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Does QALY type matter in estimating willingness to pay for health gains?

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Introduction

The health care budget in the UK is finite and, as such, decisions must be made about how best to allocate scarce resources. The establishment of the National Institute of Health and Clinical Excellence (NICE) by the UK government is one way in attempting to provide a more efficient and transparent method for evaluating new health care interventions in terms of clinical and cost effectiveness to ensure the affordability and sustainability of the health care system. Cost effectiveness analysis and its overall summary measure of cost per quality adjusted life year (QALY) gained from an intervention is used by NICE as part of the decision as to which interventions are recommended for adoption by the NHS. However, there is no empirically established point at which the cost per QALY becomes too high. The lack of any definitive decision rule raises the question of what is the monetary value of a QALY.

Within the health economics literature the focus on developing a monetary value of a QALY for use in policy making has been on developing a single willingness to pay (WTP) per QALY value which can be applied to all health care interventions. This is based on the assumptions of the underlying QALY model which assumes that all QALYs are equal no matter what the combination of quality of life and life expectancy. However, there is empirical evidence to suggest that this may not coincide with how people value the trade-offs between quality of life and life expectancy, and WTP per QALY may be dependent on how the health gain arises (Byrne et al., 2005). Estimates of WTP per QALY values in the health economics literature have been produced using two main types of estimation process. The first has been to infer the monetary value of a QALY from estimates of the value of a statistical life (which is calculated as WTP for a reduction in the risk of death) (e.g. Hirth et al., 2000, Abelson, 2003, Johannesson and Meltzer, 1998). The estimates of WTP per QALY which are produced by these studies range from £51,000 up to £101,000 (in 2003 prices). The second approach has been to directly elicit WTP per QALY values in studies which derive WTP values for changes in health status (see for example, Gyrd-Hansen, 2003, Johannesson and Johannsson, 1997, Johnson et al., 1998). The WTP per QALY values arising from these studies range from £330 up to £7,500 (in 2003 prices). The variation in the estimates of WTP per QALY values which come from these two approaches indicate that the type of health gain that an intervention produces is important, with interventions which reduce the risk of death are likely valued more highly than those which make small improvements in quality of life, but this has not been tested explicitly.

This study was designed to test the hypothesis that WTP per QALY gained will vary according to whether the health gain arises through a change in quality of life or a change in life expectancy. Based on the results of a previous study (Mason et al., 2005) and values presented in the literature such as those in the previous paragraph, it is predicted *a priori* that the WTP per QALY value which is elicited for an intervention which is life saving will be higher than the WTP per QALY value for an intervention which is life extending only. It is also expected that both of these values will be greater than the WTP per QALY value for an intervention which is quality of life enhancing only. There are important policy implications of any results which support such a hypothesis.

Method

Questionnaire

To test the hypothesis outlined above five WTP questions were developed to estimate WTP per QALY values for the three different types of QALY: quality of life enhancing only, life extending only and life saving. Question one elicited WTP for an intervention which improved only quality of life, questions two and three both elicited WTP for interventions which improved life expectancy only and questions four and five were designed to determine WTP for life saving interventions.

Question 1: Quality of life enhancing only intervention

This question elicited WTP values to avoid moving to a slightly impaired health state from full health. The health impairment was described using the EQ-5D system (Dolan et al., 1995) as it provides a generic description of a change in quality of life which was preferred to creating a scenario which named a specific disease or treatment. If a specific disease was named in the scenario it is likely that the respondents would have pre-existing opinions which may bias their WTP values in either direction depending on how they perceive this disease. It could also lead to the respondents' valuing more than the change in quality of life presented and it may be more difficult for them to believe that only quality of life would be affected and that there would be no change to life expectancy. One further reason for using the EQ-5D system was so that the utility loss could be measured using the existing tariff. The health impairment presented in the scenario was minor, four of the domains of the EQ-5D were at the no problems level but there would be some problems in performing usual activities, thus the utility loss for this scenario was 0.117. This marginal movement in quality of life was used because larger changes may not be perceived as plausible by the respondent. The resulting WTP values were multiplied up to give WTP for one QALY. The scenario presented to respondents is given in Figure 1.

Figure 1 Question 1

Imagine that you are currently in full health and are diagnosed with a condition which would leave you in an impaired health state. In this impaired health state you would have *some* problems in performing your usual activities but you would experience no problems in walking around, you would still be able to look after yourself, you would not be in any pain or discomfort and you would not feel anxious or depressed.

This would last for 1 year if you did not receive treatment, after which you would return to full health.

Treatment for this condition is not provided on the NHS however a treatment is available privately. Would you consider paying for this treatment? You could, if you want to, take out a loan at standard interest rates to pay for it. However, bear in mind that any payment you make for this treatment will reduce the amount of money that you have available to you to spend on everything else. If yes, what is the maximum amount you would be willing to pay for this treatment?

Question 2: Life extending only intervention

This question estimated WTP per QALY for an intervention which would increase life expectancy by one year in full health. The intervention was a drug treatment which was described as a treatment which would slow down the ageing process so that it is as if the respondent would live a little bit longer at each age (their risk of death at each age would be reduced). This was to emphasize that it was not just a gain at the end of life when the respondent is likely to be in poorer health. This was important as if the respondents believed they were likely to be in a worse health state they may underestimate their WTP value. Also, this question was designed to look purely at changes in life expectancy and, if the respondent thinks that his/her quality of life was affected, this biases the result as the overall QALY change will be different from one. Figure 2 presents the scenario for question 2.

Figure 2 Question 2

On average, life expectancy at birth in the UK is 80 years. Suppose that when you reach the age of 60 your doctor informs you that, although you are considered in full health for someone of your age, there is a new treatment available which if you take it now would increase your probability of survival at each age and as such increase your average life expectancy by 1 year. This gain is not just a few months at the end of life when people tend to be in poor health. It is as if you spent (lived) a little bit extra at each age due to a slowing down of the ageing process. So at each age you experience this time in normal health for that age. These gains cause Life Expectancy to increase by 1 year.

This treatment would involve taking one tablet at age 60; it is perfectly safe and has no harmful side effects.

If you wish to receive this treatment you would have to pay for it yourself as it is not available on the NHS. Assume that you would have to pay for it now so that it would be available to you when you reach age 60. During this time no better treatment would be developed. Would you consider paying for this treatment? You could, if you want to, take out a loan at standard interest rates to pay for it. However, bear in mind that any payment you make for this treatment will reduce the amount of money that you have available to you to spend on everything else. If yes, what is the maximum you would be willing to pay for this treatment?

Question 3: Life extending only intervention

Question three was also designed to estimate WTP per QALY for a life extending intervention. One of the main problems with question two was that, for younger respondents especially, it may be difficult to value a treatment which will not be taken at the point at which they would have to pay for it and for which the potential benefits arise many years into the future. Question three was designed to get people to think about a change in their life expectancy of one year which would occur at this point in their lifetime. This loss of one year of life would occur as a result of an unspecified condition which would lead to a coma. The scenario explained that during the coma there would be no pain or other sensations to try and alleviate any fears respondents may have about pain or ill effects of the coma which they may include in their WTP valuation so that more than just one QALY is being valued. Although this question may get around the problem of the life expectancy gain coming at the end of life it does raise other issues; namely the effect of the loss of one life year on the respondent's current commitments. Factors such as whether the respondent has

dependents or other family commitments and their job may also affect their valuation. For this reason the scenario also stated that there would be time before the coma occurred to make preparations for the year and that after the year there would be no further effects over their remaining life expectancy. Figure 3 presents the scenario for question 3.

Figure 3 Question 3

Imagine that you are currently in full health but that you are informed by your doctor that you have developed a condition which will result in you losing the next year of your life, as you would be in a coma. During this year in a coma you would feel no pain or sensation; it would be like being in a deep peaceful sleep for a year. Before you went into the coma you would have time to make preparations for this year. After this year you would wake up and return to full health for the rest of your life. All other aspects of your life would be unaffected during and after this year and you would be able to pick up where you left off. However, it does mean that you have lost a year from your life expectancy.

A treatment for this condition, which would prevent you from falling into a coma, is not provided on the NHS however a treatment is available privately. Would you consider paying for this treatment? You could, if you want to, take out a loan at standard interest rates to pay for it. However, bear in mind that any payment you make for this treatment will reduce the amount of money that you have available to you to spend on everything else. If yes, what is the maximum amount you would you be willing to pay for this treatment?

Question 4: Life saving intervention

This question estimates a WTP per QALY value for an intervention which is life saving. For this question the scenario explains that a terminal illness has been diagnosed and death would occur very quickly following this diagnosis. The respondents are asked for their WTP for a treatment that would give an extra 4 months of life in a health state with a utility value of 0.25. This would approximate to an extra 1 month in full health. To gain an overall value of a QALY this one month value is scaled up to one year.

This question was designed to convey to respondents that if they did not receive the treatment immediately then death would be imminent, thus, trying to get across that this is a life saving intervention even if the gain in life expectancy is small. The quality of life during these four months was described as being poor to make it more comparable to what may be experienced in reality by someone with a serious terminal illness. The scenario presented to respondents for question 4 is given in Figure 4.

Figure 4 Question 4

Imagine that you are currently in full health and that you are diagnosed with an illness which is terminal if untreated. Death from this illness would occur within a few months of the diagnosis if treatment is not received.

A new treatment becomes available which could give you on average an extra 4 months of life. With this treatment you would not return to full health but would be in

a relatively poor health state for this time with your quality of life measuring 0.25 on the thermometer scale.

This treatment is not yet available on the NHS, if you wish to receive it you would have to pay for it privately. Would you be willing to pay for this treatment? You could, if you want to, take out a loan at standard interest rates to pay for it. However, bear in mind that any payment you make for this treatment reduces the amount of money you have available to spend on other things. If yes, what would be the maximum amount that you would be willing to pay for this treatment?

Question 5: Life saving intervention

Question five was also designed to estimate WTP per QALY for a life saving intervention. This life saving question was framed as a risk reduction with respondents asked to give their WTP to receive treatment from the emergency services following an accident. The scenario placed the respondent in a situation where they had been involved in an accident which could prove fatal if untreated within the first 10 minutes. The standard response time was 20 minutes which would lead to 1 in 100 people dying before the emergency services arrive. Respondents were asked to give their WTP for the emergency services to arrive within 10 minutes which would reduce the risk of death from 1 in 100 to zero. The resulting WTP value was aggregated up to one life year (which is assumed to be one QALY on the basis that following treatment the respondent would be in full health for someone of their age until their death) by multiplying the WTP response by 100.

Risk reduction questions have been used in the past to estimate the value of a statistical life (Jones-Lee et al., 1985). The use of risk reduction questions for the purpose of estimating the value of a statistical life provides a strong evidence base that this type of question can be used successfully to gain estimates of values which may seem to be difficult to achieve. For these types of questions to be valid it is important for the respondents to be fully aware of what the original risk would mean for them and the effect of the risk reduction. In the focus groups (see below) the respondents were given only verbal information on the risk reduction. However, including pictorial information on the size of the risk reduction could possibly have further increased the understanding of the respondents. Figure 5 presents the scenario used in question 5.

Figure 5 Question 5

Suppose you are involved in an accident in which you sustained injuries which could prove to be fatal if you are not treated by the emergency services within the first 10 minutes of the accident occurring. The standard response time of the emergency services is 20 minutes which would lead to 1 in 100 patients dying before the emergency services arrived. If you survived the injuries from the accident you would make a full recovery and return to full health. You would then live in full health until you were 80 years old. What is the maximum you would be willing to pay to have the emergency services respond within the first 10 minutes, thus eliminating this risk? You could, if you want to, take out a loan at standard interest rates to pay for it. However, bear in mind that any payment you make for this treatment reduces the amount of money you have available to spend on other things.

For the life extending and life saving categories two questions were used to obtain WTP per QALY values. The reason for this was to determine whether the framing of the question had a significant impact on the resulting WTP per QALY value. It was also the case that each of the questions raises important issues concerning how the respondent would view the scenario and that it was not possible to separate out all elements so that only a pure WTP for the treatment described was valued.

Focus Groups

The data was collected through a series of focus groups conducted at Newcastle University. Each focus group consisted of between 2 and 8 participants with an average of 5 per group. The focus group began with a short presentation which outlined some of the key concepts that would be used during the session. The group were informed during this presentation that the NHS operated with a cash limited, fixed budget and, therefore, choices have to be made about which health care interventions are funded and, as a consequence of this, which are not funded. The presentation continued to explain how agencies such as NICE in the UK make choices as to which interventions are recommended for funding based on both the costs and effectiveness of the intervention so that they can make the most efficient choice possible. It was explained that measuring the costs was relatively straight forward but it was more difficult to measure the benefits of health care. The concept of QALYs as a measure of health benefits was described and some examples of how quality of life could be measured using the EQ-5D tariff and visual analogue scale. This section of the presentation ended with an explanation of how QALYs are constructed from quality of life and life expectancy data. The first exercise within the focus group was a Q sort which is not explained in this paper. The WTP questions were conducted after the Q sort to give participants time to gain more understanding of the concepts of health care rationing and the need for priority setting.

For the WTP exercise a response booklet was given to each participant that included all five WTP questions outlined above and a section including a series of demographic questions. A card sorting type exercise was used to determine maximum WTP for each question. This exercise involved 15 small payment cards each of which was printed with an amount of money ranging from £1 up to £20,000. Each participant was given a set of payment cards and template on which to place them. They were asked to shuffle the cards and then take one card at random¹ and decide if they would be willing to pay that amount for the intervention described in the question: if yes they were told to place it on the template in the box marked “definitely would pay”; if no, they were told to place it in the box marked “definitely would not pay”; or if they were not sure place it in the “unsure” box. The participant repeated this exercise for all of the different payment cards. They were then asked to record the highest value placed in the “definitely would pay” box onto the questionnaire booklet along with the lowest value placed in the “definitely would not pay” box. Finally, the participant was asked to decide what was the maximum amount s/he would be willing to pay and record this on the questionnaire booklet too. It was stressed to the participant that this may be one of the figures on the payment cards or it may be another value not listed. Each participant was asked to remember

¹ To avoid ‘starting point bias’ whereby a respondent ‘anchors’ their subsequent WTP value on a card offered to them by the interviewer.

when making their decision how much they could afford to pay. If the participant had stated they were not willing to pay anything then they were asked to write a short statement as to the reason for this in their questionnaire booklet. The respondents were asked to use this card sorting exercise to determine their maximum WTP for each of the 5 questions.

There were a number of difficulties which arose during the focus groups which relate to the completion of the WTP exercise. The main problem was that the introduction to the group and the Q sorting exercise took approximately one hour which left a maximum of only 30 minutes to complete the WTP exercise. It was therefore difficult to ensure that everyone fully understood the questions. Also, because all of the questions were in the same booklet many people tried to move ahead of the explanation given to the group about each question which, again, may have led to people not fully understanding the question or how to use the payment cards.

As is the case in other WTP studies there was a number of people who did not accept the aim of the exercise was to determine the benefits of an intervention. A number of people questioned why they would need to pay for health care as they had already paid in the form of taxes or that they were fundamentally against paying for health care. A further explanation of the study was given to those who expressed this view; nevertheless it was still the case that some respondent's gave zero response for the reasons outlined above.

Sample characteristics

52 participants took part in the focus groups. Table 1 gives a summary of the main demographic characteristics.

Table 1 Demographics of focus group participants

		N (52)	%
Age	18-24	18	35
	25-34	4	8
	35-44	13	15
	45-54	1	2
	55-64	6	12
	65+	10	19
Sex	Male	33	63
	Female	19	37
Occupation	unskilled/low level worker	2	4
	skilled/middle level worker	6	12
	independent	4	8
	highly skilled/level worker	7	13
	unemployed	2	4
	retired	12	23
	student	16	31
	not known	3	6
Income (own)	< £1000	22	42
	£1001 to £1500	12	23
	£1501 to £2000	7	13
	£2001 to £3000	1	2
	£3001 to £4000	2	4
	£4001 to £5000	2	4
	£5001 to £6000	0	0
	> £6000	1	2
Not known	5	10	
Housing Status	Own	24	46
	Rent	27	52
Education Level	Secondary	7	13
	Further	42	81
	Not known	3	6

Results

WTP per QALY values were estimated for each of the five questions. As a first step mean WTP was calculated including all zero responses, these results are presented in Table 2.

Table 2 WTP per QALY

Question	QALY Type	WTP per QALY (£)
1 (n=52)	Quality of life	4,674
2 (n=52)	Life extending	1,553
3 (n=52)	Life extending	6,266
4 (n=52)	Life saving	18,173
5 (n=52)	Life saving	23,872

However, for each of the questions there were a large number of zero responses. For each question all of the zero responses were identified and categorised as to whether

these zero valuations were protest responses. For question 1 there were 22 zero responses of which 4 were classed as protests zeros, for question 2 there were 21 zero responses (2 protest zeros), for question 3 there were 15 zero responses (3 protest zeros), question 4 had 32 zero responses (4 protest zeros) and question 5 had 11 zero responses (6 protest responses). This indicates that the majority of the zero responses can be classed as genuine zeros where the respondents truly did not value the treatment presented in the scenarios. The WTP results for each question were re-estimated removing all zero protest values as shown in Table 3.

Table 3 WTP per QALY, excluding protest zero responses

Question	QALY Type	WTP per QALY (£)
1 (n=48)	Quality of life	5,063
2 (n=50)	Life extending	1,616
3 (n=49)	Life extending	6,649
4 (n=48)	Life saving	19,687
5 (n=46)	Life saving	26,986

The results presented in Tables 2 and 3 both show the same pattern with the lowest mean WTP per QALY value for question 2 and the highest value for question 5. It was hypothesised that mean WTP per QALY would be lowest for question 1 and would increase for each successive question. These results mostly follow this trend but the WTP values for question 2 are lower than expected.

Discussion

The results presented in Tables 2 and 3 provide evidence to suggest that WTP per QALY values do vary according to QALY type. For four of the questions the WTP results agree with the hypothesis set out at the beginning of this paper; only question 2 does not. Excluding for the moment the results of question 2, questions 4 and 5, which were designed to elicit the value of a QALY for life saving interventions, reveal higher WTPs than the questions which were for quality of life enhancing or life extending interventions. The distinction between the results for question three, which is for a life extending intervention, and question one, which is a quality of life enhancing intervention, is less apparent with the values being very similar. However, the WTP for the life extending intervention is still higher than the WTP for the quality of life enhancing intervention.

The results for question 2, which was designed to estimate WTP for a life extending intervention, are the lowest of all five questions. There were a number of reasons which emerged from the participants as to why they did not value this intervention so highly. The written and verbal comments from the participants indicate that they were concerned with the quality of life as well as the quantity and that the quality of life at age 80 may be poor. It was stressed in the scenario that at age 80 they would be in normal health for someone of that age; but these comments suggest that people did not believe this would be the case. A number of people also expressed the view that nature should be allowed to take its course and that ‘when it’s your time to go, it’s your time to go’. Some of the younger participants found it difficult to value something which would occur so far into the future.

For the life extending and life saving interventions two questions were used to obtain WTP per QALY estimates. It was not expected that the WTP values elicited from the two questions for each type of intervention would be the same but it was hoped that they would produce similar values. As the results are different it indicates that there may be some sensitivity to the framing of the question. For the life extending questions it is likely to be factors within each of the questions which can not be separated out from the intervention such as the age at which the intervention would be required and when the benefit would occur. With question 3 a number of participants indicated that they would be willing to pay for this intervention because at this stage of their lives they could not take a year out because of educational or family commitments. For question 2, issues such as the quality of life during the additional one year of life are likely to have impacted on the resulting WTP per QALY estimates.

For the life saving questions two different styles of question were used with question 4 framed as an intervention which would increase life expectancy by a very small amount whereas question five was a risk reduction question. Question 4 had the highest number of zero responses of all of the questions with 59% of the responses being zero. The main reason given by the participants was that an extra four months was not enough time, especially as during those four months they would be in a poor health state. Thus, even though this question was designed to convey a life saving intervention, the participants were concerned with more than just 'being alive' for a bit longer. The comments provided on this question indicate that people are interested in both the size of the gain in life expectancy and the quality of life during that period as well as just physically being alive. Framing question 5 as a risk reduction is most similar to the type of question used in the estimation of the value of a prevented fatality. Eliciting WTP for an intervention using a risk reduction question means that the participants' responses will depend on their attitude towards risk. If it was the case that a large number of people in this sample were risk averse then the WTP per QALY value will be higher. Although there was no specific testing in the questionnaire, comments such as 'I would pay anything' or 'as much as it took' indicate that some people were risk averse. Also, the risk reduction presented in the scenario was such that if the payment was made the risk of death at the scene of the accident would be zero. Thus, even though the initial risk was small, people may have been willing to pay more for the knowledge that they would be treated within the specified time for certain.

Work previously conducted on estimating a monetary value of a QALY by modelling it using the Department for Transport's VPF estimated WTP per QALY values for each of the three types of QALY (Mason et al., 2005). The results of the modelling study gave a WTP per QALY value of around £64,000 for life saving interventions; in comparison this study has produced results in the range of £19,687 up to £26,986 using the results which excludes protest zeros. The results for life extending interventions are also significantly lower with the modelling study giving a WTP per QALY value of about £52,000, but this study has produced results in the range of £1,615 to £6,649. The large difference in the results produced by the modelling study and this direct estimation may indicate that the way in which people value transport safety interventions is different to how they value health interventions. These pilot results indicate that further research into the reasons why people may value safety interventions differently from health interventions should be conducted. If further

work concluded that such a difference does exist, it raises the question of whether the value of a QALY can be estimated from the VPF and if such values could be used in health care policy making. However, the WTP per QALY estimates presented in this study were estimated on a very small sample. If these questions were to be completed by a larger sample the results may be more similar to the results estimated from the modelling study. It was also the case that the WTP per QALY estimates derived from the modelling study for quality of life enhancement are more in line with those estimated using question 1.

The results of the WTP study presented in this paper and the results of the modelling study outlined in the preceding paragraph indicate that more than one WTP per QALY value could be used in health care decision making. Although the results of the two studies are not directly comparable and therefore no recommendation as to what WTP per QALY values to use are made, both studies indicate that a higher threshold value should be used when making judgements as to whether life saving interventions should be recommended for introduction to the NHS than is used for interventions which are life extending or quality of life enhancing.

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