Examining the relationship between societal views on healthcare priority setting and the willingness to pay for health gains

Thesis

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Summary

Introduction

In many countries, healthcare expenditure is increasing more rapidly than economic growth. This means that policy makers must make decisions that keep healthcare accessible by balancing affordability, necessity, efficacy of care and cost-effectiveness. Therefore it is important to prioritise specific healthcare services. From previous research it was concluded that it is important to take into account societal preferences when prioritising. One of the societal preferences to take into account is the equity of healthcare treatments. However, there are little suggestions on how to implement views on equity in the current healthcare systems. One way of researching this, is by using the societal views as formulated by Wouters et al. (2017). The aim of this thesis is to examine the relationship between these societal views on healthcare priority setting and the willingness to pay (WTP) for health gains.

Methods

This aim is achieved by looking at data from a contingent valuation (CV) study through a questionnaire that was completed by a representative sample (n = 1,625) of the adult population of the Netherlands. Respondents were first matched to one of the three prevailing societal views on the basis of their responses to 14 statements. Secondly, the equity preferences of respondents were investigated by looking at the WTP for different healthcare treatments. Finally it was investigated if the societal viewpoints are statistically related with the WTP.

Results

Most participants (94.7%) were matched to a viewpoint. They were distributed as follows: more than half (60.5%) was matched to the view 'equal rights to healthcare', 24.7% identified with 'limits to healthcare', and the smallest group, 9.5%, were adherents to the principle of 'effective and efficient healthcare'. Severity and age at the onset of the disease are also important predictors of WTP. In general, WTP increases with severity. In some scenarios, the respondents' WTP for treatments for patients with diseases of varying severity depended on the age of the patients. In general, WTP was highest for patients aged 10. The results indicate that the viewpoint 'effective and efficient healthcare' is associated with a higher WTP, although the association is not significant in all models.

Conclusion

Firstly, it was concluded that a good match was achieved between participants and the different viewpoints. Secondly, two conclusions could be drawn on the desired equity distribution of respondents. (1) I conclude that WTP is higher for patients with more severe diseases. (2) I conclude that the respondents willingness to pay is higher for younger patients. Lastly, on the relationship between the societal viewpoints and the WTP, I conclude that the viewpoints do not have a significant relationship with WTP. However, the viewpoint 'effective and efficient healthcare' is positively associated with WTP.

Table of content

Glossary

CV	Contingent Valuation
EOL	End-Of-Life
GDP	Gross Domestic Product
ICER	Incremental Cost-Effectiveness Ratio
LE	Life Expectancy
OECD	Organisation for Economic Co-operation and Development
QALY	Quality Adjusted Life Years
QOL	Quality Of Life
SIP	Socially-Inclusive-Personal
VAS	Visual Analogue Scale
VWS	Ministry of Health, Welfare and Sport
WTP	Willingness To Pay
ZIN	Dutch National Health Care Institute

1. Introduction

1.1 Increasing healthcare expenditures

In many countries, healthcare expenditure, expressed as a percentage of gross domestic product (GDP), is increasing (Lorenzoni et al., 2019). According to the Organisation for Economic Co-operation and Development (OECD), health expenditure is increasing more rapidly than economic growth in Western countries, including the Netherlands. The OECD predicts that total health expenditure, which contains government spending, compulsory health insurance, voluntary health insurance and out-of-pocket spending, will reach 10.2% of GDP by 2030, compared to 8.8% in 2015 (Lorenzoni et al., 2019). Consequently, the OECD expects that public spending, that is, government spending and mandatory insurance expenditure, which covers outpatient care, long-term care, inpatient care, pharmaceuticals & medical devices and prevention, will increase at a slightly higher rate than total health spending. The average share of public spending in total health expenditure is expected to rise from 74.2% in 2015 to 77.4% by 2030 (Lorenzoni et al., 2019).

Rising expenditure can be explained by, among others, the increase in demand for healthcare that has been accelerated by demographic change: populations are growing not only in size but also in average age. The ageing population of Western countries is a result of declining fertility rates and the longer lifespans of the post-WW2 baby boom generation. The accumulation of older individuals tends to accelerate expenditure on curative care, based on the assumption that an increase in age causes the period of time in which individuals live with morbidity and disability to expand (De Meijer et al., 2013). In Western countries, mean per-capita healthcare expenditure on individuals over the age of 65 is between two and eight times higher than healthcare expenditure on those younger than 65, and it increases progressively with age. Even if morbidity and disability decline, total expenditure growth will accelerate and transfer the sustainability of public healthcare funding into doubt (Payne et al., 2007). The increase in expenditure can be explained further by the growing availability of expensive new health technologies (Vonk et al., 2020).

1.2 Healthcare priority setting in the Netherlands

Recent research has shown that public spending on healthcare in the Netherlands is relatively high, compared to other European countries. Approximately 80% of total healthcare spending is covered by the government budget, funded from public sources. In the Netherlands, healthcare technology, an ageing population and the corresponding increase in morbidity and disability will also increase the pressure on healthcare budgets (OECD/European Observatory on Health Systems and Policies, 2019). Accordingly, the need to prioritise certain healthcare services in financing decisions becomes more pressing by the year (Stolk et al., 2001).

The government has the mandate for the regulation of a wide-ranging universal health coverage, which is divided into three governance schemes: (i) a social insurance structure which is performed by

competing private health insurers for curative care, (ii) a structure for long-term care performed by a major locally care insurer and (iii) a social care structure applied by municipalities financed from taxes (OECD/European Observatory on Health Systems and Policies, 2019). To keep the healthcare services affordable, the government introduced the national Health Insurance Act in 2006. All adult residents in the Netherlands are obliged to purchase universal basic health insurance and contract and pay a premium to a private health insurance company to have access to basic health care. The basic benefit package is legally set (Van de Ven & Schut, 2008).

1.3 Decision-making framework in the Netherlands

To determine the healthcare package that is covered under the basic health insurance, the Dutch National Health Care Institute (ZIN) advises the Ministry of Health, Welfare and Sport (VWS) in their decision-making. ZIN has developed a decision model to prioritize universal basic healthcare using the following criteria: necessity, effectiveness, cost-effectiveness and feasibility (College voor Zorgverzekeringen, 2001; College voor Zorgverzekeringen, 2006).

ZIN assesses the four package criteria carefully, although the outcome on the effectiveness criterion is the main precondition for continuing the evaluation process (Zorginstituut Nederland, 2017). The effectiveness of an intervention refers to the net added value of the new intervention compared to the existing interventions. In other words, does the (new) intervention contribute more to the proposed health objective in comparison to other interventions which are already offered? The outcome of this evaluation is taken into consideration in the further process (Zorginstituut Nederland, 2015).

The next step, evaluating the cost-effectiveness, follows straight after the evaluation of the effectiveness of the treatment. This step assesses which costs and benefits are involved in the intervention, taking into consideration the burden of illness. In order to determine the medical necessity of treating a patient's condition and reimbursing the costs of treatment, there must be a certain level of burden of illness. People might have a lower life expectancy (LE), or have a lower quality of life due to their illness (Zorginstituut Nederland, 2017). This burden of illness can be expressed in lost quality adjusted life years (QALY), and the effectiveness or health gain of a treatment can be expressed in gained QALYs. The cost-effectiveness is then determined by dividing the costs per treatment by the costs of the health gain (expressed in QALYs). If the difference in costs between the new and the old treatment, is divided by the difference in health effect of the new compared to the old treatment, the outcome is the incremental cost-effectiveness ratio (ICER; Zorginstituut Nederland 2017).

For the package criterion feasibility, ZIN examines which factors might complicate the successful implementation of the advice. They investigate for example if there is sufficient societal support, what the total costs would be, and whether the administrative burden of inclusion in the insurance package is manageable (Zorginstituut Nederland, 2015).

After evaluating these criteria, the acceptable price for a treatment is determined, by using reference values that vary with the burden of illness. To determine the level of the reference values, the residents' average 'willing to pay' (WTP) for care can be used, derived from willingness to pay (WTP) studies of other healthcare treatments (Baal et al., 2019; Zorginstituut Nederland, 2015). Empirical evidence suggests that, taking into account the necessity of care and the cost-effectiveness of the treatment, the society has a higher willingness to pay per QALY when there is a higher level of burden of illness, such as patients at the end-of-life (EOL) stage, that is, those who are not expected to survive treatment (Olsen, 2013; Wouters et al., 2013; Zorginstituut Nederland, 2015).

ZIN has identified three classes of reference values that vary with the burden of illness (scored on a scale of 0 to 1, where zero equals death and 1 equals perfectly healthy), which are shown in the table below. If the costs of a treatment for a particular burden of illness falls under the corresponding threshold, the treatment is considered cost-effective, or coverage is said to represent value for money (Bobinac et al., 2012; Zorginstituut Nederland, 2017). If it falls outside the threshold, this is not directly a reason not to reimburse, but it is a reason to take a critical look at the cost-effectiveness. (Zorginstituut Nederland, 2017).

Reference values for cost-effectiveness

Burden of illness	Maximum reference value per QALY gained
0.10 – 0.40	€ 20,000
0.41 – 0.70	€ 50,000
0.71 – 1.00	€ 80,000

Recommendations to not reimburse cost-effective treatments can be based on a low burden of illness, or low costs that would result in more demand which increases use (for example by using it as a substitute for other care), or a combination. On the other hand, argumentations to reimburse non-cost-effective treatments include justice, fairness and equality (Zorginstituut Nederland, 2017). Usually these arguments arise from an assessment against the package criteria. However, there are also arguments that cannot be directly related to a package criterion, such as a conflict with prevailing social preferences (Zorginstituut Nederland, 2017).

Next to the burden of illness, there are also other factors that influence the willingness to pay of patients, individuals and societies (Brazier et al., 2013). Research increasingly shows that the public may prefer certain QALY gains over others. More recent studies anticipate the incorporation of other determinants, such as age, into QALY analyses (Nord, 1995; Rowen et al., 2016; Williams, 1997). Nord et al. (1999) argued that the societal value of health should be incorporated as an equity weight in the decision-making framework. If these preferences are incorporated into the policy framework, health and healthcare would be distributed more equitably (Cookson et al., 2009; Dolan et al., 2005). Also in the Netherlands, pharmaco-economic cost-effectiveness studies recommend the incorporation of societal

preferences in reimbursement decisions (Postma & Krabbe, 2006). The trade-off between efficiency and equity is considered important to reach an optimal outcome for society (Hernaes et al., 2017; Maynard, 2005). In the UK, Netherlands and Australia it became apparent that the economic evaluations do not reflect the actual public preferences (George et al., 2001; Pronk et al., 2004). Different methods, such as consumers and taxpayers' WTP, personal trade-offs, or discrete choice analysis can be used to incorporate societal values into the policy decision-making framework (Van de Wetering et al., 2013).

1.4 Societal views and preferences for priority setting

Wouters et al. (2017) studied the different societal views on health care priority setting in the Netherlands. They identified three views on equity and efficiency in priority setting (Text box 1 includes a brief overview).

Text box 1: Viewpoints identified by Wouters et al. (2017)

To identify and describe the subjective views, Wouters et al. (2017) employed a systematic method. The respondents had to rank several statements about healthcare priorities and clarify their choices. The patterns that were identified in the rankings were interpreted and categorised into three different common viewpoints. Wouters et al. (2017) found that individuals who believe that access to healthcare is a basic human right also think that everyone should have access to the same level of care, irrespective of age or life expectancy (LE), and that every possible effort should be made to save lives. Another characteristic of this viewpoint is that the cost-effectiveness of end-of-life (EOL) treatments is considered less important: patient choices are respected even when costs exceed benefits. Wouters et al. (2017) called this the 'equal right to healthcare' perspective.

People who are matched to the second view, called 'limits to healthcare' (Wouters et al., 2017), are interested in delivering the right care to the right patients. According to them, it is not essential that everyone receive the same level of treatment. Life-extending treatment that results in a reduction in quality of life might be pointless, and death can be preferrable to treatments that prolong life briefly. Such individuals highlight the importance of prevention and believe that cost efficiency should not be the most important factor in healthcare decision making.

Individuals who adhere to the third view identified by Wouters et al. (2017), 'effective and efficient healthcare', believe that it is logical that the patients who would benefit the most from a treatment ought to be prioritised and that reimbursement decisions should reflect such considerations. Although cost is important, the effect of treatments should be measured by reference to quality of life rather than length. This group also prefer children over adults and believe that prioritisation decisions should be sensitive to lifestyle choices.

1.5 Thesis aim

Earlier literature showed that the burden of illness was a factor in societal views on health care prioritisation. However, it has not yet been investigated if age, in addition to burden of illness, is reflected in the societal viewpoints. It is hypothesized that by looking at age, equity can be better integrated into the current Dutch healthcare prioritisation policies. It is important that the prioritisation reflects the equity preferences of the society, because the mandate of policymakers is democratic (Brazier et al., 2013). Therefore, the results of this study can be of important social value.

It is desirable to investigate whether the current prioritisation of the Dutch healthcare system reflects societal views on equity principles. However, there are little suggestions on how to implement views on equity in the current healthcare systems. Moreover, these views were not yet linked to the monetary incentives of the respondents, in terms of willingness to pay.

This aim of this thesis is therefore to examine the relationship between **societal views on healthcare priority setting** and the **willingness to pay** for health gains, by looking at data from a **questionnaire about healthcare prioritisation** held in the Netherlands among 1,625 respondents. This questionnaire investigates the **willingness to pay** of the respondents.

This thesis has the following main question:

What is the relationship between the societal viewpoints formulated by Wouters et al. (2017) and the willingness to pay for health gains?

I will try to answer the main question by the following three steps:

1. Firstly, respondents will be matched with a particular viewpoint from Wouters et al. (2017).
2. Thereafter, the equity preferences of respondents will be investigated by looking at the willingness to pay.
3. Finally, I will investigate if these viewpoints are related to the willingness to pay.

1.5 Thesis structure

This thesis is structured in the following way. Firstly in chapter 2 the methods are described. In chapter 3 the results are set out. In chapter 4 the discussion is described. And lastly the conclusions can be found in chapter 5.

2. Method

2.1 Sample and data collection

The data were collected by means of a contingent valuation (CV) study. The questionnaire was designed and administered online in 2019 by Reckers-Droog et al. (2021). The sample (n = 1,625) is representative of the general adult population of the Netherlands in terms of age (18-75), sex and education level and there was a broad range in household income.

Before starting the questionnaire, the participants were informed that policymakers use information about societal preferences to allocate scarce healthcare resources between competing technologies and patient populations. When the participants finished the questionnaire, they would receive €0.50 or nominate a charity to receive that amount.

2.2 Questionnaire

The questionnaire was used to elicit the preferences of the participants and to match the respondents to one of three views. It consisted of four parts. Part 1 included questions about the personal characteristics and the health status of the respondents and questions that introduced them to the relevant concepts, such as quality of life (QOL; on a visual analogue scale (VAS) from 0-100), disease severity, in terms of disease-related QOL loss, and treatment-related QOL gain.

CV tasks are a method for determining the monetary valuations of the effects of healthcare interventions. In Part 1 of the questionnaire, the participants were introduced to these concepts and methods. They were asked to score their own QOL on the VAS and to perform the CV task from a personal perspective. In the subsequent parts, the participants had to execute the CV tasks from a socially-inclusive-personal (SIP) perspective**.** The SIP perspective is relevant to both individual and societal perspectives and their combined effect on WTP for health gains, as is the case in a collectively funded healthcare system such as that of the Netherlands (Bobinac et al., 2012; Dolan et al., 2003).

In Part 2, the CV tasks were used to elicit WTP for different QOL gains by presenting two scenarios (randomly selected out of a set of 20) to each respondent. The 20 scenarios, which feature different patient and disease characteristics, are listed in Table 1. In all scenarios, the respondents were told that if the patient had not developed the disease until the age of 80, they would have had perfect health (score 100 on the VAS). A treatment could be made available to all patients by increasing the basic monthly health insurance premium for all adults in the Netherlands for a year.

Table 1. Scenario characteristics

	Patient characteristics		Health gain QOL
Scenario	**Age (at onset of disease)**	**Severity (QOL before treatment)**	**Treatment-related QOL gain**
1	10	90	10
2	20	90	10
3	40	90	10
4	70	90	10
5	10	70	10
6	20	70	10
7	40	70	10
8	70	70	10
9	10	50	10
10	20	50	10
11	40	50	10
12	70	50	10
13	10	30	10
14	20	30	10
15	40	30	10
16	70	30	10
17	10	10	10
18	20	10	10
19	40	10	10
20	70	10	10

For example, Scenario 10 featured patients who developed a disease at the age of 20. As a result, their QOL dropped temporarily from 100 to 50. A treatment would increase their QOL during the course of the illness by 10 points. After a year, the patients would make a complete recovery (to a VAS score of 100), and the disease would not affect their LE. The 20 scenarios therefore do not entail EOL considerations. The participants had to quantify their WTP by evaluating a premium payment scale and indicating the maximum increase in monthly premium they would willing to pay in each scenario. They were asked to use their own household income as a reference point. Afterwards, they also answered the question of how certain they were of their WTP on a seven-point Likert scale (see Appendix 1 for an example).

If a respondent answered that they were willing to increase their premium by €0, they were asked to elaborate on this choice further in an open text field or by checking one of a set of options. If they said that they 'cannot afford more', that the 'treatment for these patients is not worth more for me', or with 'I believe the treatment is worth more than €0, but I would rather spend my money on something else' (or equivalent in the open text field), then their answers were categorised as true zero valuations. When the participants answered with 'I am against an increase in monthly basic health insurance premium', 'Patients should pay for the treatment themselves' or 'The value of health and healthcare cannot be expressed in monetary terms' (or equivalent in the open text field), their responses were categorised as protest zero valuations.

In Part 3, the participants were (randomly) allocated to five modules. Participants in each module were assigned to one of four choice sets at random. The severity level of the patient's disease was 50 (on the VAS) in all modules. The treatment-related health gain was 20 points for Module 1 and 50 points (i.e. back to full health) for Module 2. Modules 3 and 4 had the same distribution of treatment-related QOL (i.e. 20 points in Module 3 and 50 points in Module 4). However, in those scenarios, the patients died after a year. Therefore, these scenarios reflect an EOL situation. The outcomes in Module 1 and Module 2 reflect a non-EOL scenario. Consequently, the results can be compared to the results of Scenarios 9-12 from Part 2, in which QOL is the same before treatment. Only health gains differ, in that in Part 2, the health gain is 10 points. In Module 1 of Part 3, it is 20 points, and in Module 2 of Part 3, it is 50 points. The outcomes of Modules 1-4 were used to test for differences between EOL and non-EOL scenarios. It should be noted that 20% of the respondents were assigned to Module 5, which focuses on a question that is not relevant to the research.

Table 2. The four modules with all four choice sets

Module 1 (outcome: recovery) Scenario	Patient characteristics		Health gain QOL
	Age (at onset of disease)	Severity (QOL before treatment)	Treatment-related QOL gain
1	10	50	20
2	20	50	20
3	40	50	20
4	70	50	20

Module 2 (outcome: recovery) Scenario	Patient characteristics		Health gain QOL
	Age (at onset of disease)	Severity (QOL before treatment)	Treatment-related QOL gain
1	10	50	50
2	20	50	50
3	40	50	50
4	70	50	50

Module 3 (outcome: death) Scenario	Patient characteristics		Health gain QOL
	Age (at onset of disease)	Severity (QOL before treatment)	Treatment-related QOL gain
1	10	50	20
2	20	50	20
3	40	50	20
4	70	50	20

Module 4 (outcome: death) Scenario	Patient characteristics		Health gain QOL
	Age (at onset of disease)	Severity (QOL before treatment)	Treatment-related QOL gain
1	10	50	50
2	20	50	50
3	40	50	50
4	70	50	50

Part 4 includes questions about the respondents' socio-demographic characteristics as well as 14 statements. Reckers-Droog et al. (2021) selected these statements (four statements relating to each of the three views and two additional statements) from Wouters et al. (2017), based on the highest and most distinct factor scores. A statement was assigned to a view only if its factor score was higher for that view than for the others. If a respondent exhibits a high level of agreement with a statement that is highly correlated with one of the views, it can be assumed that they hold a similar view. The respondents had to assess and indicate their level of agreement with the 14 statements on a seven-point Likert scale. Table 3 presents an overview of the statements. The table also shows the mean (SD) level of agreement with each of the statements.

Table 3. Overview of statements used for matching respondents to one of three societal views on healthcare priority setting (*n* = 1,625)

View	#	Statement	Factor score[a]			Mean (SD)[b]
			F1	F2	F3	
Equal right to healthcare	1	If it is possible to save a life, every effort should be made to do so.	+3*	0	-2	5.34 (1.41)
	2	If there is a way of helping patients, it is morally wrong to deny them this treatment.	+3*	+1	+1	5.34 (1.40)
	3	It's important to respect the wishes of patients who feel they should take every opportunity to extend their life.	+1*	-3	-1	5.09 (1.28)
	4	Patient characteristics other than their health should play no role in prioritising care.	+3*	0	-1	5.17 (1.44)
Limits to healthcare	5	At the end of life, it is more important to provide a death with dignity than treatments that will only extend life for a short period of time.	+2	+4*	+2	5.25 (1.38)
	6	People should accept that if it's your time to die, it's your time to die.	0	+3*	0	4.81 (1.51)
	7	People who are in some way responsible for their own illness should receive lower priority than people who are ill through no fault of their own.	-2	+2*	0	3.99 (1.65)
	8	There is no sense in saving lives if the quality of those lives will be really bad.	0	+4*	-2	4.44 (1.60)
Effective and efficient healthcare	9	Children's health should be given priority over adults' health.	-1*	-3*	+4*	4.40 (1.52)
	10	Priority should be given to patients who benefit most from treatment priority.	-1*	+1*	+4*	4.55 (1.50)
	11	Priority should be given to those treatments that generate the most health.	+1	+1	+3*	4.79 (1.51)
	12	Treatments that are very costly in relation to their health benefits should be withheld.	-2*	0*	+1*	3.47 (1.63)
Additional statements	13	Treating people at the end of life is important, even if it is not going to result in big health gains.	+1*	-1	-3	4.98(1.41)
	14	Treating terminally ill patients as more 'worthy' of receiving care undervalues the health of other patients.	0*	-1*	+1*	3.70 (1.58)

a) Factor scores and *p*-values are extracted from Wouters et al. (2015); factor scores range from -4 (strongest disagreement) to +4 (strongest agreement)
**p*-value < 0.01; F1 relates to the view 'equal right to healthcare', F2 to the view 'limits to healthcare', and F3 to the view 'effective and efficient healthcare'.
b) Respondents' mean (SD) level of agreement with the statements, expressed on a seven-point Likert scale ranging from 1 ('completely disagree') to 7 ('completely agree').

2.3 Analyses

In order to optimise the data, the consistent outliers (95th centile), speeders (respondents who completed the three tasks too quickly as determined by a timed test of independent researchers, that is, in less than 90 seconds) and the protest and true zero valuations were identified. Consistent outliers, speeders and protest zeros are excluded from all analyses. True zero valuations were included.

The next step was to match the respondents to one of the societal views on healthcare scarcity in the Netherlands described by Wouters et al. (2017). The methodology of Reckers-Droog et al. (2018) was applied, using the answers to the statements in Part 4 of the questionnaire. The respondents' levels of agreement with the four statements were summed for each of the three views (i.e. a review of the first 12 statements). For ease of interpretation, they were rescaled to a 0-10 scale. Next, respondents were matched to the view with the highest summed score on condition that it was above 5.0, which indicates agreement. When two or three views received an equal highest sum score, the levels of agreement with Statement 13 and Statement 14 (see Table 3) were used to determine, if possible, the best match. The results of the distribution of viewpoints amongst respondents have also been visualised in a pie chart (Figure 1.0).

As a first step in the analysis, the demographic and background characteristics of the sample are demonstrated, excluding outliers, speeders and protest zero valuations. Both the means and the percentages of the total are shown (Table 4). Subsequently, the differences in characteristics between respondents with different views and between respondents who could and could not be matched to views were examined through the Chi-2 or one-way ANOVA test, where a pairwise comparison of means with equal variances is used to determine the pairs of views for which the difference is significant. Differences in socio-demographic characteristics and protest valuations between respondents with different viewpoints have been demonstrated.

The raw mean (SD; 95% CI) WTP for QOL gains was calculated for all scenarios. The difference in raw means (SE; 95% CI) between the WTP for similarly sized health gains in patients who recovered fully and patients who died one year after falling ill was also calculated. To determine whether this difference is significantly different from 0, I first tested the difference in variance between each pair of samples. If the variances were equal, I used a regular two-tailed t-test. If the variances were (significantly) unequal, I would use a two-tailed Welch's t-test.

Finally, random-effects generalised least squares (GLS) and ordinary least squares (OLS) models were developed to examine the relationship between WTP (in different scenarios) and societal views, using demographic characteristics such as age, sex, household income, education, respondent QOL and having children as control variables. In each model that includes Part 2 of the questionnaire, it is necessary to use the GLS regression, which takes into account the differences in variance (heteroscedastic) in the observations. The use of a GLS regression is appropriate because there were multiple observations per respondent, and errors could have been correlated. In Part 3 of the

questionnaire, there was only one observation per respondent. An OLS regression is adequate for those models. The random effect had to be incorporated because it corrects for the possibility that there is a difference in individual effects while the effect within the respondent group is similar.

A total of 12 models were constructed. The first four are based on the data obtained from Part 2 of the questionnaire and included the scenario characteristics 'disease severity' and 'age of patient' as well as their interaction effect. Model 1 and Model 2 replicate the models that are construed in Reckers-Droog et al. (2021). Model 3 and Model 4 build further on the replicated models by including the effect of the societal viewpoints. Models 5-8 are based on the data obtained from Part 3 of questionnaire and include the scenario characteristics 'age of patients', 'size of QOL gains' (measured in points on the VAS), and 'disease outcome' (full recovery or death a year after falling ill). Model 5 and Model 6 again reproduce the output of Reckers-Droog et al. (2021). Model 7 and Model 8 build further on Model 5 and 6, by including the effect of the societal viewpoints. Models 9-12 are based on the data from all scenarios, combining Part 2 and Part 3 of the questionnaire, and therefore include the interactions between 'disease severity', 'age of patient', 'size of QOL gains' and 'disease outcome'. Model 9 and Model 10 are again replications of Reckers-Droog et al. (2021). Model 11 and Model 12 additionally include the effect of the societal viewpoints.

The description of the views in Wouters et al. (2017) were used to formulate four hypotheses about the relationship between views and preferences regarding healthcare priority setting:

- Hypothesis 1: Respondents who hold the view 'equal right to healthcare' have a higher WTP.
- Hypothesis 2: The view 'limits to healthcare' is associated with a higher WTP for younger patients and for larger QOL gains.
- Hypothesis 3: The view 'effective and efficient healthcare' is negatively associated with respondents' WTP in all scenarios.
- Hypothesis 4: All three views have a lower WTP for patients in an end-of-life scenario, compared to a non-end-of-life scenario.

Stata v16 (Stata Corp LP, College station, Texas) was used to perform the analyses.

3. Results

Table 4 presents the descriptive statistics and the distribution of the views in the sample (n = 1,035) that remained after the exclusion of consistent protest zero valuations (n = 58), consistent WTP outliers with a 5% threshold (n = 51) and speeders (n = 433). Among the speeders, 34 also supplied protest zero valuations and 14 supplied an outlying WTP. The statistics indicate that the sample is representative of the Dutch public in terms of sex, education and age. This said, the respondents who were sampled were frequently women, less educated and somewhat older. Notably, the average QOL of the participants was relatively high (81.7 on a scale from 0-100), and approximately a quarter lived alone.

This table also provides the distribution of societal views in the sample. Most participants (94.7%) were matched to a viewpoint. A minority of respondents (5.3%) could not be matched to one of the viewpoints, based on the levels of agreements for all of the statements. Most respondents (60.5%) held the view 'equal rights to healthcare', 24.7% subscribed to 'limits to healthcare', and the smallest group, 9.5%, believed in 'effective and efficient healthcare'. Figure 1 presents these findings in visual form.

Figure 1. Distribution of viewpoints amongst respondents

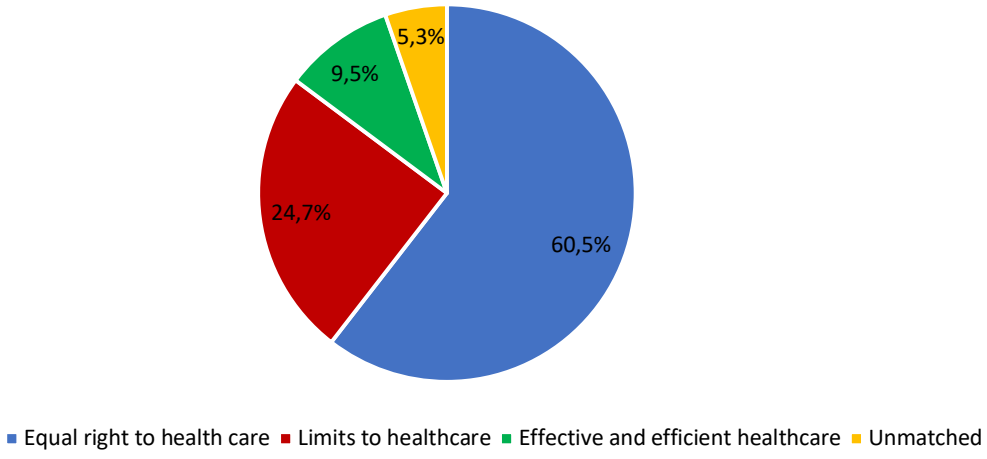

Table 4. Sample characteristics

	Sample (n = 1,035)[a]		General public[b]	
	%	Mean (SD)	%	Mean
Age (years)		50.9 (15.8)		46.1
Sex (male)	47.8		49.7	
Education[c] (level)				
Low	26.1		8.6	
Medium	43.8		57.4	
High	30.1		32.5	
Living situation				
Alone	25.8			
With 2	43.9			
3 or more	31.3			
Household income				
< €2,000	32.0			
€2,000 - €4,500	42.1			
≥ €4,500	20.5			
Not stated	5.4			
Children (yes)	59.2			
QOL (0-100 VAS)		81.7 (16.7)		
View on healthcare priority				
'Equal right to healthcare'	60.5			
'Limits to healthcare'	24.7			
'Effective and efficient healthcare'	9.5			
Not matched	5.3			
Completion time of CV tasks (minutes)		6.3 (30.9)		

CV: contingent valuation; QOL: health-related quality of life; VAS: visual analogue scale (ranging from 0 ('death') to 100 ('full health')); a) Consistent protest zero valuations (n = 58), outliers (n = 51), speeders (n = 433) and respondents who met more than one exclusion criterion (n = 48) are excluded from the table; b) Age is based on statistics for populations aged 18-75, sex is based on statistics for the overall population, education level is based on statistics for population aged 15-75. Populations statistics for 2019, source: Statistics Netherlands (https://opendata.cbs.nl/statline); c) Low: lower vocational and primary school, medium: middle vocational and secondary school, high: higher vocational and academic education.

Table 5. Views on healthcare priority – characteristics (*n* = 1,144)[a]

	'Equal right to healthcare' (*n* = 699)		'Limits to healthcare' (*n* = 283)		'Effective and efficient healthcare' (*n* = 104)		Not matched (*n* = 58)	
	%	**Mean (SD)**	**%**	**Mean (SD)**	**%**	**Mean (SD)**	**%**	**Mean (SD)**
Age (years)[b]		51.7 (15.4)		51.9 (15.6)		45.6*** (17.9)		47.4 (15.2)
Sex (male)[c]	44.1**		53.4		57.7		51.7	
Education[d] (level)								
Low	30.5***		18.0		20.2		31.0	
Medium	47.4***		38.9		32.7		36.2	
High	22.2***		43.1		47.1		32.8	
Living situation								
Alone	25.2		27.6		22.1		32.8	
With 2	44.4		44.5		38.5		37.9	
3 or more	30.5		27.9		39.4		29.3	
Household income								
< €2,000	34.2		28.6		30.8		29.3	
€2,000 - €4,500	43.2		38.9		35.6		36.2	
≥ €4,500	17.5		27.9		30.8		19.0	
Not stated	5.2		4.6		2.9		15.5	
Children (Yes)	62.1		53.7		59.6		51.7	
QOL (0-100 VAS)		81.2 (16.8)		81.8 (16.9)		83.3 (15.2)		83.2 (17.8)
Protest zero valuations	5.4		5.0		3.9		3.5	

QOL: health-related quality of life; VAS: visual analogue scale (ranging from 0 ('death') to 100 ('full health')); a) excluding speeders, b) age is based on statistics for populations aged 18-75, c) sex is based on statistics for the overall population d) education level is based on statistics for population aged 15-75 (low: lower vocational and primary school, medium: middle vocational and secondary school, high: higher vacation and academic education). Populations statistics for 2019, source: Statistics Netherlands (https://opendata.cbs.nl/statline).
** $p < 0.05$, *** $p < 0.01$

Table 5 presents the characteristics of the sample (n = 1,144), with speeders excluded. The proportions and raw means (SD) are presented and classified by view (including the respondents who could not be matched). Asterisks indicate significant differences from the other two views. The results indicate that the respondents who held the view 'equal right to healthcare' were more likely to be women (the mean is statistically different from the other views at the 0.05 level), had a relatively low level of education ($p < 0.01$) and also tended to have children (significantly more than respondents who held the second view, at the 0.10 level, but the difference with the third view is not significant at $p > 0.10$). Respondents who were matched to the view 'limits to healthcare' mostly had a medium or high education level and a higher household income, although the means for those variables are not statistically different from those for the other views ($p > 0.10$). The respondents who held the view 'effective and efficient healthcare' had the lowest average age (45.6 years; statistically significant difference at the 0.01 level) and were mostly men (statistically different from respondents who held the first view at the 0.01 level, but no statistical difference with respondents who held the second view). Unmatched respondents were more likely to live alone and were the least likely to have children, although these differences are not statistically significant ($p > 0.10$). All respondents had relatively high health-related QOL scores (mean above 80).

Table 6. Raw mean (SD; 95% CI) WTP for QOL gains of 10 points in patients who recover fully one year after falling ill (in €)[a]

	Severity[b]											
	10		30		50		70		90		Average	
Age[c]	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	Mean (SD; 95% CI)	
10	112	8.1 (7.1; 6.8, 9.4)	97	8.1 (6.9; 6.8, 9.5)	116	8.6 (6.8; 7.4, 9.8)	108	9.0 (7.7; 7.6, 10.5)	89	8.6 (7.8; 6.9, 10.2)	8.5 (7.2; 7.9, 9.1)	
20	102	6.8 (6.3; 5.5, 8.0)	89	7.4 (6.6; 6.1, 8.8)	102	7.6 (7.3; 6.2, 9.0)	104	9.4 (8.2; 7.8, 11.0)	88	8.9 (7.5; 7.3, 10.4)	8.0 (7.3; 7.4, 8.7)	
40	92	6.5 (6.8; 5.1, 7.9)	91	9.1 (6.8; 7.7, 10.5)	98	8.3 (6.6; 7.0, 9.6)	111	8.1 (6.5; 6.8, 9.3)	91	7.8 (6.8; 6.4, 9.2)	8.0 (6.7; 7.4, 8.6)	
70	95	7.4 (7.7; 5.9, 9.0)	99	8.2 (6.7; 6.8, 9.5)	105	7.6 (7.4; 6.1, 9.0)	84	7.0 (6.1; 5.7, 8.4)	103	8.2 (6.3; 7.0, 9.5)	7.7 (6.9; 7.1, 8.3)	
Average		7.2 (7.0; 6.5, 7.9)		8.2 (6.8; 7.5, 8.9)		8.0 (7.0; 7.4, 8.7)		8.5 (7.2; 7.8, 9.2)		8.3 (7.1; 7.6, 9.1)	8.1 (7.0; 7.7, 8.4)	

QOL: health-related quality of life (measured in points on a visual analogue scale (VAS), ranging from 0 ('dead') to 100 ('full health')); WTP: willingness to pay (in € per month for a year); a) Respondents with protest zero valuations, an outlying WTP (≥ €40.00) and speeders are excluded from this table. In the scenarios, the groups consist of 10,000 patients who recover fully one year after falling ill. The treatment-related QOL gain is 10 points, measured on the VAS; b) Severity is operationalised in terms of disease-related QOL loss and measured in points out of 100 on the VAS; c) Age at onset of disease (in years).

Figure 2. Raw mean WTP for QOL gains of 10 points in patients who recover fully one year after falling ill (in €)

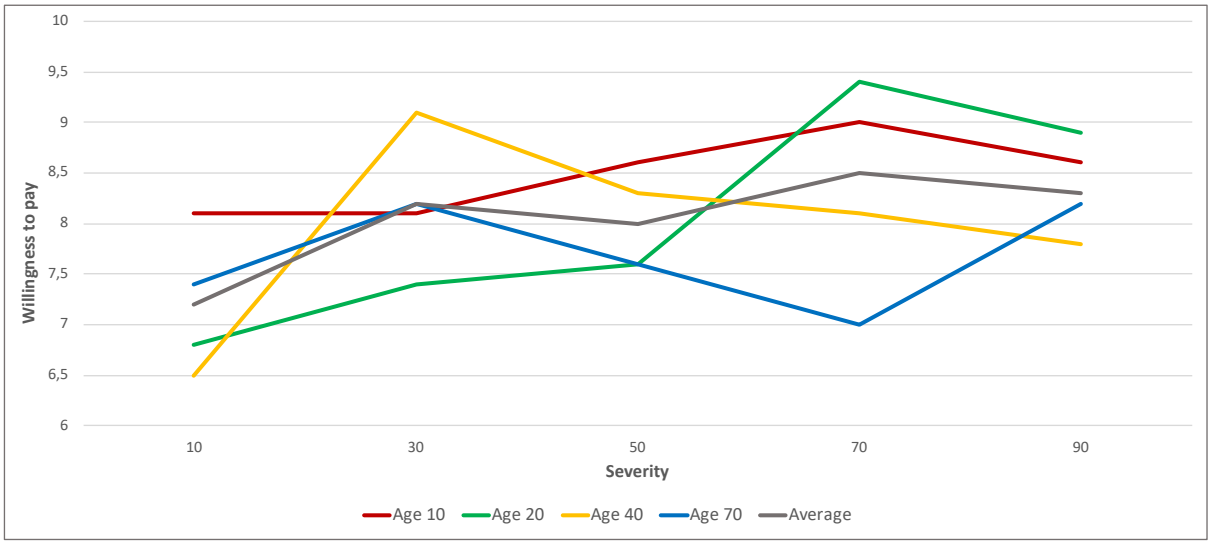

Table 6 shows the raw means (SD; 95% CI) of WTP in € for QOL gains of 10 points in patients who recover fully one year after falling ill. On average, WTP was €8.1 per month for a year. Average WTP was relatively higher for younger patients, at €8.50 for 10-year-old patients, and relatively low, at €7.70, for 70-year-old patients. At €7.20, average WTP was comparatively low for patients with less severe diseases. In contrast, WTP for severely ill patients was above €8.0. Patients with a severity level of 70 benefitted from the highest average WTP, €8.50. Figure 2 also shows that a lower WTP was predicted for less severely ill patients than for those with more severe illnesses and that WTP was higher for young patients than for older ones.

Table 7. Raw mean (SD; 95% CI) WTP for QOL gains in patients who recover fully and for patients who die one year after falling ill (in €)[a]

		Disease outcome after one year after falling ill										
		Full recovery						Death			Difference	
		Part 2 10 points		Module 1 20 points		Module 2 50 points		Module 3 20 points		Module 4 50 points	Module 3 – 1 20 points	Module 4 – 2 50 points
Age[b]	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	*n*	Mean (SD; 95% CI)	Δ Mean (SE; 95% CI)	Δ Mean (SE; 95% CI)
10	116	8.6 (6.8; 7.4, 9.8)	66	8.5 (6.1; 7.0, 10.0)	59	10.4 (11.0; 7.6, 13.3)	61	7.5 (6.2; 5.9, 9.1)	71	9.8 (6.7; 8.2; 11.4)	-1.0 (1.1; -3.2, 1.2)	-0.6 (1.6; -3,9, 2.6)
20	102	7.6 (7.3; 6.2, 9.0)	61	8.9 (7.1; 7.1, 10.8)	66	12.3 (12.9; 9.2, 15.5)	57	9.7 (7.4; 7.7, 11.6)	64	7.8 (6.2; 6.3, 9.4)	0.7 (1.3; -1.9, 3.4)	-4.5** (1.8; -8.0, -1.0)
40	98	8.3 (6.6; 7.0, 9.6)	61	7.4 (5.8; 5.9, 8.9)	61	10.1 (10.1; 7.5, 12.6)	59	7.9 (7.5; 6.0, 9.9)	61	8.9 (8.1; 6.8, 10.9)	0.6 (1.2; -1.9, 3.0)	-1.2 (1.7; -4.5, 2.1)
70	105	7.6 (7.4; 6.1, 9.0)	54	7.5 (6.4; 5.7, 9.2)	68	8.6 (9.4; 6.3, 10.8)	61	5.6 (5.1; 4.2, 6.9)	60	8.0 (6.9; 6.2, 9.8)	-1.9* (1.1; -4.0, 0.2)	-0.6 (1.4; -3.4, 2.3)

QO:, health-related quality of life (measured in points on a visual analogue scale (VAS), ranging from 0 ('dead') to 100 ('full health')); WTP: willingness to pay (in € per month for a year). a) Respondents with (consistent) protest zero valuations, an outlying WTP ≥ €40.00 in Part 2, ≥ €26.50 in Module 1, ≥ €63.00 in Module 2, ≥ €50.00 in Module 3, ≥ €32.80 in Module 4) and speeders are excluded from this table. The respondents evaluated a group consisting of 10,000 patients with a severity level of 50 points on the VAS; b) Age at onset of disease (in years).
* $p < 0.10$, ** $p < 0.05$.

Figure 3. Raw mean (SD; 95% CI) WTP for QOL gains in patients who recover fully and for patients who die one year after falling ill (in €)

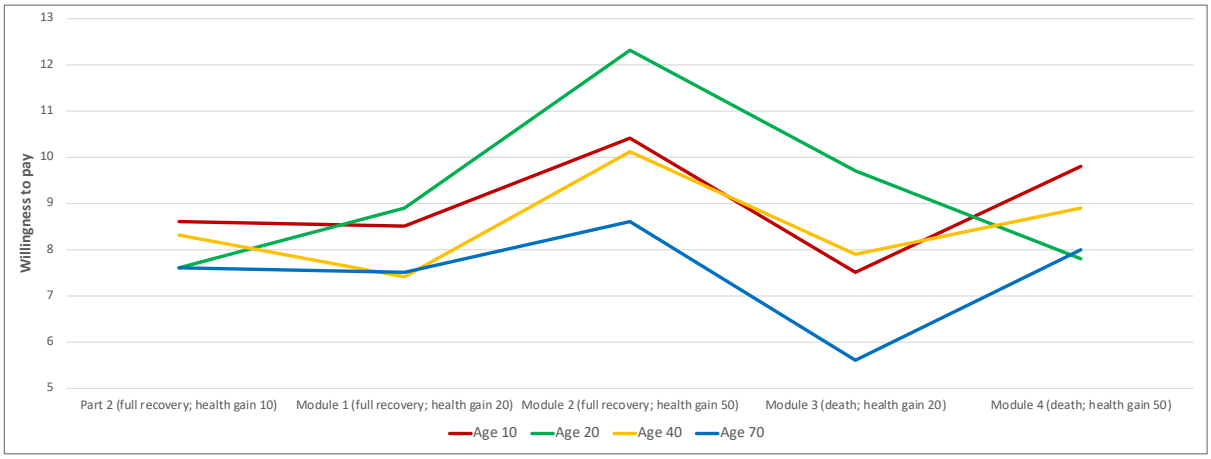

Table 7 presents the raw means (SD; 95% CI) of WTP for QOL gains of 20 and 50 points for patients with a severity level of 50 who recover fully and for patients who die one year after falling ill (presented with the WTP for a QOL gain of 10 points for patients with severity level 50 who recover fully a year after falling ill from Table 6 to enable comparison). The results of the comparison between Module 2 and Module 4 indicate that WTP for patients in Module 2, with the outcome 'full recovery', was higher. In Module 3 and Module 4, with the outcome 'death', the respondents demonstrated lower WTP for patients who were 70 years old than for patients who were younger. Most differences were not statistically significant, except for 20-year-old patients, where WTP for a 50-point QOL gain was significantly higher for patients who would recover fully (€12.3) than for patients who would die (€7.8). This difference in means is significant at the 0.05 level. Moreover, for the 70-year-old patients, the difference in mean WTP for a QOL gain of 20 points was significantly lower if the patient would die (at the 0.1 level). Notably, Table 7 is presenting the same output for the modules 1-4 and their difference as in Reckers-Droog et al. (2021), because the same sample is used for the analyses. Figure 3 shows that WTP was generally highest for a QOL gain of 50 points, provided that the patient would recover, and it was lowest for a QOL gain of 20 points if the patient would die.

Table 8. Regression results[a]

DV: WTP	**Model 1[b]**		**Model 2[b]**		**Model 3[b]**		**Model 4[b]**	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
Severity[c] (10 = reference)								
30	0.63** (0.27)	0.10, 1.15	0.24 (0.53)	-0.81, 1.27	0.62** (0.27)	0.10, 1.14	0.65** (0.27)	0.13, 1.18
50	1.08*** (0.27)	0.55, 1.61	0.62 (0.57)	-0.50, 1.75	1.08*** (0.27)	0.55, 1.61	1.09*** (0.27)	0.56, 1.63
70	1.20*** (0.26)	0.69, 1.72	0.35 (0.53)	-0.68, 1.39	1.20*** (0.26)	0.68, 1.72	1.21*** (0.26)	0.70, 1.73
90	1.08*** (0.32)	0.46,1.70	0.11 (0.57)	-1.00, 1.23	1.08*** (0.35)	0.46, 1.70	1.11*** (0.32)	0.50, 1.73
Age[d] (10 = reference)								
20	-0.46* (0.24)	-0.94, 0.01	-1.37*** (0.48)	-2.31, -0.44	-0.47* (0.24)	-0.95, 0.01	-0.48** (0.24)	-0.96, -0.00
40	-0.34 (0.24)	-0.81, 0.14	-1.54*** (0.54)	-2.58, -0.49	-0.33 (0.24)	-0.81, 0.14	-0.35 (0.24)	-0.82, 0.12
70	-0.84*** (0.25)	-1.34, -0.35	-0.67 (0.59)	-1.82, 0.48	-0.85*** (0.25)	-1.35, -0.35	-0.87*** (0.25)	-1.37, -0.37
CV task	-0.84*** (0.13)	-1.09, -0.58	-0.81***(0.13)	-1.06, -0.56	-0.84*** (0.13)	-1.09, -0.58	-0.84*** (0.13)	-1.09, -0.58
Severity * Age (Severity 10; Age 10 = reference)								
30*20			0.78 (0.66)	-0.51, 2.06				
30*40			1.49** (0.75)	0.01, 2.79				
30*70			-0.87 (0.80)	-2.44, 0.70				
50*20			0.69 (0.71)	-0.70, 2.09				
50*40			1.43* (0.81)	-0.15, 3.01				
50*70			-0.44 (0.86)	-2.13, 1.25				
70*20			1.36** (0.69)	0.01, 2.70				
70*40			1.56** (0.71)	0.16, 2.95				
70*70			0.37 (0.79)	-1.18, 1.92				
90*20			1.93** (0.79)	0.38, 3.49				
90*40			1.55** (0.77)	0.03, 3.06				
90*70			0.35 (0.82)	-1.26, 1.69				

	Model 1 (cont'd)		Model 2 (cont'd)		Model 3 (cont'd)		Model 4 (cont'd)	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
View (unmatched = reference)								
'Equal right to healthcare'					0.38 (0.67)	-0.94, 1.70	0.40 (0.68)	-0.92, 1.73
'Limits to healthcare'					0.17 (0.75)	-1.30, 1.63	-0.18 (0.75)	-1.65, 1.29
'Effective and efficient healthcare'					1.57* (0.88)	-0.15, 3.30	1.10 (0.88)	-0.63, 2.83
Age (of respondents)							-0.01 (0.01)	-0.03, 0.2
Sex (Female = reference)							1.32*** (0.41)	0.52, 2.12
Education (low = reference)								
Medium							0.67 (0.59)	-0.49, 1.83
High							0.87 (0.72)	-0.54, 2.28
Income (< €2,000 = reference)								
€2,000 - €4,500							1.49*** (0.46)	0.59, 2.40
≥ €4,500							2.38*** (0.63)	1.15, 3.61
Not stated							1.48* (0.90)	-0.27, 3.24
Children (yes = reference)							-0.02 (0.44)	-0.88, 0.83
QOL (0-100 VAS)							0.02** (0.01)	0.00, 0.04
Constant	9.37*** (0.36)	8.66, 10.08	9.85*** (0.46)	8.95, 10.74	8.95*** (0.70)	7.58, 10.31	4.98*** (1.42)	2.19, 7.76
R^2 overall	0.006		0.008		0.009		0.045	
n (observations; groups)	2,358; 1,226		2,358; 1,226		2,358; 1,226		2,358; 1,226	

CV: contingent valuation; DV: dependent variable; QOL: health-related quality of life; VAS: visual analogue scale (ranging from 0 ('dead') to 100 ('full health')); WTP: willingness to pay (in € per month for a year); a) Models 1-4 are based on the data obtained from Part 2 of the questionnaire. Observations with an outlying WTP (≥ €40.00), speeders and (consistent) protesters are excluded from this table; b) Severity and age coefficients cannot be compared directly between the models. In Model 1, Model 3 and Model 4, these coefficients represent main effects, and in Model 2, they represent conditional effects; c) Severity is operationalised in terms of disease-related QOL loss and measured in points out of 100 on the VAS; d) Age at onset of disease (in years).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8 presents the regression results from the data obtained from Part 2 of the questionnaire. The results indicate that severity and age at the onset of the disease were important predictors of WTP. Those characteristics are significant in all models, either as a main effect (Model 1, Model 3 and Model 4) or as a conditional effect, as captured by the interaction effect. The effect remains consistent even once respondent characteristics are added to the model. For example, for a severity level of 50, Model 1 predicts a β of 1.08, and Model 4 a β of 1.09. For an age of 70, Model 1 predicts a β of -0.84, and Model 4 a β of -0.87. In general, WTP increased with severity. However, WTP was relatively lower for patients with a severity level of 90. The interaction between disease severity and age indicates that, in some scenarios, respondents' WTP at different levels of severity depended on age. When patients were aged 40, respondents' WTP was, *ceteris paribus*, higher for severity levels that exceeded 30 (Model 2: β between 1.43 and 1.56) than for a severity level of 10.

In terms of respondent characteristics, sex was a significant ($p < 0.01$) predictor of WTP in Model 4 (and also in Model 8 and Model 12). Men were willing to pay more than women. Household income had a significant effect on WTP: the higher a respondent's income, the more willing they were to pay. In Model 3, the view 'effective and efficient healthcare' was associated with a higher WTP (significant at the 0.10 level). However, after respondent characteristics were added in Model 4, the view in question was no longer significantly associated with a higher WTP. One implication is that the characteristics are, *ceteris paribus*, a stronger predictor of WTP.

The results provide no evidence for the hypotheses that link particular viewpoints to WTP, although they provide preliminary support for conclusion that the view 'effective and efficient healthcare' is not negatively associated with the respondents' WTP, that is, that Hypothesis 3 ought to be rejected.

Table 9. Regression results[a]

DV: WTP	**Model 5[b]**		**Model 6[b]**		**Model 7[b]**		**Model 8[b]**	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
QOL gain (20 points = reference)								
50 points	1.53*** (0.45)	0.65, 2.42	2.19** (0.92)	0.38, 4.01	1.57*** (0.44)	0.69, 2.45	1.69*** (0.44)	0.83, 2.56
Age[c] (10 = reference)								
20	0.30 (0.65)	-0.97, 1.58	1.49 (0.98)	-0.44, 3.41	0.31 (0.65)	-0.96, 1.59	0.32 (0.63)	-0.92, 1.55
40	-0.29 (0.64)	-1.55, 0.96	-0.28 (0.94)	-2.13, 1.57	-0.24 (0.64)	-1.49, 1.00	-0.26 (0.62)	-1.48, 0.95
70	-1.66** (0.61)	-2.87, -0.46	-1.28 (0.95)	-3.14, 0.58	-1.62*** (0.61)	-2.82, -0.42	-1.80*** (0.60)	-2.97, -0.63
Death (Full recovery = reference) [d]	-0.73 (0.45)	-1.61, 0.16	-0.60 (0.92)	-2.41, 1.20	-0.65 (0.45)	-1.54, 0.24	-0.73 (0.45)	-1.61, 0.14
QOL gain * Age (QOL gain 20 points; Age 10 = reference)								
50 points*20			-1.87 (1.31)	-4.45, 0.72				
50 points*40			-0.25 (1.31)	-2.80, 2.30				
50 points*70			-0.52 (1.24)	-2.96, 1.91				
Death * Age (Full recovery; Age 10 = reference								
Death*20			-0.49 (1.32)	-3.07, 2.10				
Death*40			0.20 (1.29)	-2.34, 2.74				
Death*70			-0.26 (1.25)	-2.71, 2.19				
View (unmatched = reference)								
'Equal right to healthcare'					0.08 (0.79)	-1.46, 1.62	0.09 (0.76)	-1.41, 1.58
'Limits to healthcare'					-0.82 (0.86)	-2.51, 0.86	-1.21 (0.83)	-2.84, 0.43
'Effective and efficient healthcare'					1.68 (1.04)	-0.36, 3.72	0.97 (1.03)	-1.04, 2.99
Age (of respondents)							-0.02 (0.02)	-0.05, 0.01
Sex (Female = reference)							1.70*** (0.46)	0.80, 2.59
Education (low = reference)								
Medium							0.55 (0.71)	-0.84, 1.95
High							0.48 (0.83)	-1.15, 2.10

DV: WTP	**Model 5 (cont'd)**		**Model 6 (cont'd)**		**Model 7 (cont'd)**		**Model 8 (cont'd)**	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
Income (< €2,000 = reference)								
€2,000 - €4,500							2.43*** (0.53)	1.39, 3.46
≥ €4,500							3.47*** (0.69)	2.11, 4.85
Not stated							0.89 (0.85)	-0.78, 2.56
Children (yes = reference)							0.57 (0.53)	-0.47, 1.61
QOL (0-100 VAS)							0.03** (0.01)	0.01, 0.05
Constant	8.92*** (0.51)	7.91, 9.92	8.53*** (0.65)	7.25, 9.81	8.81*** (0.87)	7.10, 3.72	4.31** (1.75)	0.87, 7.47
R^2	0.021		0.024		0.029		0.085	
n (observations)	1,172		1,172		1,172		1,172	

DV: dependent variable; QOL: health-related quality of life; VAS: visual analogue scale (ranging from 0 ('dead') to 100 ('full health')); WTP: willingness to pay (in € per month for a year); a) Models 5-8 are based on the data obtained from Part 3 of the questionnaire. Observations with an outlying WTP (≥ €25.00 in Module 1, ≥ €60.00 in Module 2, ≥ €50.00 in Module 3 and ≥ €34.00 in Module 4), speeders and (consistent) protesters are excluded from this table; b) Age, QOL gain and death coefficients cannot be compared directly between the models. In Model 5, Model 7 and Model 8, these coefficients represent main effects; in Model 6, they represent conditional effects; c) Age at onset of disease (in years); d) Disease outcome one year after falling ill.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9 presents the regression results from the data obtained from Part 3 of the questionnaire. The results of the regression indicate that a QOL gain of 50 (rather than 20) points was an important predictor, *ceteris paribus*, of higher WTP. The variable was significant as a main effect in all models (β between 1.53 and 2.19) except Model 6, where QOL gains interact with the effect of age. In all models, WTP for a patient aged 70 was lower. This effect was significant at the 0.05 level in all models except Model 6. The estimate in Model 5 is a β of -1.66. In Model 7, it is a β of -1.62, and in Model 7, it is a β of -1.80. Model 8 shows that sex (a β of 1.70 for men), income (a β of 2.43 for middle incomes and 3.47 for the highest ones) and the health status of the respondent (QOL) were positively related to WTP (β of 0.02). WTP for the 'death' outcome was lower in all models, although the effect is not significant in any of them. These results are consistent with Hypothesis 4, but they do not prove it conclusively.

Model 7 and Model 8 indicate that societal views do not affect WTP significantly. This said, the WTP of respondents who held the view 'limits to healthcare' was generally lower (a β of -0.82 in Model 7 and -1.21 in Model 8), and the WTP of respondents who believed in 'effective and efficient healthcare' was higher (a β of 1.68 in Model 7 and 0.97 in Model 8). Respondents who held the view 'equal right to healthcare' were almost indifferent in their WTP (β close to 0). The three conclusions are not consistent with the corresponding hypotheses (1, 2 and 3).

Table 10. Regression results[a]

DV: WTP	**Model 9[b]**		**Model 10[b]**		**Model 11[b]**		**Model 12[b]**	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
Severity[c] (10 = reference)								
30	0.66** (0.27)	0.14, 1.19	0.09 (0.50)	-0.90, 1.08	0.66**	0.13, 1.19	0.69** (0.27)	0.15,1.21
50	1.17*** (0.27)	0.64, 1.70	0.54 (0.52)	-0.47, 1.56	1.17***	0.64, 1.70	1.17*** (0.27)	0.64, 1.70
70	1.14*** (0.26)	0.64, 1.65	0.30 (0.49)	-0.66, 1.25	1.14***	0.65, 1.65	1.15*** (0.26)	0.65, 1.66
90	1.31*** (0.29)	0.74, 1.88	0.16 (0.53)	-0.88, 1.21	1.31***	0.73, 1.88	1.33*** (0.29)	0.75, 1.90
Age[d] (10 = reference)								
20	-0.20 (0.22)	-0.62, 0.23	-1.60*** (0.49)	-2.57, -0.64	-0.20	-0.62, 0.23	-0.21 (0.22)	-0.63, 0.21
40	-0.32 (0.21)	-0.72, 0.09	-1.56*** (0.54)	-2.61, -0.50	-0.31	-0.72, 0.09	-0.32 (0.21)	-0.72, 0.08
70	-1.11*** (0.22)	-1.53, -0.68	-0.71 (0.58)	-1.84, 0.43	-1.10***	-1.53, -0.68	-1.12*** (0.22)	-1.55, -0.70
QOL gain (10 points = reference)								
20 points	1.19*** (0.31)	0.59, 1.79	0.79 (0.54)	-0.27, 1.85	1.18***	0.59, 1.78	1.19*** (0.31)	0.59, 1.78
50 points	2.44*** (0.35)	1.75, 3.12	2.79*** (0.68)	1.45, 4.13	2.44***	1.75, 3.12	2.46 *** (0.35)	1.77, 3.15
Death (Full recovery = reference) [e]	-0.57** (0.29)	-1.14, -0.01	-0.41 (0.61)	-1.60, 0.78	-0.57**	-1.13, -0.01	-0.58** (0.29)	-1.14, -0.02
CV task	-0.86*** (0.13)	-1.12, -0.61	-0.85*** (0.13)	-1.10, -0.59	-0.86***	-1.12, -0.61	-0.86*** (0.13)	-1.12, -0.61
Severity * Age (Severity 10; Age 10 = reference)								
30*20			1.33** (0.66)	0.03, 2.62				
30*40			1.46* (0.76)	-0.03, 2.97				
30*70			-0.71 (0.77)	-2.22, 0.80				
50*20			1.25* (0.69)	-0.11, 2.60				
50*40			1.52** (0.78)	0.01, 3.02				
50*70			-0.42 (0.82)	-2.02, 1.17				
70*20			1.89*** (0.68)	0.56, 3.22				
70*40			1.43** (0.68)	0.09, 2.77				
70*70			-0.01 (0.75)	-1.48, 1.46				
90*20			2.19*** (0.80)	0.61, 3.76				
90*40			1.94** (0.76)	0.44, 3.44				

DV: WTP	Model 9 (cont'd)		Model 10 (cont'd)		Model 11 (cont'd)		Model 12 (cont'd)	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
90*70			0.35 (0.79)	-1.20, 1.91				
QOL gain * Age (QOL gain 10 points; Age 10 = reference)								
20 points*20			1.47* (0.77)	-0.04, 2.98				
20 points*40			0.06 (0.77)	-1.44, 1.57				
20 points*70			-0.00 (0.79)	-1.55, 1.54				
50 points*20			-0.58 (0.98)	-2.49, 1.34				
50 points*40			-0.71 (0.92)	-2.51, 1.09				
50 points*70			-0.16 (0.89)	-1.91, 1.58				
Death * Age (Full recovery; Age 10 = reference								
Death*20			-0.10 (0.89)	-1.83, 1.64				
Death*40			0.15 (0.15)	-1.42, 1.72				
Death*70			-0.68 (0.79)	-2.24, 087				
View (unmatched = reference)								
'Equal right to healthcare'					0.43 (0.69)	-0.92, 1.78	0.40 (0.67)	-0.92, 1.72
'Limits to healthcare'					-0.03 (0.75)	-1.51, 1.45	-0.47 (0.74)	-1.92, 0.99
'Effective and efficient healthcare'					1.74* (0.90)	-0.02, 3.51	1.16 (0.89)	-0.58, 2.91
Age (of respondents)							-0.00 (0.01)	-0.03, 0.02
Sex (Female = reference)							1.54*** (0.41)	0.74, 2.34
Education (low = reference)								
Medium							0.86 (0.60)	-0.31, 2.03
High							0.84 (0.71)	-0.56, 2.24
Income (< €2,000 = reference)								
€2,000 - €4,500							1.88*** (0.47)	0.967, 2.80
≥ €4,500							2.98*** (0.63)	1.74, 4.22
Not stated							1.37 (0.84)	-0.27, 3.01
Children (yes = reference)							0.32 (0.46)	-0.58, 1.23
QOL (0-100 VAS)							0.03*** (0.01)	0.01, 0.05

DV: WTP	**Model 9 (cont'd)**		**Model 10 (cont'd)**		**Model 11 (cont'd)**		**Model 12 (cont'd)**	
	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI	β (SE)	95% CI
Constant	9.44*** (0.36)	8.73, 10.14	10.01*** (0.45)	9.14, 10.90	9.01*** (0.71)	7.62, 10.39	3.95*** (1.46)	1.09, 6.80
R^2 overall	0.010		0.014		0.015		0.057	
n (observations; groups)	3,530; 1,256		3,530; 1,256		3,530; 1,256		3,530; 1,256	

CV: contingent valuation; DV: dependent variable; QOL: health-related quality of life; VAS: visual analogue scale (ranging from 0 ('dead') to 100 ('full health')); WTP: willingness to pay (in € per month for a year); a) Models 9-12 are based on the data obtained from Part 2 and Part 3 of the questionnaire. Observations with an outlying WTP (≥ €40.00 in Part 2, ≥ €25.00 in Module 1, ≥ €60.00 in Module 2, ≥ €50.00 in Module 3 and ≥ €34.00 in Module 4), speeders and (consistent) protesters are excluded from this table; b) Severity, age, QOL gain and death coefficients cannot always be compared directly between the models. The coefficients of scenario characteristics for which no interaction effect is estimated represent main effects, and the coefficients of scenario characteristics for which an interaction effect is estimated represent conditional effects; c) Severity is operationalised in terms of disease-related QOL loss and measured in points out of 100 on the VAS; d) Age at onset of disease (in years); e) Outcome of disease one year after falling ill.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10 presents the combined results from the data obtained from Part 2 and Part 3 of the questionnaire and provides further insights into the characteristics and the interactions. In Model 10, a higher WTP is predicted, *ceteris paribus*, only for the interaction of QOL gains of 20 points and an age of 20 (β = 1.47), compared to the reference (QOL gains of 10 and an age of 10). The view 'effective and efficient healthcare' was associated with a higher WTP in Model 11 (β = 1.74). However, in Model 12, that view was no longer significantly associated with a higher WTP once characteristics had been added, although the coefficient was still positive (β =1.16). The characteristics 'sex' ('female' was the reference) and 'income' in Model 12 are significantly and positively associated with WTP ($p < 0.01$). In addition, the respondents' self-reported QOL (0-100 VAS) was a significant predictor ($p < 0.01$) of WTP in Model 12. It is therefore possible that personal characteristics were, *ceteris paribus*, a better predictor of WTP.

In most of these models, WTP was significantly lower in EOL situations, with β at -0.57 and -0.58. This result is consistent with Hypothesis 4, which posits that all three views have a lower WTP for patients in an EOL situation than for patients in a non-EOL situation. There was no obvious difference between the three views in this regard.

4. Discussion

4.1 Discussion on results

This study is one of the first to examine the direct relationship between societal views on healthcare priority setting and WTP in a representative sample of the Dutch public. It accounts for severity and the age of the patients at the onset of disease. It was structured in three parts.

4.1.1 Matching respondents to views

Firstly an attempt was made to match each of the respondents to one of the views defined by Wouters et al. (2017). I was able match nearly 95% of the respondents to a view. Most respondents (60.5%) identified with the 'equal right to healthcare' view. Respondents in that group were more likely to be female and less educated, and they tended to have children. Those who believed in 'limits to healthcare' were the second largest group (24.7%). They had middle or high education levels and higher household incomes. The smallest group (9.5%) adhered to the 'effective and efficient healthcare' view. They were significantly younger (average age of 45.6 years) than the respondents from the other two groups and more likely to be men. A small group of respondents (5.3%) could not be matched to any of the three views. They were more likely to live alone and were least likely to have had children. All respondents had a relatively high health-related QOL score (mean above 80).

The distribution of the views is consistent with other Dutch studies (Reckers-Droog et al., 2018), in which 'equal right to healthcare' predominates and 'effective and efficient healthcare' is the least common view. The results are also consistent with the studies of Wouters et al. (2017) and Reckers-Droog et al. (2021), who found that, in the Dutch society, healthcare priorities in general and in EOL situations may be inconsistent with societal preferences.

4.1.2 Desired equity

Secondly the WTP for different healthcare treatments was investigated to give an insight into the desired equity of respondents. Severity and age at the onset of disease were important predictors of WTP, both as main effects and as conditional effects captured by the interaction effect. The effect remains consistent even when respondent characteristics are added. In general, WTP increases with severity. Respondents are willing to pay most for patients aged 10. In some models, WTP is lowest for 70-year-old patients. The results may be compared to those of other studies that have elicited societal healthcare preferences in monetary terms. Both Bobinac et al. (2015) and Reckers-Droog et al. (2021) found a higher WTP for health gains in younger patients.

4.1.3 Examining the relationship between views and WTP

Lastly the relationship between the views and the WTP was investigated. The WTP of respondents who adhered to the first view, 'equal right to healthcare', was, *ceteris paribus*, slightly higher, although this effect is not significant in any of the models. The finding is consistent with Hypothesis 1. However, the

results do not permit its confirmation. The view 'limits to healthcare' is associated with a lower WTP in most models. However, the effect is neither consistent nor significant. Therefore, there is no evidence to accept or reject Hypothesis 2, which posits that the view in question is associated with higher WTP (at least for younger patients and for larger health gains). The WTP of adherents to the third viewpoint, 'effective and efficient healthcare', is consistently higher. This effect is significant in Model 3 and Model 11 (at the 0.10 level) however, once respondent characteristics were added in Model 4 and Model 12 respectively, the effect of this viewpoint was no longer significant. WTP was generally higher for the characteristics 'sex' (men tended to have a higher WTP) and household income (the higher the income, the higher the WTP). This might indicate that such characteristics might therefore be better predictors of WTP than the views.

4.2 Strengths and limitations of this research

The main strength of this study is that it provides further insights into the link between societal views on healthcare priorities and WTP for health gains for different groups of patients. The paper builds on the works of Reckers-Droog et al. (2018, 2021) and provides supporting evidence for the outcomes. The study also contains novel insights: a respondent's view on healthcare priorities is a not a significant predictor of WTP, with only a slight effect in some of the models. Moreover, that effect disappears upon the introduction of characteristics such as age and sex into the analysis. Using a large sample, the study demonstrates the differences in characteristics between respondents with different views and between respondents who can and cannot be matched to views. Another advantage of the paper derives from the use of ANOVA and Chi-2 tests, which were combined with the pairwise comparison of means to identify pairs of views for which the differences are significant.

The sample is representative of the general adult population in the Netherlands in terms of age (18-75), sex and education level. A wide variety of household incomes were represented. Other advantages include the use of CV tasks to elicit WTP for different QOL gains, the randomisation of scenarios, the exclusion of speeders, the exclusion of protest zero valuations, the restriction of the duration of the disease to one year and the use of a GLS regression to correct for multiple observations per respondent.

The SIP perspective was used to investigate both individual and societal perspectives and the effect of their combination on WTP for health gains. However, these self-regarding preferences might have biased the results, in that the respondents' personal treatment needs may have impacted their WTP. For example, a respondent who has children (who may require treatment) might be willing to pay more in a scenario that features 10- or 20-year-old patients. Proximity between the age of a respondent and the age of the patients may have also biased outcomes. The random allocation of scenarios in the questionnaire mitigated these biases. It should also be noted that the QOL gain of 50 points sometimes restored the patients to full health, which made it more difficult for the respondents to assess the effect of the size of the QOL gain from the effect of patients' health being fully restored.

4.3 Future research

Future research should focus on performing a sensitivity analysis of the results to evaluate their robustness to alternative scenarios. For example, WTP outliers can be analysed. The interactions between societal views, severity, age and WTP could be analysed, to gain further insight in the willingness to pay within each viewpoint. Finally, the respondents who held the view 'effective and efficient healthcare' were relatively young. It might therefore be relevant to repeat this study at a later stage to reassess WTP.

4.4 Relevance of this research

The conclusions of this paper could inform policymakers about the relative size of severity-, age- and/or EOL-dependent equity weights. These could be operationalised by applying equity weights to QALY gains and as such adjusting the cost-effectiveness (without adjusting the reference values) or by amending the reference level against which the ICER is valued (Bobinac et al., 2012).

Societal preferences for equity are generally not made explicit in cost-effectiveness analyses, which might result in a discrepancy between efficiency-based recommendations and the desires of the public (Linley & Hughes, 2013; Rutten & Van Busschbach, 2001; Van de Wetering et al., 2013).

The findings may inform discussions about healthcare priorities, especially if the aim is to integrate equity-efficiency preferences into the policy framework.

The results are most relevant to the Netherlands, where increasing demand for healthcare which puts pressure on limited budgets. The results could also be of interest in other countries where it is necessary to incorporate public preferences into healthcare policies.

The results suggest that current equity policies are not consistent with societal preferences about resource allocation. Interpreting societal preferences remains a point of difficulty. The most prevalent view of the Dutch public is that there should be an equal right to healthcare.

5. Conclusions

The aim of this thesis was to examine the relationship between the societal views on healthcare priority setting and the willingness to pay (WTP). This was done by analysing the data from a questionnaire about healthcare prioritisation held in the Netherland among 1,625 participants.

Firsty respondents were matched with three specific viewpoints. It is concluded that a good match was achieved between the participants and the different viewpoints.

Secondly information about the equity preferences of the respondents was investigated. This was done by examining the WTP in different scenarios, distinguishing between severity levels, patient ages, QOL gains and disease outcomes (full recovery or death). Two conclusions can be drawn about the WTP for different healthcare treatments:

- I conclude that WTP is higher for patients with more severe diseases. This effect interacts with age at the onset of the disease and diminishes for the most severe diseases. In general, the older the patient, the lower the WTP. This said, the effect is not consistent across scenarios.
- I conclude that the respondents are willing to pay most for patients aged 10. In some models, WTP is lowest for 70-year-old patients.

Finally the relationship of different societal viewpoint and the WTP was investigated. I conclude that the viewpoints do not have a significant relationship with WTP. However, the viewpoint ‘effective and efficient healthcare’ is positively associated with WTP.

6. Literature

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Appendix 1: Task example

Imagine a group of 10,000 patients who all have the same disease and to which you, your family, friends, and/or acquaintances can also belong. The patients would have lived in full health until the age of 80 had they not fallen ill. The patients fall ill at the age of 10. The disease lasts for one year and leads to a lower quality of life during this year. Due to the disease, patients' quality of life decreases from 100 to 70 on the scale from 0 (dead) to 100 (full health). A treatment is available that reduces the effects of the disease. The type and costs of the treatment are the same for all patients. Due to treatment, patients' quality of life during the year of illness is 10 points higher than without the treatment. Patients' quality of life will increase from 70 to 80 points. After this year, the patients fully recover and their quality of life returns to a score of 100.

To be able to pay for this treatment, the monthly basic health-insurance premium will increase for the duration of one year for all adult (18+) inhabitants of the Netherlands. Thus, this increase also applies to people who are not affected by the disease. After this year, the monthly premium will return to its current level. Without the increase in monthly premium, the patients will not be treated. Please inspect the row with amounts below, from left to right, and state the highest basic health insurance premium you are certainly willing to pay extra per month for the treatment that increases the 10-year-old patients' quality of life from 70 to 80 on the scale from 0 (dead) to 100 (full health).

Please be considerate of your net monthly household income when answering this question. Please inspect the row with amounts below again, from left to right, and state the first basic health-insurance premium you are certainly not willing to pay extra per month for the treatment that increases the 10-year-old patients' quality of life from 70 to 80 on the scale from 0 (dead) to 100 (full health).

€0	**€0,50**	**€1**	**€1,50**	**€2**	**€2,50**	**€3**	**€4**	**€5**	**€6**	**€7**	**€8**	**€10**	**€12**	**€14**	**€16**	**€18**	**€20**	**€22**	**€24**	**meer**
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Please be considerate of your net monthly household income when answering this question.

You have stated that you are certainly willing to pay €X extra basic health-insurance premium per month for the treatment that increases the 10-year-old patients' quality of life from 70 to 80 on the scale from 0 (dead) to 100 (full health), but certainly not more than €Y.

€0	**€0,50**	**€1**	**€1,50**	**€2**	**€2,50**	**€3**	**€4**	**€5**	**€6**	**€7**	**€8**	**€10**	**€12**	**€14**	**€16**	**€18**	**€20**	**€22**	**€24**	**meer**
O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

You have stated that you are certainly willing to pay €X extra basic health-insurance premium per month for the treatment that increases the 10-year-old patients' quality of life from 70 to 80 on the scale from 0 (dead) to 100 (full health), but certainly not more than €Y. Within the range €X - €Y, what is the maximum amount you are willing to pay extra in monthly basic health-insurance premium for the treatment? Please be considerate of your net monthly household income when answering this question.