

Eliciting the Monetary Value of a Quality-Adjusted Life Year in a Greek Outpatient Department in Times of Economic Austerity

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Abstract

Background and objective Contingent valuation is widely used to determine individuals' willingness to pay (WTP) for a health gain. Our study aimed to elicit an empirical estimate of the monetary value of a quality-adjusted life year (QALY) in a Greek outpatient setting in times of economic austerity and assess the impact of patients' characteristics on their valuations.

Methods We used a questionnaire as a survey tool to determine the maximum WTP for a health gain of a hypothetical therapy and to evaluate patients' health-related quality of life (EuroQoL-5D-3L) and demographic and socioeconomic characteristics. EuroQoL tariffs were used to estimate health utilities. Mean WTP values were computed and ordinary least squares regressions performed on transformed Box-Cox and logarithmic dependent WTP per QALY variables to remedy observed skewness problems.

Results Analyses were performed for 167 patients with utility values less than unity. Mean WTP per QALY reported was similar for both payment vehicles examined: payments made out-of-pocket (€2629) and payments made through new tax imposition (€2407). Regression results

showed that higher net monthly family income was associated with higher WTP per QALY for both payment vehicles. Moreover, the presence of a chronic condition and higher level of education were associated with higher out-of-pocket WTP per QALY and WTP per QALY through taxes, respectively.

Conclusion The very low WTP per QALY estimates could be explained by the recent severe economic depression and austerity in Greece. In fact, family income was found to be a significant predictor of WTP per QALY. Since these estimates deviate significantly from the cost-effectiveness thresholds still employed in economic evaluations in this country, research should be undertaken promptly to further examine this important issue using a nationwide representative sample of the general population along with WTP and other methodologies.

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Key Points for Decision Makers

Applied economic evaluations in Greece typically adopt the World Health Organization's threshold. They consider medical technologies as being cost-effective if their additional costs per quality-adjusted life year do not exceed three times the country's annual gross domestic product per capita.

Estimates, however, of the payments per quality-adjusted life year that patients are willing to make, either out-of-pocket or via taxes, seem significantly lower in this era of severe economic recession.

Cost-effectiveness thresholds previously applied should thus be treated with caution by decision makers.

1 Introduction

Economic evaluation is widely applied in healthcare policy making in order to inform decisions related to budget allocation and reimbursement of new interventions. Cost-utility analysis (CUA) that uses quality-adjusted life years (QALYs) constitutes nowadays a widely used economic evaluation approach [1]. When conducting CUA, a common decision rule is to choose an intervention with an incremental cost per QALY below a specified threshold [2–4]. A technique to set this threshold is contingent valuation (CV). CV has been extensively adopted in environmental and transport economics as a way to assess users' preferences and place monetary values on non-market goods or services [5]. In healthcare, several studies have used CV for determining individuals' willingness to pay (WTP) for a health gain [5–10].

It is thus obvious that setting a threshold for comparing a new intervention's cost per QALY gained to determine its cost-effectiveness is of utmost importance in healthcare decision making. This is primarily true due to the fact that budget allocation decisions of millions of Euros are based on such thresholds [4]. Acknowledging the above, several countries have set relevant threshold values. For instance, the UK threshold is typically between £20,000 and £30,000 (€25,700–€38,600); however, recently, a lower 'central' cost-effectiveness threshold of £12,936 has been proposed [4]. In the Netherlands, cost-effectiveness thresholds of €54,000–€245,000 are set [11].

In Greece, such thresholds have not been established yet, and in economic evaluations, typically World Health Organization thresholds, defined in terms of the country's gross domestic product (GDP), have been employed for assessing cost-effectiveness [12]. Regarding WTP, research by Kontodimopoulos and Niakas has shed light on WTP for kidney transplantation [13]. Specifically, this study reported that 9.7% of the end-stage renal dialysis patients were willing to pay up to €15,000 for kidney transplantation; 18.8% would pay €15,000; and 31% would pay more than €15,000. However, no specific WTP per QALY threshold was provided. Therefore, to the best of our knowledge, no WTP per QALY threshold has been determined for the Greek healthcare system.

This research aimed to elicit an empirical estimate of the monetary value of a QALY from a sample of individuals visiting the outpatient department of a Greek public hospital. We adopted the CV approach from the individual perspective, using a questionnaire to determine the maximum WTP for a health gain of a hypothetical treatment and EuroQoL tariffs to estimate health utilities. WTP was preferred over other methods, such as willingness to

accept, since it has been suggested that it provides more valid and conservative monetary valuations [14, 15].

2 Methods

2.1 Study Design

The research took place in the General Hospital of Preveza, Western Greece, which was chosen for convenience. It was conducted during a 4-month period between January and April 2016 and was approved by the General Manager of the institution. Questionnaires were completed by patients with the guidance of specially trained hospital nurses during all weekdays and hours that the outpatient department was in operation. Patients 18 years or older were asked to participate in the research upon arrival to the outpatient facility.

2.2 Survey Tool

The questionnaire used in this research was based on that developed by Martín-Fernández et al. [16]. For the purposes of our study we made the necessary changes for adaptation to the Greek context (see the appendix provided in the electronic supplementary material).

2.3 Variables

Respondents were asked about their demographic and socioeconomic characteristics: age, gender, educational level, number of family members living at home, presence of a chronic condition and net monthly disposable family income (income after taxes and reservations). Regarding the income variable, following other researchers' approach, we asked respondents about their net household income acquired on a monthly basis [17–19].

Patients were asked to evaluate their personal health condition using the EuroQoL-5D-3L. These values were transformed into utilities based on the related reference values of Greek tariffs [20]. Personal health condition was also expressed on a visual analogue scale (VAS), where patients assessed their health on a scale from 0 (worst health status) to 100 (perfect health).

Moreover, we assessed patients' attitudes towards risk. A recent study acknowledged that CV is a deterministic technique regarding the health impact of the intervention as well as the relevant result [16]. However, it was suggested that due to the hypothetical nature of the WTP scenario, respondents must manage uncertainty to a degree. In fact, it presents theoretical and empirical evidence to support the hypothesis that attitudes towards risk might affect WTP

[11, 21, 22]. Although the usefulness of incorporating risk attitudes in a scenario that does not involve risk is debatable, we decided to include the specific variable given that it has been found to affect WTP in the above research [16].

Risk attitudes were measured as an outcome of a lottery game. Theory suggests that an individual is prone to risk (risk lover) if, given the opportunity to earn a payoff with certainty or choose a gamble with an expected value equal to that payoff, he or she would prefer the latter. In other words, the certainty equivalent (that is, the certain amount offered that would make him/her indifferent between that amount and the gamble) of a person prone to risk is higher than the expected value of the gamble. Therefore, the following lottery game was devised [16, 23]. In order for a patient to participate, he or she had to contribute €40. Each participant was presented with two imaginary boxes (one containing €200 and one being empty) and a monetary offer, and was provided with two options: pick up one of the two boxes and gain its contents or accept the monetary offer and quit the game. If the participant chose to pick up one of the two boxes, a new higher monetary offer was made so as to tempt him/her to quit the game. The certain monetary offer was gradually increased, and if a participant continued playing by choosing the option of picking up one of the two boxes, a higher offer was made, which again he or she could accept and quit the game or refuse to do so and keep on playing. The final monetary offer with certainty was that of €90, which was higher than the expected value. If a participant rejected this offer and decided to pick up one of the two boxes, he was characterised as a risk lover or prone to risk [24–26]. The maximum game payoff was €160 and the maximum loss €40. No real monetary transactions were made.

To elicit patients' WTP per QALY, respondents had to react to a hypothetical scenario. They had to imagine that there was a new treatment available that, while administered, would relieve them from all health problems and symptoms and, therefore, allow them to recover to perfect health; this new treatment was assumed to have no side effects. WTP was determined through the use of an iterative closed-ended bidding system [8, 16, 27–29]. Each participant was asked to imagine that he or she would gain perfect health for as long as the treatment was administered by making payments on a monthly basis. If he or she stopped paying, this would entail returning to the previous health state from perfect health. The lowest bid provided was €1 and the highest bid permitted was €8192. A rule of a maximum bid equal to 10 times the net monthly national disposable income is found in the literature [8, 19, 30]. In our case, the latter was equal to €10,820. Therefore, we decided to assume €1 as the lowest bid and adopt the highest bid of the Martín-Fernández et al. [16] study (€8192), which was close to the Greek figure mentioned. If

participants replied positively (negatively), the hypothetical payment was doubled (halved) until they were unwilling (willing) to pay the specified amount [16, 19]. We used randomisation for the first bid value (starting from the lowest or highest bid) in order to minimise starting point bias [16, 19, 27, 31, 32].

The hypothetical scenario was tested considering two different payment vehicles: out-of-pocket (OOP) payments and payments made through a new tax imposition (TAX). The Greek NHS is a mixed public and private system. In 2014, government schemes accounted for 28% of total Greek healthcare spending, while 66% of health spending was financed through compulsory health insurance (31%) and OOP payments (35%) [33]. Therefore, in our setting both OOP payments and payments through taxation were relevant and were considered when eliciting WTP for a new intervention. The same bidding values were used for both payment vehicles.

2.4 Data Analysis

Based on the EQ-5D Greek tariff, we calculated a utility score for each patient. WTP per QALY was calculated based on the following formula [16, 19]:

$$\text{WTP per QALY} = \frac{\text{WTP per month} \times 12}{1 - \text{QoL}}.$$

Health-related quality of life (QoL) was expressed in utilities. Patients in perfect health (utility = 1) were excluded from estimations to avoid zero QALY gains and division by zero in the denominator [19, 34]. Therefore, all subsequent analyses were based on subjects that expressed a utility value less than 1. Descriptive statistics, however, were given both for the overall sample and for patients who expressed a utility value less than 1. We captured respondents' payment for only 1 year, and thus, life expectancy and discount rate were not taken into account. WTP per QALY was also calculated using the adjusted value of VAS (VAS score/100) as a QoL measure. In both cases, WTP per QALY was first calculated at the respondent level and then the mean of the ratios was computed. In the regressions that follow, the dependent variable (WTP/QALY) used was that expressed in utility terms. Spearman's correlation coefficient was employed to assess differences between WTP/QALY values using either tariff or VAS and TAX or OOP scores.

Multiple linear regressions were performed to assess the effect of socioeconomic and health characteristics on the dependent WTP/QALY variable. However, since the normality assumption was violated, we transformed the dependent variable in order to apply ordinary least squares (OLS) estimation. Specifically, we adopted the Box-Cox transformation approach of the dependent variable and

used STATA v.13 to identify an appropriate exponent (λ) that minimised the skewness of the variable. For positive data, if $\lambda \neq 0$, the Box-Cox transformation equalled the quotient of the variable raised to the power of λ minus 1 divided by λ . If $\lambda = 0$, the natural logarithm was used instead [35, 36]. Note that when zero values exist in the data, unity is typically added to all observations of the variable of interest prior to the Box-Cox transformation.

Overall, we developed two regression models: one with Box-Cox (WTP/QALY OOP) and one with $\ln(\text{WTP}/\text{QALY TAX})$ as the dependent variable; in the latter case, λ was zero and therefore a log transformation was employed. Age, gender (1=female, 0 otherwise), level of education (1 = university, 0 otherwise), number of family members, net monthly disposable family income (captured by three dummies included in the models), presence of a chronic condition, and attitude towards risk (1 = prone to risk, 0 otherwise) were the independent variables considered in the regression models. For the 'net monthly disposable family income' variable, we used the first category ('income less than €600') as the reference. Moreover, we merged two other categories ('net monthly family income €1801–2400' and '€2401–3600') into one ('net monthly family income over €1800') in order to increase the reliability of statistical inference, given the few observations of the last category ($n = 11$, 6.6%).

Note also, that there were no individuals in the income category '>€3600' in the sample employed in the regressions. Finally, for those independent variables that regression results indicated an impact on Box-Cox(WTP/QALY OOP) and $\ln(\text{WTP}/\text{QALY TAX})$, the average values in each variable category were presented.

Statistical significance was set at 5%. Statistical analyses were conducted using STATA v.13. We used IBM SPSS v.22 for the plots presented in the figures. Finally, power analysis was performed with G*Power v.3.1.9.2.

3 Results

3.1 Sociodemographic Characteristics

Demographic and socioeconomic characteristics of the overall sample ($n = 200$ patients; response rate 68%) are given in Table 1. Out of these patients, 33 (16.5%) reported a utility value equal to 1 (perfect health). As explained above, these subjects were excluded from subsequent analysis, and the usable observations on which all analyses were based were 167. The demographic and socioeconomic characteristics of these participants who expressed a utility value less than 1 are also presented in Table 1. Participants' average age was 61.7 years. Most of the patients had

Table 1 Demographic and socioeconomic characteristics of initial sample ($n = 200$) and patients not being in perfect health (utility < 1) ($n = 167$)

Characteristic	Initial sample	Sample excluding individuals with perfect health
	Mean (SD), median/percentage	Mean (SD), median/percentage
Age	59.3 (15.8), 60	61.7 (15.3), 63
Gender (female)	52.5%	50.9%
Education		
No/elementary	35%	41.3%
High school	31%	30%
Private college (IEK)	6%	3.6%
University	28%	25.1%
Family members	2.1 (1.2), 2	2.1 (1.2), 2
Net monthly family income		
<€600	17%	19.2%
€600–€1200	43.5%	46.7%
€1201–€1800	21.5%	18.6%
€1801–€2400	9.5%	9%
€2401–€3600	8%	6.6%
>€3600	0.5%	0%
Chronic condition	56.5%	65.3%
Risk tendency (lottery game)	17%	15.6%
VAS	69.2 (17.2), 70	67.8 (15.2), 70
Utilities (EuroQol-5D-3L)	0.69 (0.32), 0.73	0.62 (0.26), 0.73

SD standard deviation, VAS visual analogue scale

no or elementary education. Almost half of the patients reported a net monthly family income between €600 and €1200 and about two-thirds had at least one chronic condition. Regarding the assessment of risk attitudes, 15.6% of the 167 patients analysed were found to be prone to risk according to the lottery game.

3.2 WTP per QALY

Table 2 shows the descriptive statistics of WTP/QALY both for OOP payments (WTP/QALY OOP) and payments made through taxes (WTP/QALY TAX) and for WTP/QALY measures using either tariff (WTP/QALY-Utility) or VAS scores (WTP/QALY-VAS). When WTP/QALY was estimated using utility scores as QoL measurements, the mean WTP/QALY was estimated to be €2629 for OOP payments, whereas when payments were to be made through a new tax imposition, the mean WTP/QALY was slightly lower at €2407. When WTP/QALY was estimated using VAS as a QoL measure, mean WTP/QALY was slightly higher compared with WTP/QALY-Utility both for OOP and TAX values (Spearman's $\rho = 0.945$, $p = 0.000$, and Spearman's $\rho = 0.960$, $p = 0.000$, for OOP and TAX values, respectively). Finally, WTP/QALY OOP showed a significant, strong, positive correlation (Spearman's $\rho = 0.768$, $p = 0.000$) with WTP/QALY TAX.

3.3 Zero Bids and Outliers

As it is often the case in WTP studies, there were a number of patients who chose €0 as their maximum WTP

[9, 13, 37, 38]; we identified only six and five zero bidders in the WTP OOP and WTP TAX responses, respectively. These zero value responses were considered as legitimate zero valuations and were therefore included in the analysis.

Moreover, as shown in Table 2, in all cases, the mean value was greater than the median value, indicating a right skewed distribution for WTP/QALY data and, thus, potential outliers in patients' responses. In order to reduce the effect of outliers, we trimmed the mean WTP/QALY value by excluding the top 1% of the estimates (Table 2). WTP/QALY OOP had a trimmed mean of €2525 and WTP/QALY TAX a trimmed mean of €2165. These values were very close to the original mean values. Similar results were also observed for the WTP/QALY OOP and TAX trimmed values when WTP/QALY was estimated using the VAS score (Table 2).

3.4 Regressions

A post hoc power analysis for an effect size $f^2 = 0.10$, $\alpha = 0.05$ and $n = 167$ showed adequate statistical power for the overall F test (0.80) and the individual t tests (0.98).

Both WTP/QALY OOP and TAX raw data and their respective estimated regression residuals had non-normal distributions (the latter are presented in terms of normal PP-plots in Fig. 1). To approximate normality, we adopted the Box-Cox transformation. Regarding WTP/QALY OOP data, it was estimated that for $\lambda = 0.2566$ [95% confidence interval (CI) 0.1899–0.3297], skewness took the value of -0.0004 , indicating that the Box-Cox transformed WTP/QALY OOP data were appropriate for OLS estimation. For

Table 2 Descriptive statistics of willingness to pay (WTP) per quality-adjusted life year (QALY) (€)

Descriptive statistics	QoL-utility		QoL-VAS	
	WTP/QALY OOP	WTP/QALY TAX	WTP/QALY OOP	WTP/QALY TAX
Mean	2629	2407	2706	2498
SD	3628	5789	4555	8065
Median	1396	1235	1536	960
95% CI	2074–3183	1523–3292	2010–3402	1266–3731
Minimum	0	0	0	0
Maximum	22,342	44,684	47,261	94,523
Range	22,342	44,684	47,261	94,523
IQR	2251	2274	2481	1874
Skewness	3.02	5.92	6.31	9.75
1% trimmed mean	2525	2165	2453	1956
10th percentile	79	59	78	58
25th percentile	542	253	591	320
50th percentile	1396	1235	1536	960
75th percentile	2793	2526	3072	2194
90th percentile	5586	5053	6144	3950

CI confidence interval, IQR interquartile range, OOP out-of-pocket payment, QoL quality of life, SD standard deviation, TAX payment through taxation, VAS visual analogue scale

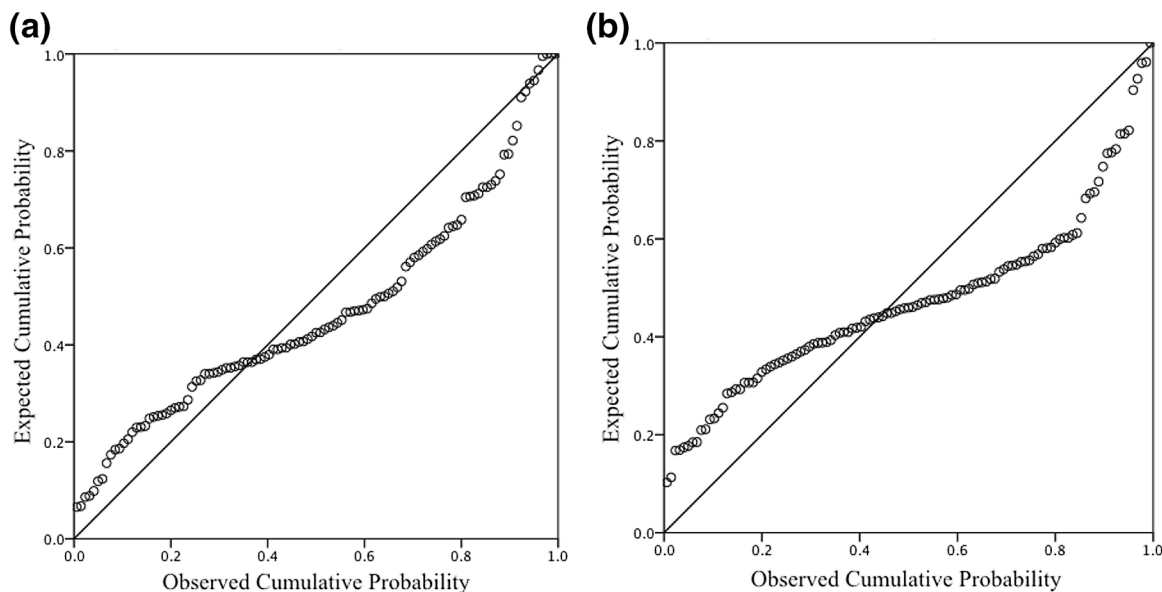


Fig. 1 Normal probability plots of regression standardised residuals for the untransformed willingness-to-pay per quality-adjusted life year dependent variable: **a** monetary estimates based on out-of-pocket payments; **b** monetary estimates based on payments made through taxation

the WTP/QALY TAX data, $\lambda = 0$, indicating that the natural logarithm was appropriate. As shown in Fig. 2, after the Box-Cox and logarithmic transformations, no considerable deviations from normality were indicated by the PP-plots.

We ran two multiple linear regression models. In model 1, the transformed dependent variable WTP/QALY was based on OOP payments and, in model 2, on payments made through taxes. Table 3 presents OLS results for both models. Model 1 had an adjusted R^2 equal to 0.188 ($F = 3.880$, $p = 0.000$). There was no evidence of heteroscedasticity (Breusch–Pagan/Cook–Weisberg test, $p = 0.714$) or misspecification (Ramsey RESET test, $p = 0.988$). Regression results showed that compared with patients having a net monthly family income less than €600, patients in all the other income categories were willing to pay higher amounts of money OOP for gaining a QALY. As expected, higher income categories had greater regression coefficients, indicating that higher income was associated with higher WTP OOP for one additional QALY, *ceteris paribus*. Similarly, patients having a chronic condition were also willing to make higher OOP payments for one additional QALY. The negative sign of the risk tendency regressor would imply that prone-to-risk participants were willing to pay less for a QALY than other individuals. However, the coefficient of this variable, as was also the case for age, gender, education and the number of family members, lacked statistical significance in model 1.

Given the average values of the dependent variable, we observe that subjects suffering from a chronic condition showed a slightly higher WTP/QALY OOP value (€2790) compared with those with no chronic condition (€2326).

Moreover, subjects with net monthly family income not exceeding €600 revealed an approximately three times lower WTP/QALY OOP mean value (€877) compared with those with an income between €600 and €1200 (€2380) and between €1201 and €1800 (€2691) and a six times lower value compared with those with an income exceeding €1800 (€5455).

Similarly, in model 2, adjusted R^2 was 0.135 ($F = 2.852$, $p = 0.005$). There was no evidence of heteroscedasticity ($p = 0.325$) or misspecification ($p = 0.510$). As shown in Table 2, patients with a higher level of education expressed, on average, increased WTP/QALY TAX by 112% ($e^{0.750} = 2.12$). Patients with a monthly family income of €600–€1200, €1201–€1800 and over €1800 stated, on average, higher WTP/QALY TAX by 304%, 283% and 596%, respectively, compared with patients having a monthly family income less than €600. In model 2, age, gender, number of family members, risk tendency and the presence of a chronic condition had no statistically significant impact on $\ln(\text{WTP/QALY TAX})$.

Given the mean values of the dependent variable, we observe that highly educated subjects stated, on average, a higher WTP/QALY TAX value (€3406) compared with those having acquired any other level of education (€2071). Moreover, subjects with a net monthly family income not exceeding €600, revealed a less than half WTP/QALY TAX mean value (€788) compared with those with an income between €600 and €1200 (€2144), almost four times less compared with those with an income between €1201 and €1800 (€2870) and almost six times less compared with those with an income exceeding €1800 (€4638).

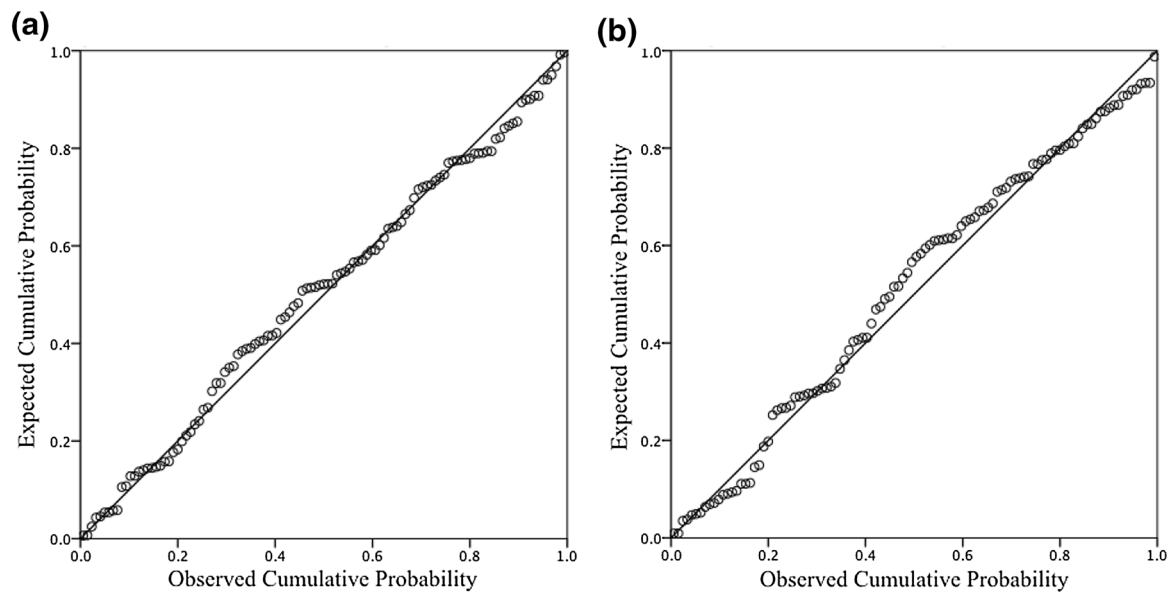


Fig. 2 Normal probability plots of regression standardised residuals for the transformed willingness-to-pay (WTP) per quality-adjusted life year (QALY) dependent variable: **a** monetary estimates based on out-of-pocket payments, Box-Cox transformed WTP per QALY

dependent variable; **b** monetary estimates based on payments made through taxation, log transformed WTP per QALY dependent variable

Table 3 Regression models 1 and 2—variables affecting willingness to pay (WTP) per quality-adjusted life year (QALY) estimates based on out-of-pocket (OOP) payments (model 1) and payments made through taxation (TAX) (model 2)

Independent variable	Model 1 Dependent variable Box-Cox (WTP/QALY OOP)				Model 2 Dependent variable ln(WTP/QALY TAX)			
	Coefficient	SE	95% CI (p value)		Coefficient	SE	95% CI (p value)	
Intercept	2.799	6.798	(-10.682 to 16.281) 0.681		3.794	1.085	(1.641 to 5.948) 0.001	
Age	0.072	0.082	(-0.091 to 0.236) 0.383		0.021	0.013	(-0.005 to 0.047) 0.115	
Gender	2.461	2.014	(-1.534 to 6.456) 0.225		0.353	0.323	(-0.289 to 0.994) 0.278	
Educational level	4.091	2.319	(-0.508 to 8.691) 0.081		0.750	0.368	(0.019 to 1.481) 0.044	
Number of family members	0.280	0.734	(-1.176 to 1.735) 0.704		0.055	0.116	(-0.176 to 0.286) 0.639	
Net monthly family income €600–1200	10.143	2.595	(4.996 to 15.290) 0.000		1.395	0.411	(0.581 to 2.210) 0.001	
Net monthly family income €1201–1800	11.721	3.133	(5.508 to 17.935) 0.000		1.342	0.494	(0.362 to 2.323) 0.008	
Net monthly family income over €1800	11.878	3.155	(5.621 to 18.136) 0.000		1.940	0.501	(0.946 to 2.935) 0.000	
Chronic condition	5.722	2.017	(1.721 to 9.723) 0.005		0.139	0.323	(-0.501 to 0.779) 0.668	
Risk tendency (prone to risk)	-2.242	2.287	(-6.777 to 2.293) 0.329		-0.219	0.381	(-0.975 to 0.538) 0.567	

SE standard error, CI confidence interval

4 Discussion

The present research showed that for a treatment, which would relieve patients from all health problems and symptoms and allow them to recover to perfect health, study participants were willing to pay, on average, €2629 for an additional QALY if payments were to be made OOP and €2407 if payments were to occur through taxation. During the last 7 years, the Greek population has faced fierce salary cuts and an increased burden of taxation, which has shrunk individual and family net disposable

income. This can presumably explain both its intolerance to a tax rise for making the hypothetical treatment available to all and its potential inability to pay higher OOP amounts.

The estimated WTP/QALY corresponded to 17% and 15.5%, in the case of OOP and TAX values, respectively, of the Greek GDP per capita in 2015 (i.e. €16,028 [30]). This is similar to the respective proportions observed in other studies [34, 39, 40] and much lower than the cost-effectiveness threshold recommended by the World Health Organization, namely three times the country’s GDP per capita [41]. In absolute values, the WTP/QALY estimated

here is very low and much lower than estimates reported in studies having a similar approach to ours [7, 9, 16, 27, 31, 40, 42]. These discrepancies could be due to different demographic and socioeconomic characteristics of the samples [9, 16, 27] and different WTP elicitation methods [7, 31, 40, 42]. For instance, studies adopting the same WTP and QALY estimation techniques with younger and more affluent sample participants reported higher WTP/QALY estimates [9, 27].

Our study focused on a specific population with certain characteristics, namely patients of an outpatient department who tended to be old, with the majority reporting a low educational level, the presence of a chronic condition and a low net monthly family income. Since the sample is specific and is expected to differ from the general population, it is interesting to compare sociodemographic characteristics that were found here to affect WTP/QALY. Twenty-seven percent of the Greek population has a higher level of education [43] and 49.7% is suffering from a chronic condition [30]. In our case, 25.1% of the sample had a university education and 65% were suffering from a chronic condition. Regarding net family income, the majority of the participants reported low family incomes (net monthly/annual family income ranged between €600 and €1200/€7200 and €14,400). In 2015, Greeks had an annual net household disposable income of €16,769 [44]. Therefore, some differences in the characteristics of the sample participants compared with those of the general population seem to exist.

Another noteworthy result was the impact of patients' socioeconomic characteristics on WTP per QALY estimates according to the regression analysis. Participants' family income and the existence of a chronic condition were found to affect positively WTP/QALY OOP estimates. Therefore, patients having a chronic condition and higher income were willing to pay more OOP, a result consistent with other study findings [8, 9, 27, 31, 32, 39]. In fact, the increases in WTP/QALY OOP were congruent with the increases in the income ranges. Specifically, as patients' net monthly family income increased so did the amount they were willing to pay OOP for an additional QALY compared with the reference group.

Moreover, WTP/QALY TAX was affected by participants' level of education and income. Both these variables had a positive impact on WTP/QALY TAX. Thus, patients with higher education and higher household income were found to be willing to pay more tax for being administered the hypothetical treatment. Overall, participants' income was a significant predictor for WTP/QALY. In this case, the dummy for incomes between €600 and €1200 had a somewhat higher estimated coefficient than the dummy for €1201–€1800. However, given the CIs of these estimates, this difference could be due to chance or at least be small. In addition, it would not be inconceivable in the Greek

setting to really observe a somewhat lower WTP in the higher income group. For instance, it could be that prior to the economic crisis, people with higher incomes got more housing or other loans, which under the very stringent present economic conditions, they find difficult to repay. More generally, the economic crisis has affected people with various levels of incomes differently.

The overall results of the present study are perhaps not as surprising they might initially seem. Greeks have witnessed a deep and prolonged depression, which resulted in a 26% fall in the country's real GDP since 2009 and an unemployment rate of 25%. Anchored poverty, that is, poverty measurement relative to the pre-crisis income level, almost tripled from 2007 to 2013, with one out of three Greeks being poor in the latter year. In fact, this has been the sharpest increase in poverty among OECD countries [45].

In this context, although our findings cannot be generalised to the population of Greece, we nevertheless believe the very low WTP values per QALY documented here provide useful insights in a country that still uses much higher cost-effectiveness thresholds despite the severe depression it has faced. In fact, we hope it will act as a trigger for a nationwide WTP study and the use of alternative methodologies to more fully explore the thresholds that should be adopted by health technology experts and policy makers in this country.

As is already evident, the present research is subject to some limitations. The sample is rather limited in size and was recruited in the outpatient department of a single regional public hospital. Since inpatients were not included in the study, WTP/QALY estimates were elicited by mainly considering utility gains that result from a hypothetical transition from a mild health condition to perfect health. Patients recovering from a serious condition to perfect health are likely to report low WTP/QALY values due to the ceiling effect, as their income is limited. More generally, as already acknowledged, study findings cannot be generalised to the Greek population. Another limitation is that when respondents chose €0 or really low values (i.e. €1, €2 or €4) as their maximum monthly WTP, no question regarding the reason behind this preference followed [9, 37], which would have allowed further exploration of their attitudes. Hence, it could be the case that WTP is reflecting respondents' inability to pay rather than unwillingness to give money for a treatment, indicating the important impact of family income constraints. Moreover, Greek respondents have a limited experience in health-related interviews and questionnaires, which renders them more sceptical towards such studies, thus presumably increasing biases. Furthermore, our study focused on the individual perspective, limiting the use of the results in the deduction of a socially acceptable threshold. In future research, it is important to examine, along with people's WTP, the budget constraints of the national healthcare system in order to combine this information and identify a socially affordable

threshold. Lastly, it would also be interesting to assess WTP regarding different treatment durations, as they have been shown to affect people's WTP [31].

Author contribution AM worked on the design of the study, data analysis and interpretation of results, and the writing and editing of the manuscript. VA worked on the design of the study, data analysis and interpretation of results, and the writing, editing, final review and approval of the manuscript. AS worked on the design of the study, data collection, analysis and interpretation and approval of the study. DN worked on the design, the critical review and approval of the study.

Compliance with Ethical Standards

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Conflict of interest Mavrodi A, Aletras V, Spanou A, and Niakas D declare that they have no conflict of interest.

Ethical standards (approval and informed consent) The study design received approval from the General Manager of the hospital. Informed consent was obtained from all individual participants included in the study.

Data availability statement The datasets generated and analysed during the current study are available from the corresponding author on reasonable request.

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