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Abstract

For the assessment of value of new therapies in healthcare, Health Technology Assessment (HTA) agencies often review the cost per Quality-Adjusted Life-Years (QALY) gained. Some HTAs accept a higher cost per QALY gained when treatment is aimed at prolonging survival for patients with a short expected remaining lifetime, a so called End-Of-Life (EoL) premium. The objective of this study is to elicit the existence and size of an EoL premium in cancer. Data was collected from 509 individuals in the Swedish general population 20-80 years old using a web-based questionnaire. Preferences were elicited using subjective risk estimation and the contingent valuation (CV) method. A split-sample design was applied to test for order bias. The value of a QALY at EoL in cancer was between €275,000 and €440,000, which is higher than the thresholds applied by HTAs. When expected remaining life expectancy was 6 months, the value of a QALY was 10-20 % higher compared to when remaining life expectancy was 24 months. Order of scenarios did not have a significant impact on the result and the result showed scale sensitivity. Thus this study supports an EoL premium in cancer when expected remaining lifetime is short.

Keywords: willingness to pay; value of a QALY; cancer; contingent valuation; order bias

JEL code: D61; D8; I18; J17

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1. INTRODUCTION

For the assessment of value of new therapies in healthcare, Health Technology Assessment (HTA) agencies often review the cost per Quality-Adjusted Life-Years (QALY) gained. The HTA's are implicitly placing a monetary value per QALY gained when taking decisions on price or inclusion of the treatment on treatment guidelines. A review of reimbursement decisions by the Swedish Dental and Pharmaceutical Benefits Agency (TLV) show that the implied Willingness To Pay (WTP) per QALY is between €80,000 and €135,000 (Svensson et al., 2015). The TLV does not apply an explicit threshold, and the empirical basis for an upper bound is limited. The Value of a Statistical Life (VSL) applied by the Swedish Transport Administration (€2.64 million(Trafikverket, 2016)) is however used as one reference, which would correspond to a value per QALY of about €103,000 (TLV, 2010). The English equivalent of the TLV – the National Institute for Health and Care Excellence (NICE) – applies an explicit threshold value for a QALY of €25-38,000 (£20-30,000) (NICE, 2013). The much lower value used by NICE is based on the actual cost per QALY gained in health care (supply side) instead of people's preferences (demand side) (Baker et al., 2011).

The Cancer Drug Fund (CDF), which was introduced by the UK government in 2011, pays for cancer drugs that has not been reviewed or was not approved by NICE (CDF, 2015). The fund implies assigning a higher value to health benefits generated by cancer drugs. The TLV apply a higher threshold to severe diseases (including cancer) (Svensson et al., 2015), but a number of reimbursement applications for cancer drugs exceeding a cost of €110,000 per QALY gained has been declined (TLV, 2012a, TLV, 2012b, TLV, 2014). Since the threshold lacks empirical support – other than the implicit reference to the VSL applied in the context of road traffic accidents – it has been questioned whether this corresponds to the value assigned to these gains by the general public (Engström, 2015). It has also been argued that cancer medicines are

associated with factors (e.g. dread, hope) that are not being considered in standard QALY measurements (Devlin and Lorgelly, 2016).

The weighting of QALY gains depending on the context in which they appear is an area of debate, and there are both theoretical (Brouwer et al., 2008, Gyrd-Hansen, 2005, Hammitt, 2013, Weinstein, 2008) and empirical support (Baker et al., 2010, Dolan et al., 2008, Pinto-Prades et al., 2009, Ryen and Svensson, 2014) for questioning whether a single value of a QALY is consistent with individual preferences. A review of studies of WTP for a QALY (Ryen and Svensson, 2014) concluded that WTP seems to be higher for life extending QALYs compared to Quality of Life (QoL) enhancing QALYs. The review also found that WTP for a QALY was negatively related to the size of the QALY gain, which has also been supported in theory (Hammitt, 2013). In 2009, NICE implemented an End-Of-Life (EoL) criteria into its decision making. This meant assigning a higher value to treatments that would cause an increase in survival of 3 months or more for diseases where the expected remaining lifetime was lower than 24 months (NICE, 2009). This implies that the value of a life-extending QALY gained would be negatively related to the expected remaining lifetime.

The preferences for the societal views of NICE, including the existence of a cancer premium and an EoL premium, have been assessed in a large-scale study. The study used a choice-based format where respondents were asked to allocate NHS fund between two different groups of patients. The study showed no preference for giving higher priority to patients with cancer (compared to patients with a non-cancer disease with similar outcome) or to extend life for patients with a short survival time (18 months vs 60 months) (Linley and Hughes, 2013). The existence of an EoL premium have also been assessed in several studies using a Patient Trade Off (PTO) approach where respondents are asked to choose between treating patient A or patient B who differ with respect to age, length of life, and quality of life before and after treatment. Except for a pilot study of 59 UK respondents (Shah et al., 2014), none of the studies

applying PTO have shown support for an EoL premium (Abel Olsen, 2013, Baker et al., 2010, Shah et al., 2015). Studies using individual WTP to elicit the existence of an EoL premium have resulted in the opposite result (Pennington et al., 2015, Pinto Prades et al., 2014). An explanation for these diverging results is that PTO studies rely on a social perspective, i.e. stating preferences for others. A social perspective could involve preferences for equality and the expression of social acceptable norms. The PTO studies might therefore not reveal any existence of an EoL premium since it would imply discriminating one patient over another. The available studies using an individual perspective do however apply rather extreme comparators to end-of-life treatment (e.g. alleviating temporary health problems) and estimate preferences under certainty (ex post).

The objective of this study is to estimate the existence and size of an EoL premium in cancer using individual ex ante WTP, enabling individuals to express preferences for themselves and to include risk aversion. In contrast to previous studies using this approach, we estimate the existence of an EoL premium by comparing the value of a small gain in life expectance at varying (but limited) expected remaining lifetime. This will make it possible to test if the EoL premium exist when using less extreme comparators and to assess if the premium remains when expected remaining lifetime increase. To our knowledge, this is the first study of an EoL premium and value of a QALY using subjective risk and specifying the disease that causes the premature death. Using subjective is expected to generate less biased estimates since the perceived risk has been shown to deviate from statistical risk (Slovic, 1987, Viscusi, 1998). Specifying the cause of death is expected to result in a more appropriate estimate since it has been shown that context has an impact on preferences (Alberini and Scasny, 2013). A secondary objective is to investigate if there is order bias and scale sensitivity when estimating an EoL premium and to study the characteristics of individuals who have a preference for EoL.

The following presentation is organized as follows. Section 2 describes the study design and presents the details of the methods used. The main result is presented in Section 3 and the article ends with a discussion of the result in Section 4.

2. METHODS

2.1 Study design

The study perform a Contingent Valuation (CV) study, where respondents are asked to state their WTP for an insurance that will give them access to a drug that can prolong survival if they would get a fatal cancer disease during the next ten years. The CV approach was chosen since the suitability of the discrete choice method for deriving a value of a QALY have been questioned (Baker et al., 2010).

We constructed a web-based questionnaire based on CV methodology that presented four WTP scenarios, varying the length of life without treatment and the increase in survival with treatment. The questionnaire was distributed to a sample drawn from an internet panel recruited from Swedish national population registry. Half sample received a questionnaire version with opposite scenario order to enable test of order bias.

2.2 Questionnaire design and scenario presentation

The first part of the questionnaire included background questions (e.g. sex, age, occupation, income). The respondent was then introduced to the purpose of the study as well as the concept and meaning of WTP. After this, the respondent was introduced to the QoL of a person with a fatal cancer disease partly based on a review of QoL in cancer (Pickard et al., 2007)[1] and asked to rate her own QoL on a scale from 0 (representing death) to 100 (representing best possible health). The respondent was then presented with the risk of dying in cancer. The risk was presented per 1,000 persons of the age and sex of the respondent during the next ten years (Appendix) and illustrated by displaying 1,000 dots, whereof X dots were colored black to

[1] The review found a large variation of QoL in cancer ranging from 0.33 to 0.93. Most QoL measurements were however above 0.5. Since the cancer type in the questionnaire is fatal, it was found reasonable to apply 0.6 as a mean average and 0.4 was considered appropriate for the last month alive.

represent the risk of a fatal cancer disease. The respondent was also asked about her risk perception (control, anxiety), and to estimate her own risk (per 1,000 in the next ten years).

Next, the respondent was asked for her WTP for an insurance which would give her access to a treatment that could increase length of life if she would get fatal cancer during the next ten years. The ten-year time horizon was chosen to make the insurance meaningful and baseline risk more tangible. The risk of a fatal cancer disease was presented as the risk estimated by the respondent, i.e. the subjective risk. (Figure 1). Four follow-up sections were included to make it possible for the respondents to review and change their WTP when comparing WTP in different scenarios. The respondent was also asked to choose between two end-of-life treatments differing with respect to survival without treatment or survival gain in order to gain a further check on preferences. (Table I)

<<Figure 1>>

<<Table I>>

A modified version of Payment Card (PC), certainty calibration, and debriefing questions for payers and non-payers were included in the WTP scenarios in order to limit bias which is common in CV studies. The PC-procedure consist of presenting a number of amounts to the respondent in numerical order (SEK1, 100, 500, 1,000, 1,500, 2,000, 3,000, 4,000, 5000, 7,000, 9,000 per year) and ask whether she would pay or not pay the amount (Bateman et al., 2002, Covey et al., 2007). The range of amounts were set to identify non-payers and to cover what are assumed to be the range of WTP estimates in these kind of studies (Johannesson, 1996, Svensson, 2009). This study applies two modifications to the PC-procedure. First, the amounts were presented one at a time instead of all at once. This allowed us to identify non-payers without having to use a screening question which is known to increase zero response (Gyrd-Hansen et al., 2014), and to avoid the problem of range bias which is associated with presenting all of the amounts simultaneously (Covey et al., 2007). Secondly, we added a procedure from

the EuroVaq study (EuroVaq Team, 2010) where the respondent is presented with the highest amount she would pay and the lowest amount she would not pay and asked to state her WTP in an open question. This allows the respondent to be more precise and generate WTP as a continuous variable.

Certainty calibration means asking respondents to rate (on a scale from 0 to 10) how sure she is that she would pay the amount if she were given the opportunity to buy the good for that price. This question is assumed to reduce hypothetical bias (i.e. WTP responses deviating from what the respondent would pay for real) by separating certain respondents – those who are assumed to buy the good for real – from uncertain respondents – those who are assumed to not buy the good for real (Blumenschein et al., 2001, Loomis, 2014). Debriefing questions means asking respondents to state their reasons for paying or not paying. Respondents who indicate that they do not take the survey seriously, do not understand the question, or who protest against the scenario can thereby be identified and possibly excluded (Bateman et al., 2002).

2.3 Pilot

The questionnaire was pre-tested by a sample of 53 respondents from an internet panel, and a convenience sample of 14 respondents who were also included in a focus group discussion after completing the questionnaire. The pilot study was performed in May 2016. The pilot showed that preferences for EoL varied between scenarios and between respondents. To make sure that the order of the scenarios did not cause bias, the final questionnaire was constructed in two versions with opposite scenario order. Some questions with a choice-based format were also included in the final version to further elicit the preferences of respondents. It was also apparent in the pilot that the increase in survival between scenario 1-2 (+3 months) and scenario 3-4 (+12 months) might produce an income effect (i.e. the budget constraint puts a limit on the WTP of

the respondent), leading to less reliable estimates. The gain in survival was therefore reduced to +6 months in scenario 3-4 in the final questionnaire.

2.4 Sample

A web-based version of the questionnaire was programmed and sent to a randomly stratified sample of individuals from the adult Swedish general population (20-80 years old) drawn from the Sinitor panel (http://vocnordic.se/panel-2/; total panel population, n = 25,000). The panel respondents were offered a minor incentive for their participation. Data was collected in June 2016. The questionnaires were sent to a total of 2067 individuals, whereof 780 (38 %) started the questionnaire and 509 (25 %) completed the questionnaire. The majority of the respondents who choose not to complete the questionnaire dropped out after introduction of WTP or at the first WTP question. The respondents were older (SCB, 2015), more educated (SCB, 2016b) and had a higher mean income (SCB, 2016a) compared to the general population (Table II).

<<Table II>>

2.5 Analysis

All respondents who completed the questionnaire were included. When analyzing the WTP responses, respondents classified as protesters or outliers where excluded in the main analysis. Protesters are respondents who do not want to pay because they think the government should pay or respondents who state any WTP because they know they do not have to pay for real. Excluding these respondents is a common procedure since they have indicated that they do not accept the scenario (Bateman et al., 2002). Outliers are defined as respondents stating a WTP in the open-ended question which is above the largest amount in the PC-procedure (SEK 9,000 per year). Trimming results with respect to outliers is also a common procedure to avoid giving extreme responses too much weight on mean results. A subgroup analysis was also performed where respondents who rated below 7 on the certainty calibration question were excluded. The

cut off at 7 has been supported by previous research (Loomis, 2014), while other studies argues for only treating the respondents rating 10 as certain (Svensson, 2009). WTP is reported in SEK (SEK1=€0.11).

The value of a QALY (VQALY) for different EoL treatments (e) was calculated by multiplying the individual WTP per year by ten and dividing it by the subjective risk (p) of the individual multiplied by the QALY gain[2] of the treatment (eq.2).

$$(\text{Eq. } 1)\ \text{VQALY}_e = \frac{WTP\ per\ year_{i,e} \times 10}{p_i \times 0.15\ or\ 0.30\ QALYs}$$

A Wilcoxon Signed Ranks Test was used to test for significant differences in WTP within groups – i.e. between different scenarios - and a Mann-Whitney U Test was used to test for significant differences between groups – i.e. between groups with different scenario order.

An OLS regression was performed to validate and explain the result, using the log of WTP as the dependent variable and questionnaire version, age, age squared (defined as (age-mean age)^2), sex, university education, log of income per consumption unit (Statistics Sweden, 2015), response in certainty calibration, log baseline risk, log subjective risk, control, and anxiety as explanatory variables. The logarithm of WTP and other variables is used to take account of the skewed distribution of WTP and to make the result easy to interpret. Age squared is used to assess if the relationship with WTP takes the form of an inverted U (Shepard and Zeckhauser, 1984), which is a common finding. The OLS regression was performed for each scenario separately (both questionnaire versions) and for all scenarios pooled.

[2] QALY-gain of 3 months survival gain = 0.6 x (3/12) =0.15 QALYs. QALY-gain of 6 months survival gain= 0.6 x (6/12) = 0.30 QALYs.

3. RESULTS

3.1 Risk perception

After excluding 43 respondents (8 %) with an implausibly high subjective risk (300 per 1000 or higher), mean subjective risk was lower than the mean statistical risk (40 vs 48 per 1000). Consistent with previous findings and theoretical expectations (Slovic, 1987, Viscusi, 1998) there was a tendency to overestimate risk when statistical risk was small and underestimate risk when statistical risk was large (Figure 2). The majority of respondents rated control of cancer risk (can impact by own behavior) at 3 or above on a 5-point scale while the majority of respondents rated worry of cancer death at 3 or below on a 5-point scale. There were however a significant share of respondents rating control below 3 (29 %) and worry above 3 (21 %).

<<Figure 2>>

3.2 Choice-based questions

About 25 % of respondent preferred a survival gain of 3 months when expected remaining lifetime was shorter (9 vs. 24 months), i.e. expressing preference for EoL. (Figure 3) An almost equally large share of respondents preferred a survival gain of 3 months when expected lifetime was longer, indicating that preferences regarding EoL are heterogeneous. About 40 % of respondents were indifferent. There was a tendency for less preference for EoL when expected remaining lifetime was longer, but the size of the survival gain did not seem to have an impact on preferences. (Figure 4) The share of respondents with a preference for EoL was higher in questionnaire version 1 (low to high), which indicate some order bias.

<<Figure 3>>

<<Figure 4>>

3.3 Willingness to Pay (WTP)

The WTP for a survival gain of 3 months was significantly higher when expected remaining lifetime was shorter (6 months vs 24 months) in questionnaire version 1 (low to high), indicating the existence of an EoL premium of about 9 %. Support for an EoL premium of about 13 % was also found in questionnaire version 2 (high to low) but the difference was not statistically significant. The support for an EoL premium found in version 1 seems to be driven by the preferences of women and older respondents (Table III-V).

The WTP for a survival gain of 6 months was not significantly different when the expected remaining lifetime was shorter (24 months vs 36 months). This might suggest that an EoL premium only exist when expected remaining lifetime is very short, a finding that is consistent with the result of the choice-based questions.

The WTP for a survival gain of 6 months was significantly higher compared to WTP for a survival gain of 3 months when expected remaining lifetime was 24 months, indicating scale sensitivity. The difference was close to proportional in questionnaire version 2 (high to low) but less than proportional in questionnaire version 1 (low to high). This would support the assumption that scale insensitivity is to some part a consequence of an income effect.

There were no significant differences in WTP between questionnaire versions, indicating no order bias. However, there were different patterns. As stated above, the result from questionnaire version 2 (high to low) resulted in more scale sensitivity and less support for EoL. The WTP for a 3 month survival gain was also somewhat lower which can be explained by finding it to be of a lower value after having been presented with a 6 month survival gain.

<<Table III>>

<<Table IV>>

<<Table V>>

The value of a QALY is between MSEK 5.8 and 11.0 in the main analysis. (Table VI) When excluding the respondents with a value of a QALY above SEK 50 (about ten times the lowest mean), the value of a QALY is between MSEK 2.5 and 4.0. Consistent with the result of the WTP per year, the value of a QALY based on a 3 months survival gain is higher with a shorter expected remaining lifetime in both versions, although only significantly higher in version 1 (+18 %). There were no differences between value of a QALY derived from scenario 24+6 and 36+6. The value of a QALY derived based on a 6 months survival gain was lower compared to the value of a QALY derived based on a 3 months survival gain. This could indicate scale insensitivity, but might also reflect diminishing marginal returns to QALY gains.

<<Table VI>>

Questionnaire version did not have a significant impact on the WTP, indicating no order bias. (Table VII) Respondents with a university education had a significantly lower WTP compared to respondent without a university education. This could support the trimming of outliers if the lower WTP represent a more correct estimation of risk. Income was not related to WTP, which could be a consequence of the negative relation between education and WTP. Subjective risk was positively related to WTP, as was rating anxiety for cancer above average. This indicate that risk perception is an important driver for the WTP of the respondent which has also been shown in previous studies. Rating on the certainty scale was positively related to WTP. Age, sex, objective risk and quality of life were not related to WTP. The WTP in scenario 24+3 was not significantly different from the WTP in scenario 6+3, but the coefficient was negative. The WTP in scenario 24+6 and 36+6 were both significantly higher than the WTP in scenario 6+3, indicating scale sensitivity.

<<Table VII>>

4. DISCUSSION

This study supports an EoL premium when expected remaining lifetime is short. Preference for EoL was found even though the survival gain was small and the expected remaining lifetime was short in both scenarios. The preference for EoL was also of a similar size irrespective of scenario order and did remain after calculating the value of a QALY. No support was found for an EoL premium when comparing the value of a 6 month survival gain with 24 and 36 months of expected remaining lifetime. The choice-based questions also reveal a decline in preferences for EoL when expected remaining lifetime is between 12 and 21 months and that preferences for EoL are heterogeneous. This study also show that the value of a QALY at EoL in cancer is between MSEK 2.5 (€275,000) and MSEK 4.0 (€440,000).

This is to our knowledge one of the first studies using subjective risk when estimating the value of a QALY. Subjective risk had a significant impact on WTP, validating this approach and the result of the survey. Consistent with previous research on risk perception, there was found to be a difference between subjective risk and statistical risk. Using the statistical risk to calculate the value of a QALY will consequently result in a biased estimate.

The study showed evidence of scale sensitivity, i.e. that the WTP increase in relation to the size of the benefit. However, the increase in version 1 was only 16 % which is far from proportional while the increase in version 2 was close to proportional. The scenario with a 6 month survival gain was presented after the scenario with a 3 month survival gain in version 1 and the opposite order was used in version 2. Consequently, respondents to version 1 would have to double their previously stated WTP while respondents to version 2 would have to state half their previously stated WTP in order for a proportional result. The difference in scale sensitivity seem therefore to be a result of an income effect, i.e. the budget of the respondent put a limit on the WTP.

Although there were no significant differences in WTP depending on scenario order, there were some different trends. One is the previously mentioned difference with respect to scale sensitivity. Another is the evidence for EoL when expected remaining lifetime is short. Although the difference in WTP was similar between questionnaire versions, the difference was only significant in version 1. A third difference is that the WTP for a 3 month survival gain was lower in version 2 compared to version 1. Using the WTP in the first scenario as a reference point for the WTP of subsequent scenarios could be an explanation for these findings. Income effect might be another possible explanation if respondents interpreted payments as cumulative.

A majority (62 %) did not begin to answer to the questionnaire and about 13 % dropped out before it was completed. The majority dropped out when being presented with WTP. Since health care is payed for through taxes in Sweden, being asked to pay for a private insurance giving access to a cancer treatment that can prolong life can be considered controversial. To avoid this, the respondents were told that the scenarios were purely hypothetical and would not have any implications for the real-world financing of health care. However, some respondents may still have considered it controversial and objected to take part in the survey. The share of zeros, protesters, and outliers were however similar to what has been reported in other studies (Gyrd-Hansen et al., 2014), suggesting that respondents who chose to complete the questionnaire did not object to paying for health care to a unusual high degree. Respondents who completed the questionnaire were however older and more educated compared to the general population.

The support for an EoL premium is consistent with the result of other studies eliciting preferences for EoL using WTP and an individual perspective (Pennington et al., 2015, Pinto Prades et al., 2014). However, both studies applied a rather extreme comparator (life extending QALY at EoL versus QoL enhancing QALY for temporary/non-fatal disease). The result of this study is contrary to the studies using PTO (Abel Olsen, 2013, Baker et al., 2010, Shah et

al., 2015) and the study by Linley and Hughes 2013 that did not find any support for an EoL premium. An explanation for this finding is that these studies applied a social perspective while this study relied on an individual perspective. Also, the study by Linley and Hughes 2013 used 18 months as the EoL alternative. The result of this study suggests that support for EoL exist when expected remaining lifetime is very short, and start to decline somewhere between 12 and 21 months.

The value of a QALY in this study is higher than other studies. One explanation for this is the use of an ex ante perspective (i.e. when the individual faces a probability of falling ill). Another study on the value of a QALY ex ante found it to amount to €250,500 (Bobinac et al., 2014). Another explanation for a higher value of a QALY is the context of cancer which has been shown to cause dread and consequently of a higher value to avoid or eliminate (Alberini and Scasny, 2013, Viscusi et al., 2014). Alberini and Scazny show that the VSL in cancer is almost double the VSL in road traffic accidents (Alberini and Scasny, 2013). This has also been confirmed in a currently unpublished study, which showed that pancreatic cancer (6 months survival) had a VSL of MSEK 45-64 and multiple myeloma (24 months survival) had a VSL of MSEK 32-60. A further reason for the high value is the small gain in QALY and the short expected remaining lifetime. Research has shown that the value of a QALY is negatively related to the expected remaining lifetime and to the QALY gain (Hammitt, 2013, Ryen and Svensson, 2014).

The use of an EoL criteria by NICE is supported in this study as well as the application when expected remaining lifetime is below 24 months. The current threshold of NICE is however not supported, but it is on the other hand meant to be based on the actual cost per QALY gained in health care. The TLV does however apply value-based pricing and the value of a QALY should at least include considerations of the preferences of the general population. Reviews on reimbursement decisions by the TLV imply the use of an upper threshold of around MSEK 1

(Svensson et al., 2015). Several reimbursement applications with a higher threshold have been declined and pharmaceutical companies have consequently started to adapt their applications for this limit. This study – along with other research – suggest that there are reasons to assume that the general population consider the value of a QALY in the context of cancer treatments with a survival gain to be higher.

Tables

Table I. Questionnaire design

	Version 1 (low to high)	**Version 2 (high to low)**
Scenario 1	6+3[a]	36+6
Scenario 2	24+3	24+6
Follow-up 1 (scenario 1 and 2)	Review[b] + choice1[c]	Review + choice2[d]
Scenario 3	24+6	24+3
Follow-up 2 (scenario 2 and 3)	Review	Review
Scenario 4	36+6	6+3
Follow-up 3 (scenario 3 and 4)	Review+choice2	Review + choice1
Follow-up 4 (all scenarios)	Review	Review

[a]6 months expected remaining lifetime without treatment, 3 month survival gain with treatment.
[b]WTP of scenarios were presented and respondents were allowed to change them.
[c]Choosing what treatment would have a higher value: 9+3 vs 24+3, 12+3 vs 24+3, 21+3 vs 24+3
[d]Choosing what treatment would have a higher value: 24+12 vs 36+12, 24+3 vs 36+3

Table II. Sample characteristics

Variable	Version 1 (n=252)	Version 2 (n=257)	p-value
Mean age (Std.Dev.)	53.81 (16.68)	55.06 (16.00)	0.3877
Females	55 %	50 %	0.2639
One adult in household	28 %	30 %	0.7286
Child in household	21 %	24 %	0.4654
University education	54 %	53 %	0.8815
Employed	46 %	46 %	0.9076
Mean household[a] income	43,043	42,607	0.8227
Quality of Life (QoL)[a]	0.8255 (0.1547)	0.8109 (0.1775)	0.3281

[a]Optional question, QoL: Version 1 n=248; Version 2 n=253. Income: Version 1 n=230; Version 2 n=234 Income transformed from interval using intermediate values.

Table III. Mean WTP (SEK) per year (Std.Dev.), median in questionnaire version 1 (low to high)

	(1) 6+3	**(2) 24+3**	**(1-2) Diff**	**(3) 24+6**	**(2-3) Diff**	**(4) 36+6**	**(3-4) Diff**
All	2054 (8388), 200	1916 (8321), 175	138 (7%)**	2118 (8516), 250	-202 (11 %) ***	2167 (8570), 200	-49 (2 %)
Excl. protesters	2228 (8722), 500	1975 (8540), 250	253 (13 %) **	2287 (8836), 300	-312 (16 %) ***	2351 (8909), 450	-64 (3 %)
Excl. protesters and outliers (main analysis)	**918 (1650), 250**	**837 (1579), 200**	**81 (9%)****	**968 (1667), 250**	**-131 (16 %) *****	**984 (1713), 275**	**-16 (2 %)**
Excl. protesters and outliers, using final value	858 (1548), 250	853 (1585), 200	5 (1 %)	979 (1651), 300	-126 (15 %) ***	1001 (1712), 300	-22 (2 %)
Excl. protesters, outliers, and uncertain	749 (1682), 100	741 (1684), 65	8 (1 %)	800 (1689), 125	-59 (8 %) ***	729 (1569)	71 (10 %)
Zero response (n)	61 (24 %)	69 (27 %)		59 (23 %)		64 (25 %)	
Protesters (n)[a]	20 (8 %)	18 (7 %)		19 (8 %)		20 (8 %)	
Outliers (n)[b]	11 (4 %)	10 (4 %)		12 (5 %)		12 (5 %)	
Changers (n)[c]	9 (4 %)	18 (4 %)		19 (8 %)		6 (2 %)	
Uncertain (n)[d]	114 (45 %)	118 (47 %)		112 (44 %)		116 (46 %)	

*p<0.1 **p<0.05 ***p<0.01

[a]Nonpayers "because government should pay" + Payers stating any amount "because they do not have to pay".

[b]WTP open question >SEK9,000 per year.

[c]Change WTP after reviewing their WTP of different scenarios.

[d]Below 7 on a scale from 0 to 10.

Table IV. Mean WTP (SEK) per year (Std.Dev.), median in questionnaire version 2 (high to low)

	(1) 6+3	**(2) 24+3**	**(1-2) Diff**	**(3) 24+6**	**(2-3) Diff**	**(4) 36+6**	**(3-4) Diff**
All	1175 (3470), 150	1854 (8240), 150	-679 (58 %)	1965 (8039), 500	-111 (6 %) ***	2094 (8157), 500	-129 (7 %)
Excl. protesters	1235 (3567), 200	1967 (8529), 200	-732 (59 %)	2086 (8270), 500	-119 (6 %) ***	2192 (8342), 500	-106 (5 %)
Excl. protesters and outliers (main analysis)	**737 (1272), 200**	**641 (1062), 150**	**96 (13 %)**	**1055 (1557), 500**	**-414 (65 %) *****	**1052 (1661), 500**	**3 (0 %)**
Excl. protesters and outliers, using final value	735 (1270), 200	658 (1075), 150	77 (10 %)	1117 (1952), 500	-459 (70 %) ***	1137 (2063), 500	-20 (2 %)
Excl. protesters, outliers, and uncertain	831 (1627), 100	674 (1140), 100	157 (23 %)	1045 (1713), 200	371 (55 %) ***	916 (1541), 250	129 (14 %)
Zero response (n)	64 (25 %)	59 (23 %)		45 (18 %)		47 (19 %)	
Protesters (n)[a]	22 (9 %)	18 (7 %)		15 (6 %)		12 (5 %)	
Outliers (n)[b]	8 (3 %)	11 (4 %)		9 (4 %)		11 (4 %)	
Changers (n)[c]	4 (2 %)	19 (8 %)		16 (6 %)		7 (3 %)	
Uncertain (n)[d]	127 (50 %)	126 (50 %)		134 (53 %)		120 (48 %)	

*p<0.1 **p<0.05 ***p<0.01

[a]Nonpayers "because government should pay" + Payers stating any amount "because they do not have to pay".

[b]WTP open question >SEK9,000 per year.

[c]Change WTP after reviewing their WTP of different scenarios.

[d]Below 7 on a scale from 0 to 10.

Table V. Main result stratified by sex and age (Std.Dev.)

	(1) 6+3	(2) 24+3	(1-2) Diff	(3) 24+6	(2-3) Diff	(4) 36+6	(3-4) Diff
Version 1							
Women	938 (1593)	687 (1231)	251 (37 %)***	925 (1449)	-238 (35 %)***	876 (1473)	49 (6 %)
Men	895 (1726)	1027 (1924)	-132 (13 %)	1021 (1909)	6 (1 %)***	1115 (1968)	-94 (8 %)
≥60 yrs	879 (1738)	753 (1619)	126 (17 %)**	890 (1696)	-137 (18 %)***	929 (1714)	-39 (4 %)
<60 yrs	948 (1587)	898 (1552)	50 (6 %)	1027 (1690)	-129 (14 %)***	1026 (1718)	1 (0 %)
Version 2							
Women	763 (1288)	712 (1134)	51 (7 %)	1090 (1514)	-378 (53 %)***	1147 (1759)	-57 (5 %)
Men	710 (1261)	565 (979)	145 (26 %)	1019 (1606)	-454 (80 %)***	951 (1552)	59 (6 %)
≥60 yrs	747 (1339)	628 (1016)	119 (19 %)	1059 (1503)	-431 (69 %)***	1131 (1890)	-72 (6 %)
<60 yrs	729 (1219)	651 (1102)	78 (12 %)	1052 (1603)	-401 (62 %)***	990 (1464)	62 (6 %)

*p<0.1 **p<0.05 ***p<0.01

Table VI. Mean value (MSEK) per QALY[a] (Std.Dev.), median

	6+3	24+3	24+6	36+6
Main analysis				
Version 1	10.4 (32.6), 0.5	11.0 (37.8), 0.4	6.5 (22.1), 0.3	6.2 (20.9), 0.3
Version 2	6.9 (22.7), 0.6	6.6 (21.6), 0.5	5.8 (19.7), 0.4	6.9 (26.0), 0.3
Main analysis excluding vQALY>MSEK50				
Version 1	4.0 (8.4), 0.4	3.4 (7.3), 0.3	2.5 (5.6), 0.2	3.0 (6.7), 0.3
Version 2	3.3 (7.5), 0.5	3.0 (6.7), 0.4	2.6 (6.0), 0.3	2.5 (6.1), 0.3
Number of respondents in main analysis with vQALY>MSEK50				
Version 1	12	14	10	8
Version 2	7	7	8	10

[a](Individual WTP per year x 10)/(subjective risk x QALY-gain)

Table VII. Regression of ln(wtp)

VARIABLES	ln(wtp) all scenarios pooled	ln(wtp 6+3)	ln(wtp 24+3)	ln(wtp 24+6)	ln(wtp 36+6)
Questionnaire version (low to high=1)	0.0285	0.147	0.167	-0.0361	-0.0532
	(0.185)	(0.205)	(0.210)	(0.200)	(0.199)
ln(age)	0.0619	0.714	0.589	0.480	-1.476
	(1.759)	(1.713)	(1.747)	(1.718)	(1.758)
ln((age-mean age)^2)	0.0273	0.0184	0.0320	0.0354	0.0154
	(0.0553)	(0.0639)	(0.0667)	(0.0598)	(0.0608)
Female=1	0.0634	0.107	-0.0158	0.0787	0.117
	(0.192)	(0.214)	(0.218)	(0.208)	(0.206)
University education=1	-0.449**	-0.381*	-0.533**	-0.459**	-0.412**
	(0.190)	(0.215)	(0.221)	(0.208)	(0.209)
ln(household income per consumption unit)	0.0800	0.0427	0.108	0.268	0.0937
	(0.240)	(0.233)	(0.237)	(0.230)	(0.235)
ln(objective risk)	0.0777	-0.0659	-0.0216	-0.0648	0.356
	(0.367)	(0.361)	(0.368)	(0.358)	(0.363)
ln(subjective risk)	0.129**	0.148**	0.130*	0.128*	0.0954
	(0.0625)	(0.0713)	(0.0728)	(0.0687)	(0.0671)
Quality of life	0.223	0.322	0.128	0.408	-0.128
	(0.452)	(0.402)	(0.412)	(0.406)	(0.380)
Control above 3=1	0.326	0.377*	0.190	0.244	0.185
	(0.205)	(0.223)	(0.227)	(0.215)	(0.212)
Anxiety above 3=1	0.486**	0.378	0.551**	0.425*	0.474*
	(0.201)	(0.263)	(0.269)	(0.257)	(0.248)
24+3 vs 6+3	-0.0219				
	(0.0667)				
24+6 vs 6+3	0.308***				
	(0.0713)				
36+6 vs 6+3	0.401***				
	(0.0772)				
Certainty scale		0.115***	0.135***	0.0759*	0.107**
		(0.0429)	(0.0448)	(0.0459)	(0.0426)
Constant	3.151	0.0338	0.596	-0.978	9.648
	(6.658)	(6.280)	(6.370)	(6.221)	(6.366)
Observations	1,399	350	347	355	347
R-squared	0.072	0.094	0.107	0.066	0.068

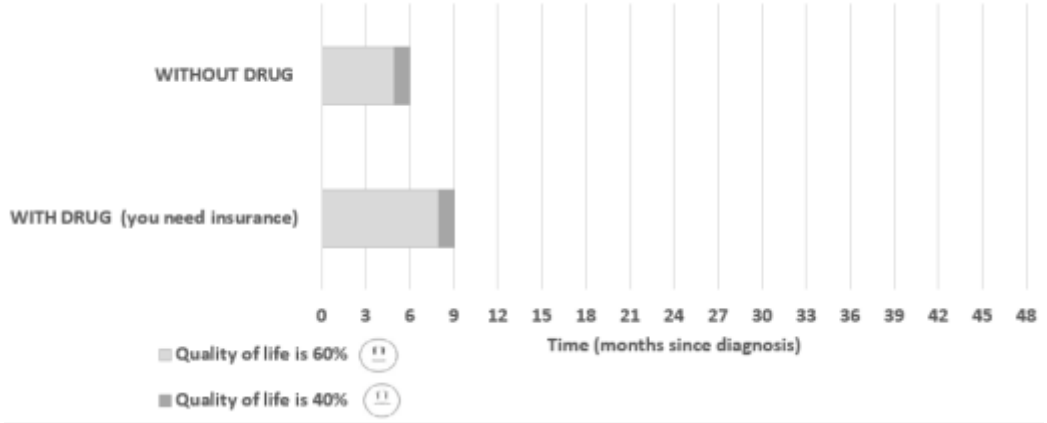
Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figures

You stated earlier that you believe that the risk that you will be diagnosed with a deadly form of cancer within 10 years is [respondent's subjective estimation] in 1,000. Assume that if you fall ill you get a standard treatment which means you live for 6 months with impaired health before you die.

Also assume that you can buy an insurance today that would give you access to a drug that can prolong your survival by 3 months if you are diagnosed with a deadly form of cancer within 10 years.

The insurance is paid one time per year for ten years.



What is the highest amount you would pay for the insurance?

Figure 1. Example of WTP-scenario in EoLQ (timeline was set on 48 months to make scenarios comparable)

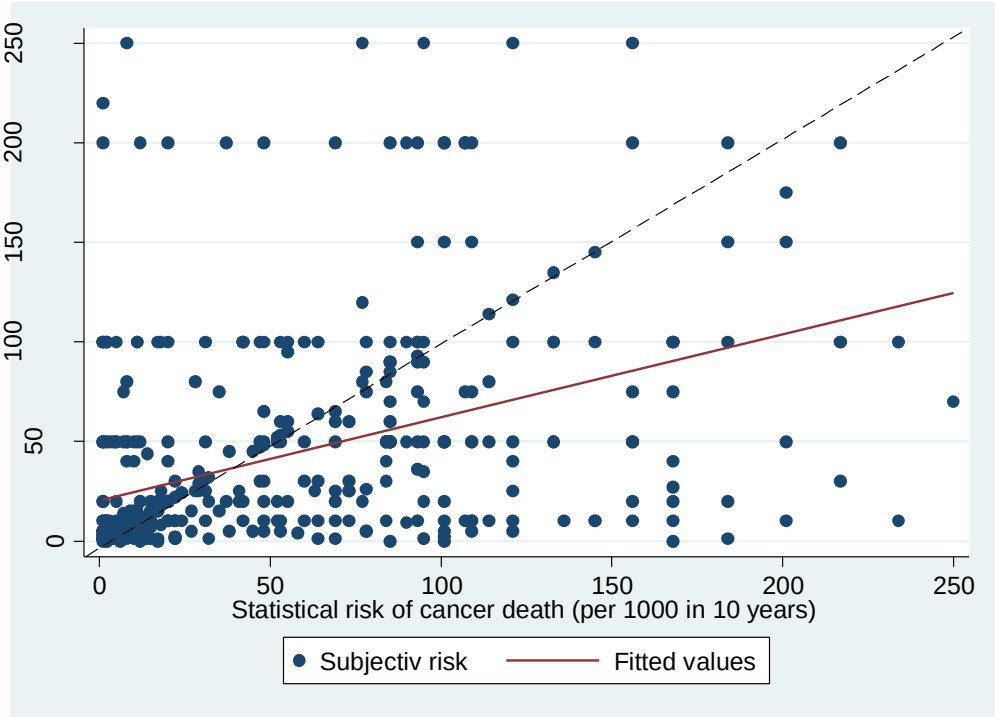


Figure 2. Relation between statistical risk (risk of death in cancer during next 10 years per 1000 persons of respondents sex and age) and estimated subjective risk (dotted line: subjective=statistical risk)

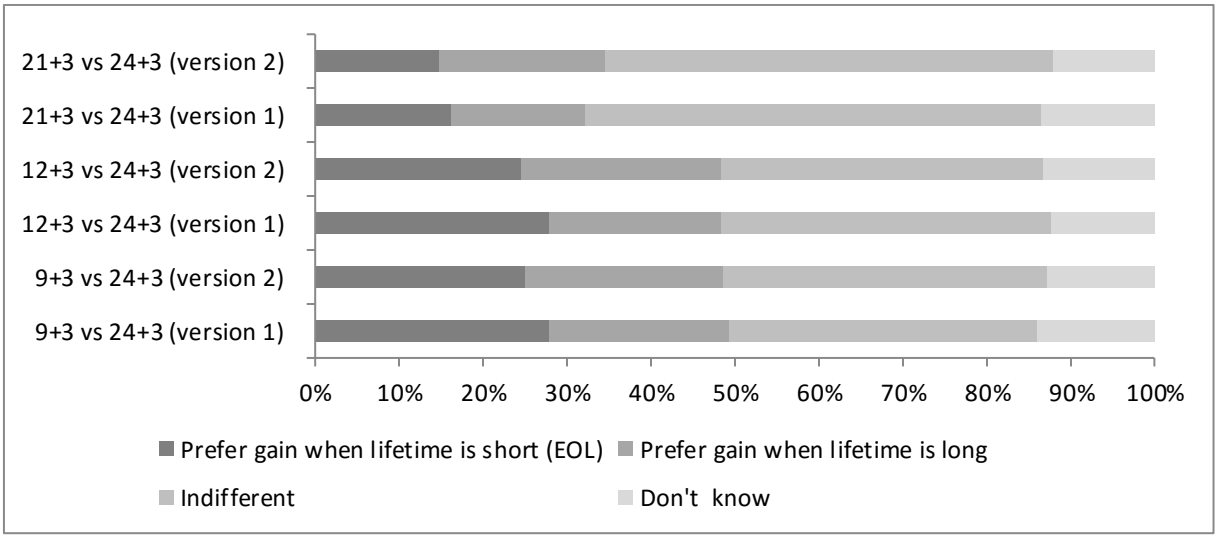


Figure 3. Choice 1: Preference for a 3 month survival gain with different expected remaining lifetime, version 1=questionnaire with scenario order low to high, version 2=questionnaire with scenario order high to low

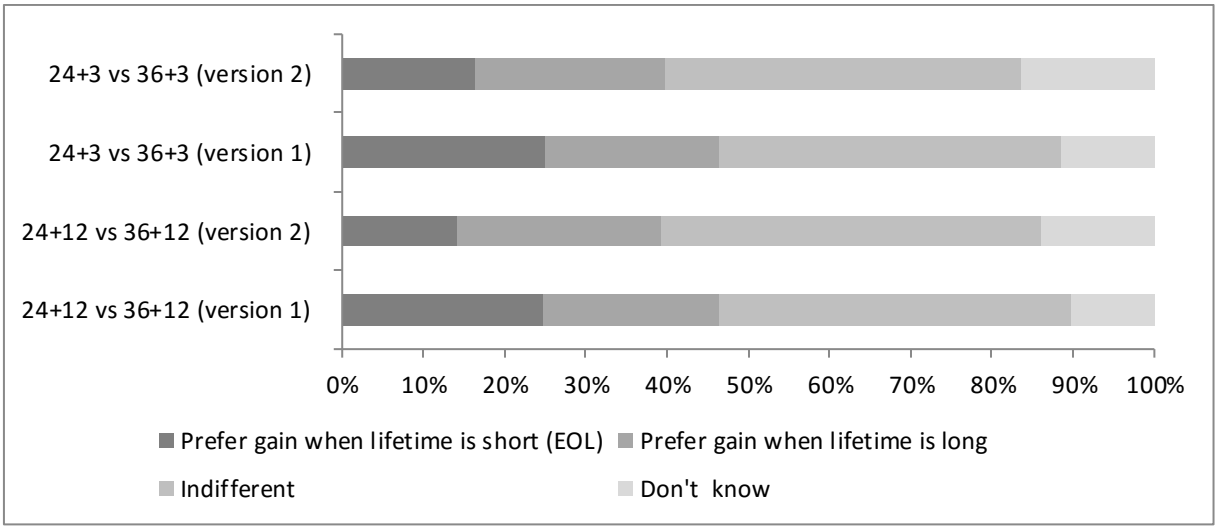


Figure 4. Choice 2: Preference for a 3 and 12 month survival gain with different expected remaining lifetime, version 1=questionnaire with scenario order low to high, version 2=questionnaire with scenario order high to low

Appendix

Cancer death 10-year risk (per 1000)		
Age	Men	Women
20	1	1
21	1	1
22	1	1
23	1	1
24	1	1
25	1	1
26	1	1
27	1	1
28	1	1
29	1	1
30	1	1
31	1	2
32	2	2
33	2	2
34	2	2
35	2	3
36	2	3
37	3	3
38	3	4
39	3	4
40	3	5
41	4	5
42	5	6
43	5	7
44	6	8
45	7	8
46	8	10
47	9	11
48	10	12
49	12	14
50	13	15
51	15	17
52	17	18
53	20	20
54	22	22
55	24	24
56	28	27
57	31	29
58	35	32
59	38	35
60	42	37
61	47	41

62	53	45
63	58	48
64	63	52
65	69	55
66	77	60
67	85	64
68	93	69
69	101	73
70	109	78
71	121	84
72	133	90
73	145	95
74	156	101
75	168	107
76	184	114
77	201	121
78	217	129
79	234	136
80	250	143

Ref=The National Board of Health and Welfare (NBHW), Cause of death registry, Diagnosis C00-D48 (tumours), Number of deaths per 100 000 persons in 2014. Some risks for lower ages (men<28 years and women<25 years) are rounded to 1.

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