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What You Ask is What You Get: Willingness-to-Pay for a QALY in Germany

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Abstract

We report results of a survey of a representative sample of the German population in which respondents were asked in various scenarios for their willingness-to-pay (WTP) for a gain of one quality-adjusted life year. While one version of the survey exactly copied the setting (online survey) and the questionnaire used in the EuroVaQ project, in the second version the hypothetical nature of the questions was emphasized more strongly, and the survey was conducted as a computer-assisted personal interview. The results show that the average and median WTP responses differed between scenarios but, overall, became considerably larger in the second version.

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Keywords: willingness to pay, QALY, survey, Germany, EuroVaQ.

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1. Introduction

Health care systems in developed countries are facing tremendous financing problems, given the rapid medical progress and limited resources from public or semi-public funds such as payroll taxes. In particular with respect to decisions on financing new and innovative health care technologies, every health care system must find rational methodologies to assess value for money. The procedures currently in place differ widely even between countries with similar GDP per capita. E.g. in England and Wales, the National Health Service provides a particular treatment to the population if its ”costs per QALY gained“ does not exceed a certain threshold, which lies between 20,000 and 30,000 Pound Sterling (NICE 2007, p.54), and the assessments are provided in a transparent process by the National Institute for Health and Clinical Excellence (NICE). In contrast to this prototype of open and explicit rationing, the covering decisions for German Social Health Insurance (“Gesetzliche Krankenversicherung, GKV”) are made on a case-by-case basis by a decision-making body called “Gemeinsamer Bundesausschuss” (G-BA) with no obvious or transparent decision criteria.

No matter how explicitly and openly the decisions are taken, it is justified to require that they somehow reflect the preferences of the population which is affected by them both as potential recipients of medical services (patients) and as payers of taxes or social insurance contributions. Therefore, it would be desirable to know what value citizens place on the gains in health and life expectancy that can be achieved with the respective (new) medical treatments. Thinking about such gains in terms of quality adjusted life years (QALYs) it is thus desirable to estimate a monetary value that members of society place on additional QALYs.

There is a literature on the monetary valuation of health, which falls into two categories: in the value-of-a statistical-life (VSL) literature, the object to be valued is (the avoidance of) a small risk of immediate death. This case is especially relevant in fields involving fatal hazards such as traffic, dangerous occupations or accidents such as fires. The other category tries to assess the monetary value of an additional (healthy) life year, a QALY, or some other gain in health status over a period of time. It is obvious that gains (or avoidance of losses) in (more) healthy lifetime are the typical target of medical services so that this second branch is of greater relevance in the economics of health care. For a survey of the state of knowledge in this literature see Donaldson et al. (2010, p.11f.).

Over the last years, a group of experienced health economists from nine European countries and Palestine has tried to elicit the “monetary value of a QALY” in a research project called “EuroVaQ” (European Value of a QALY), which was funded by the Commission of the European Union under the Sixth Framework Programme. The main methodology consisted in online-surveys of approximately 4,000 persons in each of the participating countries that were conducted in late 2009 and early 2010 (Donaldson et al. 2010).

The survey questionnaire came in two versions, and in each version a different approach was used for framing the hypothetical decision situations, and each approach was used for approximately one-half of the sample in each country. The first approach ("chained approach") was based on the assumption that respondents are rational expected-utility maximizers. It used a series of standard-gamble or time-tradeoff questions to translate the WTP for a small and everyday health gain described by comparing two vectors of EQ5-D health states into a WTP for a fraction (.1 or .05) of one QALY. One notable feature of this approach is that at least one of the standard-gamble or time-tradeoff questions which had to be answered in each of these series involved the option of immediate death with a very small probability.

In contrast, the "direct approach" tries to describe the gain of a QALY to the respondents without actually using the word. First a visual analogue scale, called "health thermometer", is used on which 0 marks "death" and 100 "perfect health", and respondents are asked to rate their own health on this scale. Then, using visual means, health gains and losses that last for a certain number of years are denoted as rectangles in a diagram in which time is measured along the horizontal and health scale along the vertical axis. Finally respondents are asked for their WTP to avoid a health loss of x points on the scale that lasts for 100/x years.[1]

The preliminary results of the surveys in both versions show that mean and median responses differ considerably from country to country. Moreover, the observed mean and median values of willingness-to-pay (WTP) for a QALY appear very low, often an order of magnitude smaller than the "threshold" values adopted in those countries which use "cost-per-QALY gained" for their funding recommendations (Donaldson et al. 2010), and a large share of respondents even express a WTP of zero for substantial gains in length and quality of life.

For some reason, the largest EU member country, Germany, was not among the countries in which the survey was conducted. This fact alone would have suggested conducting a similar research in Germany in order to gain an understanding of the patterns which govern the differences in monetary valuation of human life across Europe. In addition, such an endeavour could be used to examine whether the results of the original research, in particular the low median responses, may be due to either the online nature of the survey or a lack of understanding of the hypothetical nature of the questions by part of the respondents.

Therefore, the EuroVaQ study was extended in June 2012 to a German sample on the basis of two different versions of the survey questionnaire:

- a direct translation of the English questionnaire[2] was administered online to 1501 respondents and is therefore called CAWI (computer-assisted web interview),
- a modification aimed at improving the understanding by the respondents, which was administered in computer-assisted personal interviews[3] and is therefore called CAPI.

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[1] Some questions involved health gains of fractions of a QALY so that the 100 is replaced by some smaller number.
[2] The translation was provided by the second author.
[3] In the same interviews, a discrete-choice experiment was conducted in addition. The results will be reported elsewhere.

As the chained approach uses alternatives involving small risk of death and it is well-known from the literature on the value of a statistical life (VSL) that many people have great difficulties in making consistent choices in such situations (Viscusi 1993, Hammitt and Graham 1999), we decided to administer only a questionnaire based on the direct approach. In addition we judged the direct questions to be easier to understand.

In this paper we report the procedure and the results of the German survey on the value of a QALY ("GermanVaQ"). Section 2 briefly states the hypotheses to be tested with this study. In Section 3 we describe the survey questions and emphasize the differences between the CAWI and CAPI versions. In Section 4 we comment on the representativeness of the sample for the German population. Section 5 contains a descriptive account of the results of the two surveys, and in Section 6 we analyze the pattern of responses with respect to demographic and socio-economic determinants of WTP and the dependence of these monetary valuations on the initial situation (e.g. health status), size and timing of the expected health gain. Finally, Section 7 concludes.

2. Theoretical hypotheses on WTP for a QALY

We first restate a number of hypotheses underlying already the original EuroVaQ study (H1 to H6) before we formulate an additional hypothesis which refers to the differences in survey design (H7):

H1: WTP per QALY is higher when only fractions of a QALY can be gained (theoretically derived from the budget constraint and diminishing marginal utility of health).

H2: WTP for a QALY decreases with the time span between payment and realization of the promised health gain (due to discounting).

H3: WTP increases with age (because older people are more aware of the value of health).

H4: WTP for a QALY increases with the income available to the person (due to the budget constraint).

H5: WTP for life extension is higher for persons with a family than for singles (due to positive externalities).

H6: WTP for a QALY decreases with current health status (theoretically derived from diminishing marginal utility of health).

H7: Emphasizing the hypothetical nature of the survey reduces the protest-zeros and increases mean and median WTP.

3. The design of the questionnaires

As mentioned above, Version CAWI of the questionnaire used in GermanVaQ is a direct translation of the questionnaire used in UK into German. Therefore, the reader is referred to Donaldson et al. (2010, pp. 57ff.) for a detailed description.

In the introduction, the respondents are informed that the survey is part of a research project inquiring into the value placed by citizens on their own health and that their answers would be useful to inform governments in making decisions on allocating resources to and within the health care sector. Then the hypothetical nature of the questions is stressed and it is explained that "the amount you would be willing to pay for some treatments *if you had to* gives an indication of *how much you value health gains* from those treatments compared with other things you might want to spend your money on". The combination of these two pieces was designed to convey the message to respondents: If you value your health highly and if you want the government to spend more on your health care, then you should put large numbers in the answering boxes.

Surprisingly, in each of the questions of the corresponding version of the EuroVaQ survey, there was not only a sizeable fraction of people who expressed a WTP of zero for the corresponding health gain (of 1 QALY in most cases). But also, when asked to give reasons for their choice, many of these respondents ticked the box "I do value the treatment, but do not want to pay because the government should provide health care", which clearly shows that they did not get the message mentioned above because they misunderstood either the purpose of the study or the hypothetical nature of the questions.

Therefore, in version CAPI of the GermanVaQ questionnaire, we added the following paragraph to the introduction:[4] "Imagine that there are *no sickness funds* in Germany so that you have to pay no premiums or contributions for health insurance. Thus your net income is higher *by the respective amount* than it is in fact today. In return, you must pay *for every medical service out of your own pocket*. As you have known this for a long time, you have accumulated savings of one year's income to be prepared for unexpected medical expenditures."

In addition, in the CAPI survey we reminded the respondents in every question for their WTP for a particular health gain that they should place themselves in this hypothetical situation. This was done with the following words:[5] "Remember that we assume here that there is *no health insurance* and you have to pay all medical services yourself, if necessary

[4] The German original reads: "Stellen Sie sich vor, es gebe in Deutschland *keine Krankenkassen* und Sie müssten daher auch keine Beiträge oder Prämien für eine Krankenversicherung zahlen. Ihr Nettoeinkommen wäre also *um den entsprechenden Betrag höher*, als es heute tatsächlich ist. Dafür müssten Sie *jede medizinische Behandlung selbst bezahlen*. Da Sie dies schon lange wissen, haben Sie ein Sparvermögen in Höhe eines Jahreseinkommens aufgebaut, um für unvorhergesehene Behandlungskosten gerüstet zu sein."

[5] The German original reads: "Denken Sie daran, dass wir hier unterstellen, dass es *keine Krankenversicherung* gibt und Sie alle medizinischen Behandlungen selbst bezahlen müssen, notfalls aus Ihrem dafür angesparten Vermögen."

from your savings that you have made for this purpose." Finally, when asking for the specific amount, the question read:[6] "What would be the *highest* amount you would pay for this treatment today at age x, if there was no health insurance which pays for it and if you had the equivalent of one year's income in your savings account?"

In the beginning, respondents were asked for their age, gender, occupation, region of residence (which of the 16 Länder), family status, number of children of different age groups, household size, household income, type of health insurance (public vs. private), expected life span and, most importantly, current health as a point on the 0-100 health thermometer. Based on the latter two answers different exclusion criteria were applied throughout the questionnaire to make sure scenarios were applicable to individual participants. Respondents who stated a health level below 20 points or a life expectancy lower than two years were not included in the sample. Furthermore, if life expectancy was less than six years people were redirected to the "grey block" containing four scenarios which are still meaningful for them.[7]

The questions themselves were the same in both versions and were directly translated from the English version of the EuroVaQ questionnaire. Altogether, 13 different scenarios were created of which each respondent was presented 4 or 5. Table 1 in the Appendix contains an overview of the scenarios and gives information of the nature and timing of the health gain, the number of QALYs involved and the size of the corresponding subsample.

Each of the scenarios consisted of

a) the description of a health loss, which could be avoided by getting a medical treatment,

b) the question *if* the respondent was willing to pay something,

c) if b) was answered with "Yes", the question for the WTP in Euros; otherwise the question for reasons why the respondent was not willing to pay anything.

An example of a) and b) is given in the Appendix, Figure 1. If the answer was "No", the respondent was offered the following 5 or more boxes to tick (with the possibility to tick more than one) plus an empty box for giving an additional reason:

- It wouldn't be too bad/I could live with it.[8]
- I would get better anyway, so it is not worth paying for the treatment.[9]
- I do value the treatment, but I cannot afford to pay anything for it.

[6] "Was wäre der HÖCHSTE Geldbetrag, den Sie HEUTE im Alter von x Jahren für diese Behandlung zahlen würden, wenn es keine Krankenversicherung gäbe, die dafür bezahlt, und wenn Sie ein Vermögen in Höhe eines Jahreseinkommens auf dem Sparkonto hätten?"

[7] For several questions further criteria based on life expectancy or health state were applied which led to either an exclusion or a redirection to the "grey block", which includes scenarios D, E, I and J (see Donaldson et al. 2010, p.61-62).

[8] This reason is replaced by the statements "It's not enough gain to be of value to me" (scenario I) or "I am thinking about my family/partner – I want to leave the money to them" (scenario L).

[9] In scenario L this statement is replaced by "If I was going to die, this would only be paying to prolong my death".

- I do value the treatment, but do not want to pay because the government should provide health care.
- The risk is low; I would take the chance. (Only in the questions involving risk)
- I may not live until that age, so that it is not worth paying for treatment now. (Only in situations regarding gains at the end of life)
- I may be in poor health at that age, so it is not worth paying for treatment now. (Only in situations regarding gains at the end of life)
- Other (please specify below).

These statements were derived from previous experiences and comments made by respondents during the extensive piloting of the EuroVaQ group (see Donaldson et al., 2010, p.55).

If the answer was "Yes", the respondent was confronted with a screen in which different amounts (from 10 Euros to 300,000 Euros) appeared in a random order, which he was asked to allocate to one of three columns "willing to pay", "not willing to pay" and "unsure". In the end, he was presented the largest amount of the first and the smallest amount of the second column and was asked again, what amount within this interval constituted his "maximum" WTP.

At the end of the questionnaire, respondents were confronted with all the answers they had given in the course of the survey and were given the opportunity to change their responses.

This was not the end of the survey, but the latter included a number of additional items, the results of which will not be discussed in this paper:

- a screen on which five different opinions on the general design of a health system (ideologies) were expressed and respondents were asked to rate the degree of their (dis)agreement on each of these opinions,
- a series of questions on how they would allocate a given health budget between two different groups of patients,
- (only in the CAPI version:) a number of questions in the discrete-choice format.

The situations described in the discrete-choice experiment considered extensions of the benefit package of the statutory health insurance. Hence, it was necessary to include only respondents with public insurance in the CAPI sample. In contrast, participants with private or public health insurance are contained in the CAWI sample. Several characteristics of all groups are presented in the next section.

4. The representativeness of the German sample

Representativeness of the German sample was created along the same dimensions as in the EuroVaQ study. These dimensions are gender, age, household income, ESOMAR[10] social grades and region (Länder). In the following we compare the distributions of respondents in the CAWI and in the CAPI version to the distribution of the German population of age 18 and older. In Section 6, further descriptions of sample characteristics are presented.

First we consider the dimensions gender (male, female) and age partitioned into four intervals (18-29, 30-44, 45-59, 60 and over). The distribution of respondents in these eight subgroups is presented in Table 2. The fit of the shares is very good in the CAPI version. In the CAWI version female respondents of age 60 and over are slightly underrepresented. This was observed, too, in some countries of the EuroVaQ study and might be caused by the fact that older women tend to use the internet less frequently. Also there are considerably more males (65.4%) than females (34.6%) among respondents with a private health insurance (n=220). These proportions are quite similar to representative figures where the share of women among all adults is about 37.9% (PKV 2012).

We partition the dimension household income into nine classes and add a class for "no answer". The upper part of Table 3 shows the relative frequencies of income classes for the German population in 2011 compared to the respective data from the CAWI and CAPI sample. The distributions of the total samples in both versions are very similar to the German data. If one considers the CAWI respondents with private insurance separately, higher income classes are overrepresented. This is mainly due to the fact that there is a threshold income below which employees are forced to be members of the mandatory public insurance.

In another dimension information on the education and type of occupation of the main income earner of a household are combined and six ESOMAR social grades are formed. These grades were used by the survey company to recruit participants. In the lower part of Table 3 we compare the distribution of social grades in the CAWI and CAPI samples with the standard demographic classification for Germany (cf. ESOMAR 1997). The distribution of social grades in the total CAWI sample is acceptable. However, not unexpectedly, among the 220 privately insured respondents grade A (well educated top managers and professionals) is overrepresented. In the CAPI version grade E (especially less well educated skilled and unskilled manual workers) is overrepresented (30.6% in our sample compared to 10.7% in the ESOMAR classification). One reason for this could be that these groups were easier accessible and more inclined to do the personal interviews.

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[10] The European Society for Opinion and Marketing Research (ESOMAR) defines social class in terms of occupation or past occupation combined with degree of responsibility in the job function and education (defined in terms of terminal education age). Social class is defined by the data of the Main Income Earner (MIE) of the household (cf. ESOMAR, 1997)

The last dimension of representativeness (not reported in Table 4) is region within Germany (defined by Länder). The distribution in both the CAWI and the CAPI sample is very similar to the distribution of the German population. However, in the CAWI version we find that Berlin and Sachsen are slightly overrepresented, two regions both being counted to East Germany. In this version 26.9% of the respondents belong to the East compared to 19.8% of the representative German population.

5. Zero willingness-to-pay and descriptive results

In the following two sections descriptive results and findings of regression models of the CAWI and CAPI version are presented. Furthermore, we examine statements of zero WTP and explain a resulting sample reduction.

5.1 Zero willingness-to-pay

One striking result of the EuroVaQ study was that a sizable share of respondents expressed a zero WTP in any individual scenario, and this result is found for Germany, too. In the columns in the middle of Table 4 corresponding shares for both versions are reported. In the CAWI sample they are also distinguished between members of private and public health insurances to allow for comparisons of frequencies between the two versions. The percentages vary tremendously across scenarios and, moreover, between the CAWI and the CAPI version. In both versions the highest proportion of zeros (46.0% and 39.2%, respectively) is found in scenario I (one additional QALY at the end of life), which seems reasonable because in particular young respondents will discount any life extension at the very end. In contrast, only 17.3% in CAWI and 8.9% in CAPI did not want to pay anything for a health gain of 25 points for 4 years in the near future (scenario A). It is also notable that the share of zeros dropped for 12 out of 13 scenarios when respondents with public insurance faced an interviewer rather than a computer screen; in several scenarios it falls by 10 or more percentage points. Finally, in the CAWI sample in all but two scenarios participants with private insurance less often stated a zero WTP. This might be due to the fact that respondents with private insurance are more often used to carry their treatment costs (at least temporarily).

In Table 4 frequencies of different reasons for stating a zero WTP in all situations are summarized. As already mentioned, reasons proposed to respondents resulted from piloting of the questionnaire. Hence it does not surprise that all statements are rather frequently chosen. Nevertheless, in several scenarios many people explicitly stated that they could live with the health reduction described in the questionnaire. Obviously, minor constraints seem to be acceptable for some respondents, suggesting that individually WTP is not strongly monotonic in cases of small health gains. In scenario L the extension of life time was described, but here several participants explained that they were not willing to pay for the prolongation of dying. Furthermore, situations regarding risk or gains at the end of life contained scenario-specific reasons, which are often selected. Many respondents stated that a risk of five to ten percent would be too small, whereas others did not want to pay for gains in the farther future. In general, the statements of respondents in the different scenarios reveal that many participants probably had well-grounded reasons to state a zero WTP. Hence, it seems to be reasonable to leave corresponding answers in the samples.

However, in Section 3 it has already been mentioned that some respondents did not get the basic message of the hypothetical situation where no government exists which may carry health care costs. This can be deduced from their statement that "government should pay for health care". In the EuroVaQ project respondents who stated only this reason were called "protestors". From the numbers in Table 5 it can be seen that in our CAWI sample between 3.2% and 6.6% of respondents in each scenario can be classified as "protestors". Furthermore, other participants stated that government should pay, but also gave at least one further reason. We call them "protestors plus". Another 1.8% to 4.6% in each scenario of the CAWI sample belonged to this group, so that in total between 6.1% (in scenario A) and 9.4% (in scenario J) of all respondents can be classified as "protestors" or "protestors plus".

In the CAPI version, participants faced an interviewer and were reminded that there is no government which could possibly pay. Here, the total share of "protestors" and "protestors plus" drops in most cases and now ranges from as little as 3.2% (in scenario A) to 10.9% (in scenario G). On the whole, this confirms hypothesis H7 stated in Section 2.

In the EuroVaQ study the percentage of protestors also differed between scenarios. However, in all but scenario L the percentage aggregated over all countries was clearly larger than 10%. There, it was decided to eliminate all "protestors" from the sample of the corresponding scenario. However, we will additionally exclude "protestors plus" since both groups revealed a deeper misunderstanding of the situation described. Corresponding effects will be described in the next subsection.

5.2 Descriptive statistics

Referring now to the raw data, Table 6 contains the maximum, mean and median responses to each of the 13 scenarios in the CAWI (both total and public insurance subsample) and CAPI version, respectively, and the standard deviations. In scenarios D, E, M, O, and N, which refer to health gains of less than 1 QALY, all responses were divided by the respective fraction so that the numbers in the table denote the implied "WTP for 1 QALY", assuming strict proportionality of WTP.

It can be seen that mean values vary strongly between different scenarios in both versions. For each sample the lowest mean can be observed in scenario G (health gain of 10 points over 10 years at the end of life), while the highest values can be found in scenario N, where respondents had to state their WTP for a gain of 0.05 QALY. Thus, obviously higher mean amounts can be observed when only fractions of a QALY are at stake (see the bottom cases of the table), which confirms hypothesis H1.

Moreover, comparing the "public and private insurance" sample with the "public insurance" sample of the CAWI version it becomes apparent that in most cases the group of respondents with private insurance displayed a higher mean and median WTP compared to their counterparts with public insurance. This might be due to the fact that on average the latter group has a lower income level. In the regression models presented in Section 6, we will control for this effect.

When looking at the maximum WTP in each scenario, it is quite obvious that mean values are very sensitive to single extreme numbers. For example, in scenario E one respondent of the CAWI sample stated a WTP, which lead to a value of a QALY of 30 million Euros so that resulting mean values are also extremely high. Even ignoring the numbers resulting from the extrapolations, i.e. the scenarios in the bottom five rows, some people expressed a WTP above one million Euros to avoid, for instance, a year in coma (scenario L) or a loss of 25 points on a health scale for 4 years (scenario A). It has to be noted that in the CAPI survey, the extreme amounts are considerably smaller, which indicates that the online survey technique is more prone to creating "outliers" than the personal interview. Nevertheless, even in the CAPI version amounts above one million Euros occurred in about one-half of all scenarios.

In the literature, several possibilities for "trimming outliers" are discussed (see Sheskin 2011 for an overview). One possibility is to exclude the highest x% of stated WTP in each scenario. In the EuroVaQ project the upper 1% of WTP was always excluded. However, this procedure has the disadvantage of trimming potentially "reasonable" cases that may be able to save enough money to pay "seemingly" too high amounts. Hence, we experimented with several trimming approaches. For example, we excluded the highest 1%, 2% or 5% of WTP but found that people with higher income or younger respondents were much more likely to be excluded.[11]

Consequently, we decided to focus more on median rather than mean values in our descriptive results and regression models. If we consider that decisions on health care rationing are ultimately made by politicians seeking re-election in democratic countries relying on majority voting, mean preferences in the population should be less important than median preferences. Looking at the median responses we find that, unsurprisingly, they are quite a bit smaller than the corresponding means. As the median reacts much less than the mean to changes in the extreme tails of a distribution it makes very little difference whether (some) outliers appear or not.

Comparing now the median values for the CAWI (public insurance) and the CAPI sample in Table 6, we find that – as with the means – CAPI usually yields much higher responses than CAWI. The ratio of the two values is only 1.4 for scenario G, but it is much larger in most other cases and exceeds 10 in scenarios B, I, J, and N. In six other scenarios (A, L,

[11] Also we used regression techniques to identify outliers (see e.g. Heij et al. 2004).

P, E, M, and O) the ratio falls in the range 5 to 10. It is plausible that this result is not due to the difference in the survey setting but rather to the fact that the hypothetical nature of the questions was emphasized more intensively.

Nevertheless, median values also vary considerably between scenarios. Again, in both versions higher median values can be observed for those scenarios which refer to fractions of one QALY compared to health gains of one QALY. However, this difference is considerably larger for the CAPI version. Additionally, in scenarios M, O and N where some risk of a health reduction is described at least in the CAPI version the highest median values of a QALY can be observed.

Furthermore, some scenarios regard health gains in one year's time, while others consider similar situations at the end of life. As expected (see hypothesis H2), mean and median values are always higher in scenarios A, F and L compared to the corresponding cases described in B, G and I. Hence, the WTP for a QALY depended on the timing of the gain. Furthermore, in scenario A, respondents had to give one single value for a gain of one QALY, while in scenario P four amounts had to be stated for a similar gain. Here, mean and median values are higher in the latter case so that the payment procedure also seems to have an influence on the WTP.

In Subsection 5.1 we have already argued that "protestors" and "protestors plus" did not get the basic message of the hypothetical situation where no government exists that may carry health care costs. Hence, we excluded both groups from the respective samples. By this, the sample is reduced by some of the respondents with a WTP of zero, which may have an impact on results. Table 7 reports resulting numbers for all samples. Naturally, almost all relevant values increase (of course exceptions only concern median values). Nevertheless, all main findings reported above also hold for the reduced samples.

As also noticed in Subsection 5.1, the proportion of respondents stating a zero WTP is considerably higher in the CAWI sample compared to the CAPI version. It could be argued that only these cases lead to lower median values in CAWI, while there are no such differences between those groups of participants who reported a positive WTP. Therefore, Table 8 contains corresponding results. Certainly, mean and median values are now considerably higher due to the exclusion of all zero WTP. However, even after this further sample reduction all median values are considerably higher in the CAPI version compared to the CAWI sample. Hence, we can conclude that the differences between both versions with respect to median values are not solely due to the higher proportion of zero WTP in CAWI, but also concern those respondents who stated a positive WTP.

Finally, we compare our CAWI results with corresponding findings in the nine European countries of the EuroVaQ study (Donaldson et al., p.93f.). Note that in order to create comparable (USD PPP) numbers we have to apply their trimming approach and exclude the 1% highest answers. In Figures 2 and 3 mean and median values, respectively, are reported for all situations regarding a health gain of one QALY. Obviously Germany ranks well in the "midfield" so that we may conclude that the WTP for one QALY is not noticeably higher in Germany compared to many other European countries.

So far we have observed several variations between scenarios. Furthermore, differences between respondents with either public or private health insurance seem to exist. In the next section we investigate the influence of different covariates by means of multivariate regression models.

6. Determinants of WTP for a QALY

In order to identify relevant determinants of WTP an appropriate regression procedure has to be selected. As revealed by the results presented in Section 5, a reasonable number of participants in each situation stated a WTP of zero. One way of dealing with such data is to estimate a lower limit censored regression, i.e. a Tobit model. This approach has been chosen by the EuroVaQ project "for its simplicity and common application" in the past to model WTP data (Donaldson et al. 2010, p.69). In a Tobit model zero responses are interpreted as censored negative values and one single equation is estimated. However, we chose an alternative approach and applied a two-part procedure called the "two-step quantile regression" inspired by Heckman's two-step approach (Heckman 1979). More specifically, in the first part the probability of observing a positive WTP is predicted by a binary Probit model, while in the second part a quantile regression on the observations above zero WTP (summarized in Table 8) is estimated.

First, this procedure has the advantage of modelling two independent decisions, where all covariates are allowed to appear in all equations and, therefore, may display distinct effects on the different dependent variables considered.

Second, especially in the case of a non-Gaussian setting like skewed or long-tailed outcome distributions a quantile regression method should be favourable against the least square method that is originally based on mean functions (see Greene 2012, Koenker 2005, Koenker and Bassett 1978). Due to some high values in our dataset causing a right-skewed distribution of WTP there is a potential risk of misleading or inconsistent estimates due to missing robustness by merely minimizing the sum of squared residuals. Taking this skewedness into account, the quantile regression method minimizes the sum of absolute deviations by using asymmetrically weighted residuals. This leads to robust and more efficient estimators by the use of conditional quantile functions based on the median, which is in turn robust against potential outliers. Hence, a further trimming of outliers is not necessary.

Third, the quantile regression is able to give a more complete description of the impact of covariates on the outcome distribution by analyzing different quantiles (see e.g. Benoit and Van den Poel 2009, and Pourhoseingholi et al. 2008 for some clarifying examples). Here, the estimated coefficients allow for a comparison of the size of impact on the dependent variable across quantiles. We decided to have a closer look on the standard first (0.25), second (0.5) and third (0.75) quartile to examine whether the influence of covariates differ in the tails of the outcome distribution. The statistical package STATA 11 was used to estimate all regression models.

We introduced two groups of covariates, individual characteristics and attributes of the scenarios. Descriptions of individual variables are given in Table 9. The selection of characteristics and their categories has been inspired partly by results of the EuroVaQ project. Explanatory variables were age in four age groups, monthly net household income in Euros grouped into five brackets plus an additional indicator for "missing specification of income", three categories of educational level depending on the years at school and any type of university studies, gender, region (East including Berlin, West), and health status grouped into four brackets. Also, similarly to the EuroVaQ study a measure for size and composition of the household has been introduced.[12] Furthermore, we included a dummy variable indicating whether a respondent expects to die within the next 15 years. Finally, as explained in Section 3, only in the CAWI sample some respondents have a full private health insurance, so that a corresponding dummy variable has been added, here.

Based on the descriptions in Table 1, we identified three attributes of scenarios which entered the regressions as dummy variables. These factors denote whether a scenario is characterised by gains of a fraction of a QALY (scenarios D, E, M, O, and N) or of one QALY (otherwise), by introducing the risk of a health reduction (M, O, and N) or certainty (otherwise), and by gains at the end of life (B, G, and I) or in one year's time (otherwise).

Using the data sets reduced by "protestors" and "protestors plus", answers to all scenarios have been pooled for both questionnaire versions. The regression results for the resulting CAWI and CAPI samples are presented in Tables 10 and 11, respectively. For the Probit models we report marginal effects rather than estimated coefficients, because they also reflect the extent of the effect observed. Chi-square tests (not reported here) show that all models have more explanatory power compared to a model including only a constant. However, as expected for an exploratory investigation, pseudo-R^2 values are very low for all models estimated. For the quantile regression models, R^2 values are somewhat higher for higher quartiles indicating that the covariates included have more explanatory power for the upper part of stated WTP.

Apparently some independent variables display a statistically significant effect only on one of the two decisions considered. Hence, a two-part model seems to be more appropriate to analyze the underlying decision process compared to a single regression equation. In the fol-

[12] It distinguishes between single-person households and multi-person households, partitioned into couples with or without children, sole-parent families and other private households with cohabitating members or families.

lowing we first consider characteristics of respondents and afterwards properties of the scenarios.

6.1 Effects of individual characteristics

The basic age category was the lowest age group (below 30 years). In hypothesis H3 it has been stated that older people are supposed to be more aware of the value of health. Hence, we should observe positive coefficients for higher age categories in each regression model. However, for the CAPI sample no significant age effects can be observed. In the CAWI version respondents aged 60 or above are more likely to state a positive WTP compared to the youngest age group. In contrast, estimated coefficients in the quantile regressions reveal that younger participants used to state significantly higher values. On the one hand, younger individuals might be less aware of "true" health care costs or might simply overstate their WTP. On the other hand, younger people may also be more able to return a possible loan for treatments costs during their lifetime.

Apparently, some very strong effects can be observed from the income dummy variables. In theoretical models this is expressed by the budget constraint (see hypothesis H4). Especially in the CAWI sample a higher household income significantly increased the probability to state a positive WTP compared to the lowest income category. Furthermore, the effect increases with income as indicated by the estimated marginal effects of the Probit model. From the quantile regression results for both samples it can be seen that the WTP was considerably lower for the lowest income group compared to all other groups including those respondents who rejected to state their income. Probably individuals in the latter group, which comprised about 11% of all respondents, did not want to reveal that they had in fact a rather high income. Furthermore, comparing the regression results for the different quartiles it becomes apparent that differences are considerably stronger for higher WTP.

Especially the estimated coefficients for the three middle income classes of the CAPI version could be used to investigate the relation between WTP and household income in more detail for those individuals who stated a positive WTP. For example, the ratios of the differences between the estimated coefficients for the third and second, and for the fourth and third income bracket and the differences between the mid-points of these brackets (36,000 Euros, 26,400 Euros and 18,900 Euros annually) reveal some clear tendencies. First, for each quartile the ratio is higher for the increase between the second and third income bracket than for the increase from the third to the fourth bracket. For instance, in the case of the median quantile regression (0.5) the calculated ratio of 0.288 indicates that WTP per QALY increases in income by 28.8% of the extra annual income when comparing the second and third income bracket, while the corresponding value for the comparison of the third and fourth bracket equals 0.200.[13] Hence, the curve appears to flatten out with higher income. Second, for each

[13] For example, for the comparison between the second and third income bracket, the difference between the midpoints of these brackets (18,900 Euros and 26,400 Euros annually) equals 7,500 Euros. The difference be-

comparison between income brackets the ratios calculated increase from the first to the second, and from the second to the third quartile. Thus, the effect is stronger for higher WTP. In summary, similar to the EuroVaQ study, we detected a rather strong influence of income on WTP.

Holding income constant, individuals with a higher level of education might be supposed to display a higher WTP due to the fact that it needs some cognitive ability to evaluate health reductions described in the questionnaire and estimate monetary consequences. Results of the quantile regression models confirm this intuition. Especially in the CAWI sample, respondents with fewer years of education wanted to pay significantly lower amounts than individuals with any type of university education.

Household type measured by the OECD coefficient, which displays the number of family members or people in a household, did not determine WTP at the 5% significance level. Only for the highest WTP quartile of the CAPI version a negative sign of the estimated coefficient shows up and confirms results of the EuroVaQ study (p.76) in the way that larger households have a lower WTP. This is in contrast to our hypothesis H5. One can conjecture that household size might lead members to think more about the restricted possibilities to finance health expenditures and to consider opportunity costs; however, in the general analyses of our data this effect may be captured already by the income situation.

The EuroVaQ group reports (p.76) that men had a higher WTP. Our results of the two-part model are able to shed some more light on this observation. In both versions women were significantly more likely than men to state a positive WTP – with even stronger effects in the CAPI version. However, focussing only on those respondents who stated a positive value, males wanted to pay considerably higher amounts compared to their female counterparts. Therefore, it seems that women are more aware of the necessity to pay something in order to improve their own health, but they are less willing to pay high amounts.

Regions within Germany were assigned to two groups: "East" contains the East German Länder including Berlin and "West" the West German Länder. These regions turned out to be significant in the quantile regression models. East Germans showed a significantly lower WTP in both versions of the survey. This effect is observed in addition to effects of income differences between both regions, which have already been captured by the income categories. Note, too, that we have excluded all "protestors" and "protestors plus", i.e. respondents who agreed to the statement that health expenditures should be financed by the government. Therefore, this kind of attitude cannot be the reason for the differences observed. There seems to be some additional reluctance to spend money for medical treatment in the "East".

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tween the corresponding estimated coefficients, viz. 2,662 Euros and 4,825 Euros, respectively, is 2,263 Euros. Hence, WTP increases by 28.8% of additional annual income. Remark that, in contrast to standard least square regressions, values are calculated at the median value instead of the mean value.

Based on the descriptive results reported in Tables 5 to 8, one could expect significant differences between respondents with private and public health insurance. As this is a specific characteristic of the German sample, corresponding results of the EuroVaQ group are not available. The estimated positive coefficients in the quantile regression models of the CAWI version indicate that people with private insurance were willing to pay much more for a QALY, indeed. Interestingly, this result holds although we have controlled for income effects. Probably the privately insured were more accustomed to pay for their health care and were also more aware of "true" costs.

Finally the current situation of a respondent with regard to health status and life expectancy may have a relevant effect on WTP for a QALY. According to our hypothesis H6 this is theoretically expressed by diminishing marginal utility of health. In our regressions these effects are covered by the dummy variables for "own health" and "low remaining lifetime".[14] Only for the first quartile of WTP in the CAPI version individuals with a lower health level were willing to pay significantly more for a QALY gain compared to all other health categories. Furthermore, in the CAWI version respondents with a low remaining lifetime were less likely to state a positive WTP. Both observations could be reasonable: If someone expects to die in the nearer future, QALY gains may be perceived as being too low to pay anything for them. But if they mean a realistic improvement of the current situation, they are very desirable.

To summarize this subsection, several individual characteristics of respondents were found to display a significant influence on both decisions regarded. Most of these observations are in accordance with previous findings of the EuroVaQ group.

6.2 Effects of attributes of the scenarios

In Section 2 we have presented some hypotheses with respect to attributes of the scenarios. Furthermore, our descriptive results in Section 5 have already confirmed several of them. With the help of our regression results we are now able to make more robust statements.

Scenarios differed in the fraction of a QALY which could be gained by a medical treatment. In hypothesis H1 it was stated that WTP for a QALY is higher when only fractions of a QALY can be gained. Interestingly, especially the results of our two-part model for the CAWI version suggest that the underlying decision process is probably more complex. In scenarios where only a fraction of a QALY could be gained respondents were less likely to pay anything for such a gain. However, those who were willing to pay a positive amount indicated a value of a QALY which was considerably higher compared to those scenarios in which one QALY could be gained. Consequently, only this latter observation confirms the

[14] In the EuroVaQ project only the covariate "own health" has been included in the regression models.

initial hypothesis. Additionally, stated amounts were even higher for the highest quartile of WTP in case of fractions of a QALY.

In some of the scenarios only a fraction of a QALY could be gained due to the introduction of risk (scenarios M, O, and N), while in two other scenarios (D and E) a fraction of a QALY could be gained with certainty. Hence, we decided to further control for risk aspects. The quantile regression results reveal that this attribute had an additional and often significant effect on stated amounts. As expected, the signs of the estimated coefficients are similar to the corresponding values for the variable "fraction of a QALY" described in the previous paragraph. Also, the coefficients increase for higher quartiles. Hence, if respondents were willing to pay a positive amount in the case of uncertainty, this payment referred to a considerably higher value of a QALY compared to situations with certainty.

Other scenarios differed with respect to time span between payment and health improvement. Payment is in most cases described to be now whereas the effect of treatment could materialize in one year or at the end of life. The regression results for both survey versions reveal that participants were less likely to pay a positive amount for the health gain if it is said to take place at the end of their life rather than in one year's time. This finding confirms the initial hypothesis H2. Furthermore, if people expressed a positive WTP, the stated amount was significantly lower for gains at the end of life.

To summarize our regression results we could confirm several of our initial hypotheses. Nevertheless, results of the two-part model suggest that the underlying decision process of a respondent when deciding about the amount to be paid for a QALY gain is more complex than perhaps expected.

7. Concluding remarks

In this paper, we reported the results of a survey of a representative sample of the German population in which respondents were asked for their willingness-to-pay for either an extension of their life by one year or an improvement in their health for a given period of time. While one version of the survey exactly copied the setting (online survey) and the questionnaire used in the EuroVaQ project, in the second version we took greater efforts to persuade test persons to imagine a situation in which there was no other source of funding for their health care than their own payment. Moreover, the survey was conducted as a computer-assisted personal interview. The results confirm our conjecture that the average and median WTP responses became considerably larger in the second format.

As could be expected, stated WTP values increased with household income, while people below 30 and with a lower educational level expressed lower WTP than older or better educated persons, respectively. In addition, East Germans were willing to pay less than West Germans. Furthermore, our two-part model revealed some more complex decisions patterns:

Men were less likely to state a positive WTP, but if they did so, they wanted to pay a significantly higher amount.

WTP for a quality-adjusted life year was found to be concave in the number of QALYs at stake, suggesting that budget constraints play a role, and was lower when the health gain will occur farther in the future.

The results not only show that there is no single "value of a QALY" but that the technique of posing the questions plays an important role when respondents are asked to imagine their being in hypothetical situations. Moreover, the numbers appear quite moderate even in comparison with the cost-per-QALY thresholds discussed in the context of the British National Health Service. If they are taken seriously, they throw doubt on the notion that people would give everything they have for living longer or being healthier.

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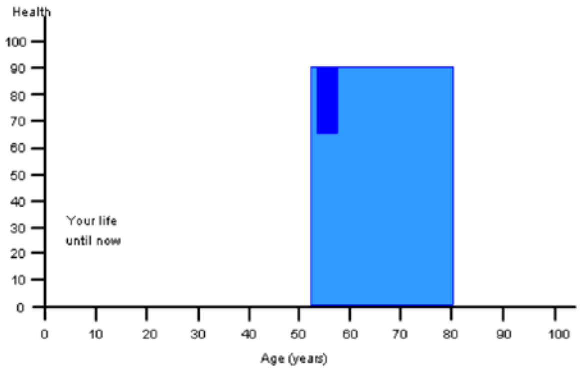
Appendix: Tables and Figures

Figure 1: Question A

Imagine that, in one year's time, rather than living the next **4 years** in your **current health**, you will experience a medical condition which reduces your health by **25 points** on the health thermometer scale.

For you this means your health will drop from **90** to **65** at age **53** as shown on the graph below.

After these 4 years, at age **57**, you will return to your **current health** for the remaining years of your life.



Would you be willing to pay something **NOW**, even if it was a small amount, for a **simple, safe and painless treatment** which would prevent you from experiencing this drop in health?

- Yes
- No

Figure 2: Overall Mean (Scenarios A, B, F, G, I, J, L, P)
1% Trimmed (USD PPP)

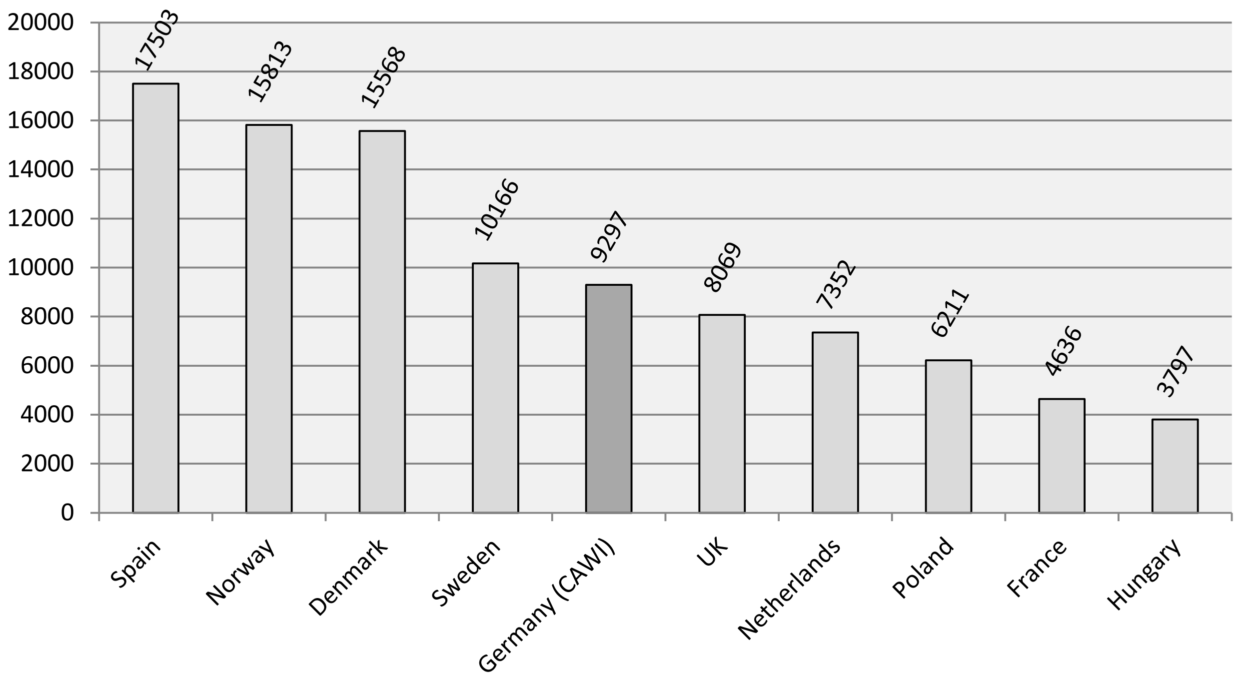


Figure 3: Overall Median (Scenarios A, B, F, G, I, J, L, P)
1% Trimmed (USD PPP)

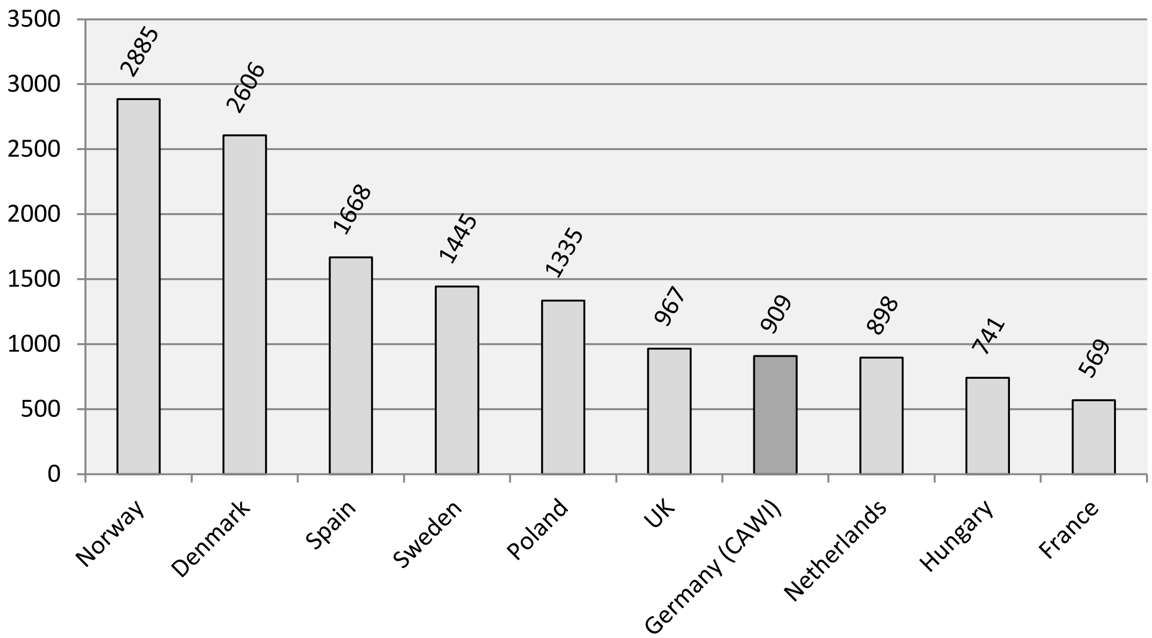


Table 1: Overview of Decision Scenarios (see Donaldson et al. 2010, p.82)

Scenario	Health gain	Duration	QALY gain	When	Certainty/Risk	Total responses (raw data)	
						CAWI	CAPI
A	25 points	4 years	1	in 1 year's time	certainty	762	246
B	25 points	4 years	1	End of life	certainty	372	121
F	10 points	10 years	1	in 1 year's time	certainty	735	231
G	10 points	10 years	1	End of life	certainty	349	110
I	extra life	12+ months [b)]	1	End of life	certainty	748	263
J	No coma	12+ months [b)]	1	in 1 year's time	certainty	744	261
L	Extra life (terminal illness)	12+ months [b)]	1	in 1 year's time	certainty	727	252
P	25 points[a)]	4 years	1	in 1 year's time	certainty	376	122
D	25 points	1 year	0.25	in 1 year's time	certainty	380	124
E	10 points	1 year	0.1	in 1 year's time	certainty	392	131
M	25 points	4 years	0.1	in 1 year's time	10% risk	325	124
O	10 points	10 years	0.1	in 1 year's time	10% risk	361	118
N	25 points	4 years	0.05	in 1 year's time	5% risk	325	124

a) Scenario P differs from A in that in P the price is to be paid in 4 annual installments, but in A in one amount.
b) In scenarios I, J, and L 'additional life' is offered. The duration is adapted to the respondent's own health rating so that the gain at that health level amounted to one QALY (see also Donaldson et al. 2010, p.60).

Table 2: Representativeness of Gender and Age

(Raw Data)

Gender and age	German population		CAWI			CAPI
	Total a)	Public insurance b)	Total (n=1.501)	Private insurance (n=220)	Public insurance (n=1281)	Public insurance (n=507)
male, 18-29	8.7%	7.4%	8.7%	14.5%	7.7%	8.9%
male, 30-44	11.9%	11.0%	14.1%	12.3%	14.4%	12.2%
male, 45-59	14.1%	13.5%	14.7%	16.8%	14.3%	13.2%
male, 60+	14.1%	14.4%	14.1%	21.8%	12.7%	13.6%
female, 18-29	8.3%	7.4%	8.9%	7.3%	9.1%	8.1%
female, 30-44	11.5%	11.8%	14.9%	10.5%	15.7%	13.2%
female, 45-59	13.8%	14.8%	11.1%	5.9%	12.0%	13.4%
female, 60+	17.7%	19.7%	13.5%	10.9%	14.0%	17.4%

a) Data from Statistisches Bundesamt, received October 13, 2012 via https://www-genesis.destatis.de/genesis/online Calculation based on age classes on 31 December 2011.
b) Data from Bundesgesundheitsministerium, received October 14, 2012 via http://www.bmg.bund.de/krankenversicherung/zahlen-und-fakten-zur-krankenversicherung.html

Table 3: Representativeness of Net Household Income and ESOMAR Social Grades (Raw Data)

	German population	CAWI			CAPI
		Total	Private insurance	Public insurance	Public insurance
Net household income class (in Euro) a)					
Below 900	12.3%	11.1%	4.1%	12.3%	4.9%
900 to below 1300	13.8%	7.2%	2.7%	8.0%	16.6%
1300 to below 1500	7.4%	2.5%	0.0%	3.0%	5.3%
1500 to below 2000	15.5%	16.0%	8.2%	17.3%	10.8%
2000 to below 2600	14.6%	19.3%	16.8%	19.8%	15.6%
2600 to below 3200	10.1%	11.5%	15.0%	10.9%	11.8%
3200 to below 4500	12.1%	11.7%	17.7%	10.7%	14.2%
4500 to below 6000	5.1%	4.1%	10.9%	2.9%	6.3%
6000 and more	3.0%	5.1%	13.2%	3.7%	3.6%
No answer	6.0%	11.5%	11.4%	11.6%	10.8%
ESOMAR Social Grade of chief income earner b)					
[A] Well educated top managers and professionals	10.7%	14.5%	31.4%	11.6%	8.7%
[B] Middle managers	11.5%	10.0%	16.8%	8.8%	3.2%
[C1] Well educated non-manual employees, skilled workers and business owners	19.7%	19.7%	23.2%	19.1%	14.2%
[C2] Skilled workers and non-manual employees	30.3%	23.0%	10.0%	25.2%	23.7%
[D] Skilled and unskilled manual workers and poorly educated people in non-manual/managerial positions	13.4%	18.2%	10.0%	19.6%	19.7%
[E] Less well educated skilled and unskilled manual workers, small business owners and farmers/ fishermen	10.7%	14.7%	8.6%	15.7%	30.6%
No answer	3.7%	-	-	-	-

a) Data for the German population from Statistisches Bundesamt, received July 30, 2012 via https://www-genesis.destatis.de/genesis/online (averages for 2011).
b) Data for the German population cf. ESOMAR 1997

Table 4: Frequencies of Reasons for Zero WTP

Scenario	N	Could live with it[a)]	Get better any-way[b)]	Can-not afford it	Gov't should pay	Too small risk	May be dead then	May be in poor health	Other
CAWI									
A	131	23.7	26.0	34.4	35.1	-	-	-	11.5
B	149	45.0	16.1	24.2	22.1	-	45.6	41.6	2.7
F	138	28.3	27.5	26.1	32.6	-	-	-	11.6
G	122	48.4	20.5	22.1	22.1	-	42.6	34.4	3.3
I	344	32.8	-	20.1	17.4	-	45.6	32.3	9.9
J	225	28.0	23.6	34.2	31.1	-	-	-	9.8
L	242	21.9	53.3	23.1	23.6	-	-	-	6.2
P	109	33.0	20.2	33.0	32.1	-	-	-	2.8
D	113	33.6	31.9	32.5	28.3	-	-	-	7.1
E	142	45.1	35.9	28.2	25.4	-	-	-	6.3
M	120	27.5	29.2	24.2	20.0	32.5	-	-	5.0
O	101	39.6	21.8	22.8	26.7	38.6	-	-	2.0
N	136	28.7	28.7	19.1	19.1	42.6	-	-	2.9
CAPI									
A	22	18.2	27.3	45.5	36.4	-	-	-	0.0
B	31	45.2	19.4	9.7	25.8	-	71.0	54.8	25.8
F	44	54.5	38.6	34.1	31.8	-	-	-	4.5
G	42	42.9	11.9	11.9	28.6	-	42.9	40.5	4.8
I	103	43.7	-	19.4	18.4	-	60.2	40.8	3.9
J	48	37.5	31.5	22.9	25.0	-	-	-	10.4
L	56	26.8	75.0	23.2	19.6	-	-	-	5.4
P	12	8.3	16.7	41.7	58.3	-	-	-	8.3
D	18	16.7	16.7	44.4	66.7	-	-	-	0.0
E	41	58.5	34.1	17.1	31.7	-	-	-	2.4
M	31	32.3	45.2	19.4	12.9	48.4	-	-	0.0
O	21	38.1	23.8	9.5	33.3	47.6	-	-	4.8
N	39	35.9	38.5	17.9	15.4	51.3	-	-	0.0

Note: Given are percentage values, multiple answers were permitted.
a) Scenario I: „Not enough of a gain“, Scenario L: “Want to leave money to family”.
b) Scenario L: “Paying to prolong death”

Table 5: Sample Sizes, Zero WTP and Protestors

Scenario	Raw Data (total responses)				Zero WTP (in % of raw data)				Protestors [a] (in % of raw data)		Protestors plus [b] (in % of raw data)	
	CAWI			CAPI (Public insurance)	CAWI			CAPI (Public insurance)	CAWI	CAPI	CAWI	CAPI
	Total	Private insurance	Public insurance		Total	Private insurance	Public insurance					
A	762	100	662	246	17.3	19.0	17.1	8.9	3.7	2.0	2.4	1.2
B	372	43	329	121	40.1	32.6	41.0	25.6	4.6	1.7	4.3	5.0
F	735	118	617	231	18.8	15.3	19.4	19.0	4.5	2.2	1.8	3.9
G	349	63	286	110	35.0	31.7	35.7	38.2	3.2	3.6	4.6	7.3
I	748	109	639	263	46.0	42.2	46.6	39.2	4.4	1.9	3.6	5.3
J	744	108	636	261	30.2	19.4	32.1	18.4	5.1	3.4	4.3	1.1
L	727	106	621	252	33.6	33.0	33.7	22.2	4.4	1.2	3.6	3.2
P	376	44	332	122	29.0	31.8	28.6	9.8	6.6	3.3	2.7	2.5
D	380	69	311	124	30.0	29.0	30.2	14.5	5.5	4.0	3.2	5.6
E	392	69	323	131	36.2	31.9	37.2	31.3	5.4	4.6	3.8	2.3
M	325	48	277	124	37.5	31.3	38.6	25.0	4.0	2.4	3.4	0.8
O	361	40	321	118	28.0	27.5	28.0	17.8	4.2	1.7	3.3	4.2
N	325	48	277	124	41.8	33.3	43.3	31.5	3.7	2.4	4.3	2.4

a) "Protestors" are those respondents who only state that "government should pay for health care".

b) "Protestors plus" are those respondents who state both that "government should pay for health care" and at least one further reason.

Table 6: Willingness to Pay for 1 QALY: Descriptive Statistics – Raw Data

Scenario	CAWI								CAPI			
	Public and private insurance				Public insurance				Public insurance			
	Max.	Mean	Median	S.D.	Max.	Mean	Median	S.D.	Max.	Mean	Median	S.D.
A	5,000,000	16,176	850	187,264	5,000,000	15,135	600	196,890	300,000	17,575	5,000	38,732
B	1,000,000	8,096	150	59,151	500,000	4,624	120	29,012	500,000	15,600	2,500	54,558
F	1,000,000	10,207	800	53,923	1,000,000	9,537	600	54,842	130,000	9,682	2,000	19,907
G	300,000	5,129	500	19,469	300,000	4,563	350	20,221	100,000	6,658	500	17,990
I	800,000	10,271	50	50,230	350,000	8,099	50	35,401	500,000	15,999	1,200	56,781
J	3,000,000	19,210	999	123,807	900,000	14,553	500	59,165	500,000	22,286	6,000	63,089
L	10,000,000	31,661	1,000	374,976	10,000,000	31,731	1,000	404,215	1,000,000	35,889	8,000	103,509
P	4,000,000	33,585	1,840	247,849	2,000,000	16,606	1,400	113,164	1,200,000	51,184	9,200	160,810
D	1,600,000	31,851	2,000	134,701	1,200,000	23,981	2,000	106,718	1,200,000	44,387	7,200	132,296
E	30,000,000	122,790	2,000	1,528,828	30,000,000	131,087	2,000	1,682,938	3,000,000	80,267	10,000	303,547
M	5,000,000	55,091	2,000	310,285	5,000,000	48,955	2,000	316,689	4,000,000	110,722	17,500	447,066
O	10,000,000	92,417	5,000	649,718	5,000,000	49,314	4,000	293,990	5,000,000	147,673	25,000	500,449
N	12,640,000	148,224	2,000	937,579	12,640,000	153,083	1,600	993,560	6,000,000	185,602	30,000	764,922

Table 7: Willingness to Pay for 1 QALY: Descriptive Statistics – Reduced Sample [a)]

Scenario	CAWI								CAPI			
	Public and private insurance				Public insurance				Public insurance			
	Max.	Mean	Median	S.D.	Max.	Mean	Median	S.D.	Max.	Mean	Median	S.D.
A	5,000,000	17,215	1,000	193,147	5,000,000	16,134	1,000	203,256	300,000	18,166	5,000	39,244
B	1,000,000	8,884	250	61,914	500,000	5,140	230	30,549	500,000	16,704	3,999	56,308
F	1,000,000	10,886	1,000	55,630	1,000,000	10,248	1,000	56,798	130,000	10,307	2,500	20,384
G	300,000	5,559	500	20,212	300,000	5,019	500	21,157	100,000	7,473	1,000	18,908
I	800,000	11,166	105	52,282	350,000	8,862	100	36,942	500,000	17,244	1,500	58,776
J	3,000,000	21,205	1,200	129,923	900,000	16,210	1,000	62,232	500,000	23,360	7,000	64,402
L	10,000,000	34,406	1,500	390,795	10,000,000	34,692	1,500	422,563	1,000,000	37,527	8,500	105,563
P	4,000,000	37,032	2,000	259,699	2,000,000	18,458	2,000	118,940	1,200,000	54,300	10,000	165,158
D	1,600,000	34,874	4,000	140,598	1,200,000	26,220	3,996	111,962	1,200,000	49,143	8,000	138,414
E	30,000,000	135,207	5,000	1,601,937	30,000,000	145,889	5,000	1,770,046	3,000,000	89,111	10,500	318,722
M	5,000,000	59,483	3,000	323,069	5,000,000	55,185	2,000	330,326	4,000,000	114,413	20,000	454,049
O	10,000,000	99,887	5,000	674,993	5,000,000	53,816	5,000	306,843	5,000,000	156,986	25,000	514696
N	12,640,000	161,113	3,000	975,284	12,640,000	164,180	2,000	1,035,251	6,000,000	195,040	30,000	783,106

a) Samples are reduced by "protestors", i.e. respondents who only state that "government should pay for health care", and "protestors plus", viz. respondents who state both that "government should pay for health care" and at least one further reason.

Table 8: Willingness to Pay for 1 QALY: Descriptive Statistics – Reduced Data and WTP>0

Sce-nario	CAWI										CAPI				
	Public and private insurance					Public insurance					Public insurance				
	n	Max.	Mean	Median	S.D.	n	Max.	Mean	Median	S.D.	n	Max.	Mean	Median	S.D.
A	630	5,000,000	19,565	1,500	205,816	549	5,000,000	18,250	1,000	216,107	224	300,000	19,301	5,000	40,184
B	223	1,000,000	13,506	1,500	75,985	194	500,000	7,842	1,000	37,485	90	500,000	20,973	5,000	62,445
F	597	1,000,000	12,567	1,500	59,592	497	1,000,000	11,839	1,500	60,893	187	130,000	11,960	3,000	21,509
G	227	300,000	7,886	1,600	23,702	184	300,000	7,093	1,500	24,874	68	100,000	10,771	3,000	21,945
I	404	800,000	19,016	2,000	67,157	341	350,000	15,177	1,800	47,370	160	500,000	26,298	5,000	70,993
J	519	3,000,000	27,537	4,000	147,500	432	900,000	21,425	3,000	70,780	213	500,000	27,309	10,000	68,874
L	483	10,000,000	47,656	5,000	459,371	412	10,000,000	47,827	5,000	495,686	196	1,000,000	46,142	10,000	115,393
P	267	4,000,000	47,296	4,000	292,777	237	2,000,000	23,287	4,000	133,230	110	1,200,000	56,768	10,000	168,485
D	265	1,600,000	45,665	8,000	159,414	216	1,200,000	34,110	6,000	126,708	106	1,200,000	51,924	9,000	141,801
E	250	30,000,000	192,535	15,000	1,909,859	203	30,000,000	209,132	14,990	2,117,704	90	3,000,000	116,834	15,000	360,926
M	203	5,000,000	88,199	15,000	390,467	170	5,000,000	83,103	10,000	402,874	93	4,000,000	147,629	45,000	511,573
O	260	10,000,000	128,317	10,000	762,974	231	5,000,000	68,493	10,000	344,866	97	5,000,000	179,643	45,000	547,204
N	189	12,640,000	254,882	20,000	1,218,069	157	12,640,000	265,616	20,000	1,308,065	85	6,000,000	270,761	70,000	912,924

Table 9: Characteristics of the Samples

Characteristic	CAWI (n=1,501)	CAPI (n=507)
Age (in years)		
18 to 29	17.6	17.0
30 to 44	29.0	25.4
45 to 59	25.8	26.6
60 plus	27.6	31.0
Income (monthly net household income in Euros)		
≤ 1,250 (lowest)	18.2	19.7
1,251 to 1,900 (low)	18.3	17.9
1,901 to 2,500 (medium)	19.4	15.2
2,501 to 3,500 (high)	17.7	15.4
Above 3,500 (highest)	14.9	20.9
Income not stated	11.5	10.8
Educational level		
Low (up to ten years of schooling)	36.2	63.7
Medium (additional three years of advanced education)	40.8	22.3
High (any type of university studies)	23.0	14.0
Females (rather than males)	48.4	52.1
East Germany including Berlin (rather than West Germany)	26.9	22.1
Private health insurance (rather than public insurance)	14.7	-
Own health (20-100)		
20 to 69 (poor)	16.3	18.1
70 to 79 (rather poor)	11.9	14.0
80 to 89 (rather good)	24.0	24.7
90 to 100 (very good)	47.8	43.2
Low remaining lifetime (less than 16 years)	9.0	11.0
OECD coefficient	1.6576 (0.6154)	1.5542 (0.5227)

Note: Given are percentage values. For the OECD coefficient mean values and standard deviations (in parentheses) are stated.

a) For Educational level four cases are missing in CAWI.

b) For OECD coefficient four cases in CAWI and one case in CAPI are missing.

Table 10: CAWI – Two-part Model (all scenarios, reduced data)

Characteristic	Probit (0: WTP=0, 1: WTP>0)		Quantile regression (only WTP > 0)					
			1st quartile (0.25)		2nd quartile (0.50)		3rd quartile (0.75)	
	dy/dx	(Std.Err.)	Coefficient	(Std.Err.)	Coefficient	(Std.Err.)	Coefficient	(Std.Err.)
Age 30 to 44	-.00655	(.01694)	-245.000**	(89.743)	-343.507	(346.374)	1402.801	(1317.601)
Age 45 to 59	.00854	(.01734)	-350.329***	(90.040)	-1232.777***	(223.783)	-3020.168**	(1033.753)
Age 60 plus	.05198**	(.01740)	-214.037	(126.193)	-703.693*	(357.719)	-1657.423	(1162.579)
Income 1.251 – 1.900	.04992**	(.01717)	110.964	(58.959)	282.269	(187.322)	95.798	(716.653)
Income 1.901 – 2.500	.09071***	(.01643)	279.526***	(77.839)	945.533**	(304.048)	1396.079	(974.667)
Income 2.501 – 3.500	.11846***	(.01650)	662.737***	(109.665)	3072.567***	(387.306)	5628.011***	(1656.010)
Income > 3.500	.12259***	(.01739)	376.774**	(128.185)	2868.112***	(572.714)	8476.471***	(2528.747)
Income not stated	-.01668	(.0217)	222.256*	(99.438)	1893.753***	(596.081)	6691.317***	(1104.239)
Education medium	.01168	(.01290)	43.212	(49.474)	122.959	(206.470)	-274.790	(815.647)
Education high	.01325	(.01579)	437.409***	(105.123)	1466.862***	(424.378)	2247.899*	(1073.487)
OECD coefficient	-.00537	(.01022)	-66.132	(38.642)	-244.903	(283.469)	78.431	(985.097)
Female	.03639**	(.01158)	-104.022*	(50.498)	-692.594***	(211.512)	-3751.821***	(718.023)
East Germany	-.01780	(.01334)	-277.898***	(59.694)	-879.611***	(248.638)	-3050.140***	(698.631)
Private health insurance	-.01705	(.01672)	289.993*	(129.318)	1870.643**	(708.658)	7426.331***	(1877.983)
Health rather poor	.02934	(.02093)	-58.715	(57.492)	-190.182	(205.336)	-362.745	(983.817)
Health rather good	-.00021	(.01884)	165.796	(108.363)	358.695	(267.167)	-401.961	(972.462)
Health very good	-.02246	(.01728)	128.073	(79.300)	269.266	(254.059)	953.782	(855.883)
Low remaining lifetime	-.06776**	(.02533)	-124.029	(111.309)	72.821	(342.457)	-94.398	(1227.288)
Fraction of a QALY	-.08179***	(.01954)	1631.613***	(303.990)	7503.181***	(1238.201)	24307.560***	(3355.884)
Risk	-.03329	(.02236)	761.774	(517.124)	2973.990	(2108.168)	17101.680**	(6675.714)
End of life	-.18441***	(.01591)	-121.453**	(44.557)	-679.980***	(186.866)	-2292.437***	(473.897)
Constant			413.226	(223.827)	1369.793	(884.022)	6129.972	(3228.248)
Number of observations	6044		4490		4490		4490	
Log likelihood	-3302.2147		-3302.2147		-3302.2147		-3302.2147	
Pseudo R^2	0.0415		0.0043		0.0143		0.0326	

Base case: Age 18-29, income ≤ 1250, educational level low, male, West Germany, public health insurance, poor health. For all independent variables except for OECD coefficient dy/dx is for a discrete change of a dummy variable from 0 to 1. Levels of significance: * 5%, ** 1%, *** 0.1%

Table 11: CAPI – Two-part Model (all scenarios, reduced data)

Characteristic	Probit (0: WTP=0, 1: WTP>0)		Quantile regression (only WTP>0)					
			1st quartile (0.25)		2nd quartile (0.50)		3rd quartile (0.75)	
	dy/dx	(Std.Err.)	Coefficient	(Std.Err.)	Coefficient	(Std.Err.)	Coefficient	(Std.Err.)
Age 30 to 44	-.03059	(.02660)	-387.586	(605.686)	-1465.789	(906.373)	-821.053	(2455.995)
Age 45 to 59	.00688	(.02643)	-170.345	(511.203)	-1577.256	(864.195)	-844.737	(3073.609)
Age 60 plus	.01500	(.02801)	702.759	(609.995)	735.338	(1127.051)	2586.842	(2802.94)
Income 1.251 – 1.900	.03681	(.02449)	687.586	(412.679)	2661.654***	(788.761)	5318.421**	(1892.902)
Income 1.901 – 2.500	.04556	(.02576)	1398.621*	(575.430)	4825.188***	(1350.061)	14100.000***	(2104.585)
Income 2.501 – 3.500	.06328*	(.02492)	2284.828*	(976.066)	6740.790***	(1445.812)	16105.260***	(2918.81)
Income > 3.500	.02035	(.02690)	3756.552***	(564.853)	10199.250***	(1811.154)	37368.420***	(7151.633)
Income not stated	.04603	(0.0295)	2066.207*	(953.736)	7149.060***	(1697.067)	28052.630*	(13719.02)
Education medium	.00991	(.02078)	759.310*	(335.996)	962.406	(777.849)	863.158	(1969.079)
Education high	.01914	(.02415)	1598.621	(1052.232)	533.647	(1680.291)	2276.316	(5828.021)
OECD coefficient	-.00716	(.01842)	-462.069	(461.228)	-1075.188	(772.890)	-6763.158***	(1555.529)
Female	.08412***	(.01707)	-1035.172***	(313.119)	-1701.128 **	(646.515)	-2189.474	(1770.025)
East Germany	-.02482	(.02213)	-1832.414***	(338.870)	-4663.534***	(691.234)	-8900.000***	(1173.145)
Private health insurance	-	-	-	-	-	-	-	-
Health rather weak	-.01735	(.03336)	-962.069*	(489.553)	-259.210	(1092.247)	-1147.368	(2296.654)
Health rather good	-.03849	(.03019)	-1687.586***	(469.268)	-497.932	(922.956)	6071.053	(3132.014)
Health very good	-.04373	(.02797)	-888.966*	(443.185)	253.384	(1160.417)	3907.895	(2816.153)
Low remaining lifetime	-.01649	(.03552)	162.069	(487.683)	1548.383	(2104.593)	5100.000	(4786.252)
Fraction of a QALY	-.03004	(.03015)	926.897	(1325.872)	5701.128***	(1555.577)	33481.580***	(8031.579)
Risk	-.06289	(.03689)	8781.379**	(3208.059)	32943.910***	(4959.254)	83681.580***	(21191.93)
End of life	-.18966***	(.02594)	-1000.000*	(405.045)	-2188.534**	(838.752)	-2836.842*	(1339.265)
Constant			4829.655***	(962.401)	9189.849***	(1622.055)	19602.630***	(3093.251)
Number of observations	2090		1715		1715		1715	
Log likelihood	-927.45731		-927.45731		-927.45731		-927.45731	
Pseudo R^2	0.0569		0.0158		0.0418		0.0996	

Base case: Age 18-29, income ≤ 1250, educational level low, male, West Germany, poor health. For all independent variables except for OECD coefficient dy/dx is for a discrete change of a dummy variable from 0 to 1. Levels of significance: * 5%, ** 1%, *** 0.1%