, Iezzi A, Coast J. The relative impacts of disease on health status and capability wellbeing: a multi-country study. *PLoS One*. 2015;10(12):e0143590.
46. Mitchell PM, Morton RL, Hiligsmann M, Husbands S, Coast J. Estimating loss in capability wellbeing in the first year of the COVID-19 pandemic: a cross-sectional study of the general adult population in the UK, Australia and the Netherlands. *Eur J Health Econ*. 2023;24(4):609–619.
47. Mitchell PM, Venkatapuram S, Richardson J, Iezzi A, Coast J. Are quality-adjusted life years a good proxy measure of individual capabilities? *Pharmacoeconomics*. 2017;35(6):637–646.
48. Ryen L, Svensson M. The willingness to pay for a quality adjusted life year: a review of the empirical literature. *Health Econ*. 2015;24(10):1289–1301.
49. Pinto-Prades JL, Loomes G, Brey R. Trying to estimate a monetary value for the QALY. *J Health Econ*. 2009;28(3):553–562.
50. Pennington M, Baker R, Brouwer W, et al. Comparing WTP values of different types of QALY gain elicited from the General Public. *Health Econ*. 2015;24(3):280–293.
51. Gal D, Rucker DD. The loss of loss aversion: will it loom larger than its gain? *J Consum Psychol*. 2018;28(3):497–516.