An explorative study of “preferred” health care decision rules

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Abstract

Priority setting in health care under conventional rules of health economic evaluation is based upon the ethos of attempting to maximize post-treatment health gain given available health care resources. In his later years, Alan Williams advocated an alternative ‘overarching’ decision rule that was informed by egalitarian principles, which is known as the ‘fair innings argument’. The fair innings approach balances differences in whole lifetime experiences of health (the egalitarian concern) with differences in post-treatment outcomes (the efficiency concern) when prioritizing people for health care. This article reports a study that presented respondents with a number of abstract health care decision contexts in an attempt to test, both quantitatively and qualitatively, the extent to which post-treatment health maximization, the fair innings argument, or, indeed other ‘decision rules’, are evident in the respondents’ answers. The results indicate that the most commonly observed decision rule differs substantially across health care contexts, possibly because underlying ‘values’ are context-dependent. Therefore, assuming that what individuals want has some relevance with respect to what policy-makers ought to do, the results of this study imply that rather than pursue an overarching decision rule, it may be more appropriate to vary the rule according to the particular health care decision context under consideration.

Key words: Priority-setting; Fair innings; QALY-maximization; Empirical ethics; Qualitative analysis; Decision rules

Content

1. Introduction

Underlying the sub-discipline of health economics is the notion that available health care resources will always be insufficient to meet all health care demands. Choices have to be made; priority-setting, and even rationing, are inevitable. Health economists, and others, are therefore right to debate and analyze how society might 'best' use the resources available to this sector.

So, how might society 'best' use the resources? The standard practice in the field of health economics is to assume that it is best to seek to maximize health gain inside the budget constraint, and many of those who work specifically in the area of health economic evaluation use quality-adjusted life years (QALYs) as the measure of 'health'. Some health economists have, however, questioned whether the sole adherence to this efficiency rule is appropriate when priority-setting health care interventions. Notable among these *agent provocateurs* was Alan Williams, who in his latter years wanted priorities to be informed by egalitarian principles.

Williams' thinking was influenced by the writings of John Harris, first in relation to Harris' concern for the possibility of 'double jeopardy' (Harris, 1987), and second in his statement appertaining to a 'fair innings' (Harris, 1985). The double jeopardy argument is the concern that by applying the post-treatment QALY-maximization criteria, those who have experienced prior misfortune in their lives in terms of their health status (due to, for instance, a disability) have a greater chance of being placed as a lower priority when deciding who ought to receive treatment. For example, consider a blind man and a fully sighted man, both in need of a liver transplant operation but with there being only one available liver. The blind man has had the misfortune of being blind since birth, the first 'jeopardy'. Moreover, all other things equal, the blind man will have fewer post-intervention expected QALYs than the fully-sighted man – the second 'jeopardy – simply because the health state of 'blind' is likely to have a lower QALY value than that of 'fully sighted'. There is some limited empirical evidence that implies that most people would find QALY-maximization unfair in this context (Oliver, 2004). It was out of the concern for double jeopardy that Williams eventually developed his fair innings model, whereby it is argued that a social preference to compensate people for their health-related misfortunes in life may lead to them being prioritized even if treatment affords them relatively few QALYs.

The essence of the basic 'intergenerational' fair innings argument outlined by Harris (1985) is that people who have achieved old age would not have their lives further prolonged if this was undertaken at the expense of those who had not yet realized their fair innings, presumably to give as many people as possible the opportunity to fulfil their ambitions and potential. Harris was concerned with a fair innings defined in terms of life-expectancy, which, according to Williams (1997) is tied in with the view that people generally feel that everyone is entitled to a 'normal' span of life – e.g. the biblical three score years and ten. Williams (1997), however, was concerned with quality-adjusted life expectancy (QALE),[1] because he considered both the quality of a person's health experiences and his/her length of life to be important considerations when assessing fairness in lifetime health. In short, although Williams still considered how much people could gain from treatment to be important, he also attached importance to how much they had so far had and could expect to have over the course of their whole life. Williams therefore believed that when prioritising people (or groups of people) for health care treatment, consideration of differences in post-treatment QALY gains (an efficiency argument) should be accompanied by consideration of differences in QALE (an equity argument).

Williams explicitly focused on the issue of intergenerational equity in his 1997 article. However, it is quite clear, from this and other writings (Williams, 2001), that he was searching for an overarching 'fair innings' decision rule, and the QALE-related fair innings argument does indeed also have implications for priority-setting over people of the same generation with different prior and future health experiences and expectations. Nonetheless, the question remains open as to whether people would generally base their decisions on an overarching health care decision rule, or whether they would prefer the 'chosen' rule, at the policy-making level, to be context-dependent.

This article reports an explorative study where a number of abstract health care-related decision contexts were presented to respondents. The decision contexts included various intergenerational and intragenerational lifetime health profiles, and the objective of the study, using a combination of quantitative and qualitative analyses, was to test whether the respondents' answers implied a tendency towards standard QALY-maximization, the QALE-related fair innings argument, or, indeed, some other decision rule *irrespective of the context*, or whether the predominant preferred decision rule across the sample of respondents varied according to the particular context under consideration.

2. Methods

2.1. Sample

Fifty respondents participated in the study. Each respondent was paid £15 for attending one face-to-face interview, all of which were conducted by me. Forty respondents were postgraduate students, with the rest comprising of university staff (of whom 9 were educated to postgraduate level and 1 to undergraduate level). Twenty-eight respondents were female, 31 were aged 18-30 years (with 18 aged 31-45 years, and 1 aged >60 years), 38 had a social science background (with 3 having a science background, 2 having a humanities background, 6 having an 'other' background and 1 unstated), and 39 stated that they were familiar with decision theory. The respondents were of 22 different nationalities.

[1] QALE is simply the number of QALYs that a person (or, on average, a group of people) can expect to experience during his/her lifetime.

2.2. Questionnaire

During the interview, the respondents were presented with three different types of questions: (1) questions intended to elicit health state values; (2) questions intended to identify the decision rules that the respondents use when prioritising patients for health care; (3) questions intended to test issues pertaining to sequencing effects in the valuation of health profiles. The order in which respondents were asked to answer the three types of question was randomized. The respondents had to complete one set of questions before moving onto the next, and once they had completed a particular set of questions, they could not revise their answers to those questions. The type (3) questions are not relevant to this paper and are reported elsewhere (in Oliver, 2008).

2.2.1. Eliciting the health state values

Five health states intermediate to ‘full health’ and ‘death’ were used in the study. Consistent with Williams’ fair innings article (Williams, 1997, p.122), the health states were described according to the Euroqol 5 dimension classification system (EQ-5D). The health states were labelled A to E, and were described in terms of a declining order of ‘betterness’, such that A is unambiguously better than B, which is unambiguously better than C, etc. These health states, together with health state X used in the practice question, are summarized in Table 1.

Table 1
Summary of the health states

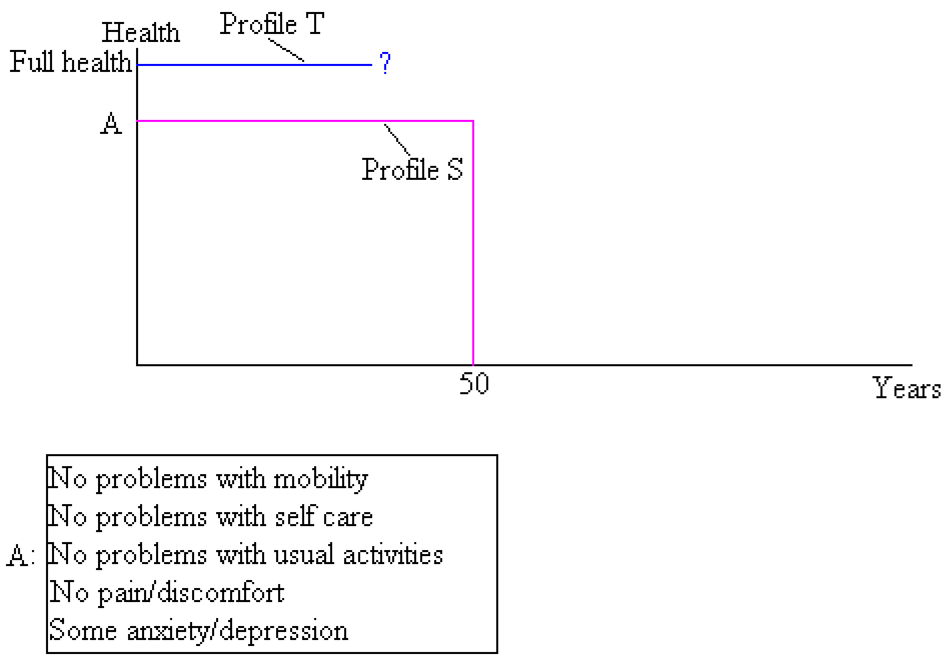
Health state[i]	Mobility	Self care	Usual activities[ii]	Pain/ discomfort	Anxiety/ depression
X	Some problems	Some problems	Some problems	Some	Some
A	No problems	No problems	No problems	None	Some
B	No problems	No problems	No problems	Some	Some
C	Some problems	No problems	Some problems	Some	Some
D	Some problems	No problems	Some problems	Some	Severe
E	Some problems	Some problems	Severe problems	Some	Severe

Notes
[i]The respondents were told that full health would be a health state with no problems on any of the five dimensions.
[ii]The respondents were told that 'usual activities' relates to work, leisure, study etc.

In eliciting the health state values, the respondents were therefore presented with a total of six questions, one of which was a practice question. They were required to answer the practice question before the five main questions to ensure that they understood the task, and were encouraged to ask questions during the practice session. All of the respondents appeared to understand the practice question, and explicitly stated that this was indeed the case. After completing the practice questions, they were required to answer the five main questions without asking any questions so as to reduce the possibility of interviewer bias, and they were allowed to return to previous questions in order to revise their answers if they so wished. The question used to elicit the respondents' values for health state A is replicated in Figure 1.

Figure 1. A health state valuation question

Consider the following two lifetime profiles.
In profile S, you will live in health state A until age 50 years and then die.
In profile T, you will live in full health for the whole of your life, but it is not known how long your life will be.



How long would the length of life in profile T have to be in order for you to be indifferent between profile S and profile T?

______years

Figure 1 shows that the health state values were elicited by means of the time trade-off (TTO) method. Williams (1997, p.125), in his calculations of expected lifetime QALYs, also relies on the TTO, and Williams' calculations are used in the current study to calculate age weights (discussed later). Therefore, in order to maintain some consistency between the methods used to calculate the health state values and the age weights, the TTO was chosen as the method by which to elicit the health state values.

Consider Figure 1, and denote the time in profile T that would render any particular respondent indifferent between profiles S and T as t. That respondent's TTO value for health state A would thus be calculated from $50.v(A) = t.v(\text{full health})$; therefore $v(A) = t/50$, where $v(.)$ is the TTO value function and $v(\text{full health}) = 1$. It could of course be contended that there are problems with diagrammatically depicting the health states on the vertical axis as in Figure 1 because this representation may bias the values that the respondents place on the health states.[2] This would be a reasonable and possibly legitimate criticism. Nonetheless, the view was taken that the diagrams would help the respondents to understand what was being asked of them, and thus the potential source of bias was traded off against possible improved understanding of the task at hand.

2.2.2. Eliciting the decision rules

In an attempt to elicit the respondents' stated decision rules in circumstances where they were required to prioritize people for health care treatment, they were presented with a total of six questions, one of which was a practice question. The practice question is replicated in its entirety as Figure 2a, and the diagrammatic depictions contained within the five main priority-setting questions are presented as Figures 2b to 2f.

The administration of the questions followed the same process as that for the health state value elicitation questions reported earlier. All of the respondents appeared to understand the practice question, and explicitly stated that this was the case. Although Figures 2b to 2f are labelled 'first main priority-setting question', 'second main priority-setting question', etc, the order in which the questions were presented to the respondents was randomized.

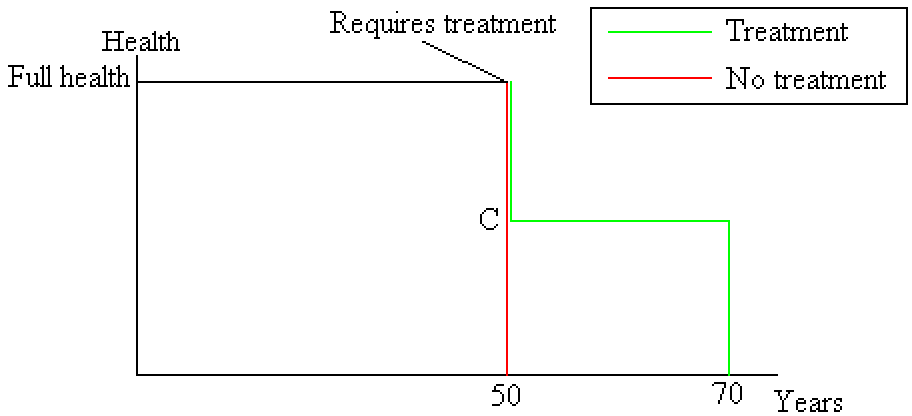
In each of the priority-setting questions, the respondents were presented with the lifetime health profiles of two patients, with these profiles first described in words and then depicted diagrammatically. As with the elicitation of the health state values, these diagrammatic depictions could be charged with introducing a biasing influence on the respondents' answers, particularly with respect to the distances placed between the various health states. However, it would have been difficult for the respondents to grasp the health profiles without the diagrams, and so, again, the potential bias was traded off against a better understanding of the task.

[2] In the TTO questions, the relative position of the different intermediate health states on the vertical axis of the diagram was altered across the questions to reflect the fact that health state A was unambiguously better than B, which was unambiguously better than C etc.

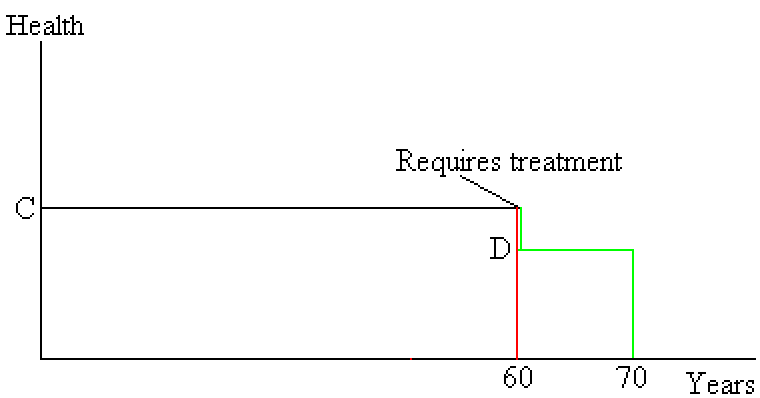
Figure 2a. The ‘practice’ priority-setting question

Consider the following two patients.
Patient P lives for 50 years in full health. At age 50 patient P suffers from an illness for which there is a health care treatment. Without treatment, patient P will die at age 50. With treatment, patient P will live for a further 20 years in health state C, and will then die.
Patient Q lives for 60 years in health state C. At age 60 patient Q suffers from an illness for which there is a health care treatment. Without treatment, patient Q will die at age 60. With treatment, patient Q will live for a further 10 years in health state D, and will then die.

Patient P



Patient Q



	C:		D:
C:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Some anxiety/depression	D:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Severe anxiety/depression

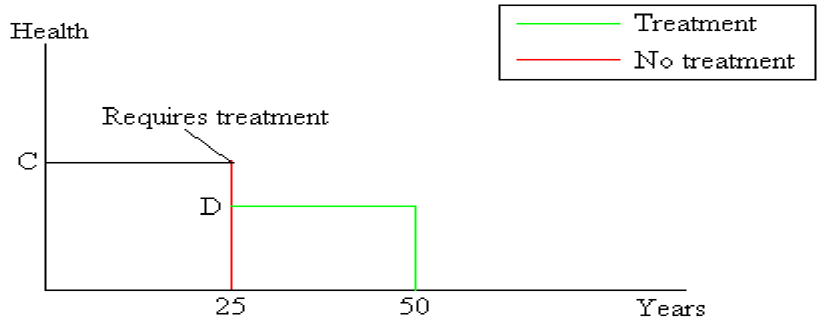
Assume that there are sufficient available health care resources to treat patient P ***or*** patient Q. Who would you prefer to treat? (please circle your answer)

1. Patient P 2. Patient Q 3. Indifferent (i.e. choose randomly)

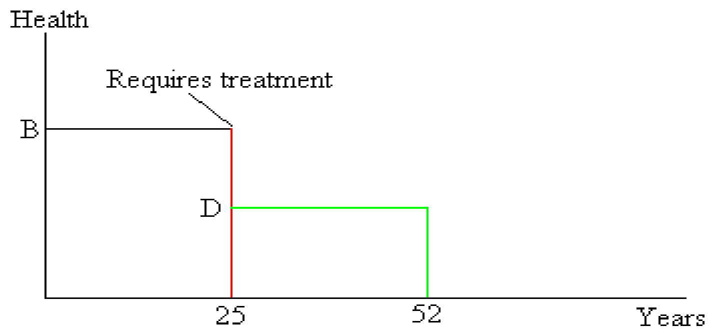
Please explain the reason for your answer:

Figure 2b. The first main priority-setting question

Patient P



Patient Q



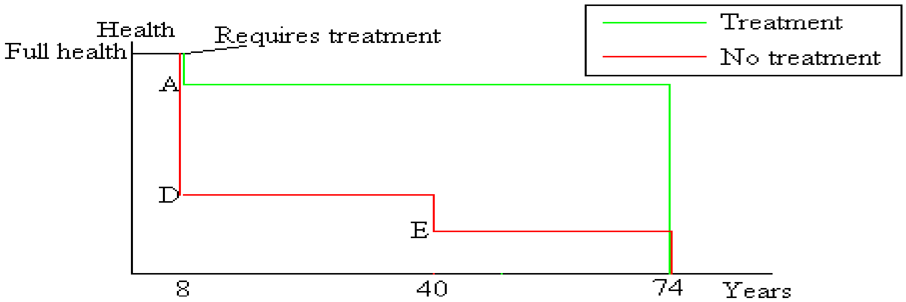
B:
No problems with mobility
No problems with self care
No problems with usual activities
Some pain/discomfort
Some anxiety/depression

C:
Some problems with mobility
No problems with self care
Some problems with usual activities
Some pain/discomfort
Some anxiety/depression

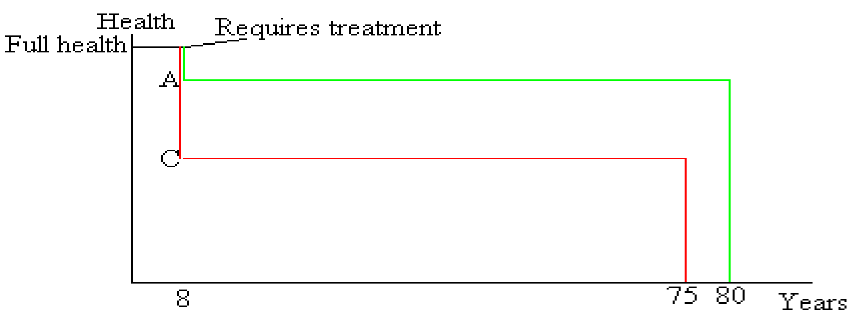
D:
Some problems with mobility
No problems with self care
Some problems with usual activities
Some pain/discomfort
Severe anxiety/depression

Figure 2c. The second main priority-setting question

<u>Patient P</u>



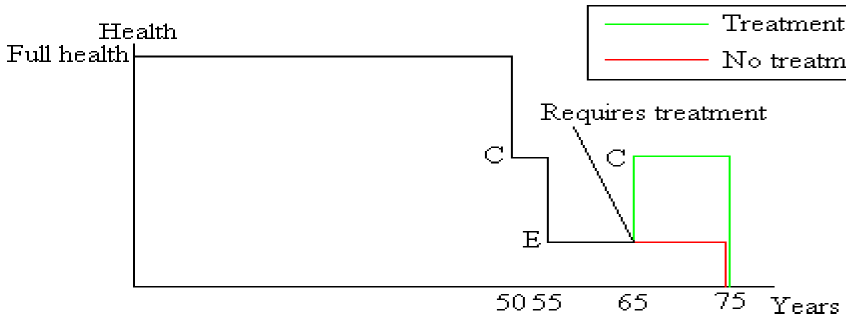
<u>Patient Q</u>



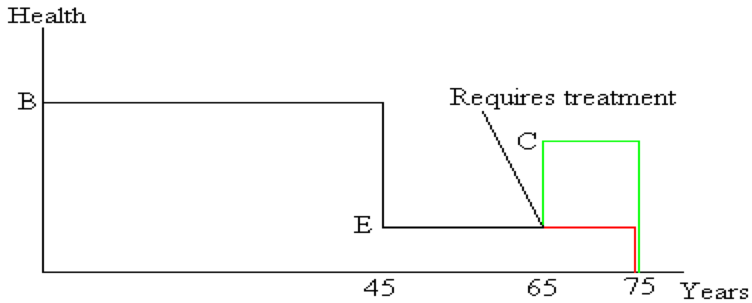
A:	No problems with mobility No problems with self care No problems with usual activities No pain/discomfort Some anxiety/depression	C:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Some anxiety/depression
D:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Severe anxiety/depression	E:	Some problems with mobility Some problems with self care Severe problems with usual activities Some pain/discomfort Severe anxiety/depression

Figure 2d. The third main priority-setting question

Patient P



Patient Q



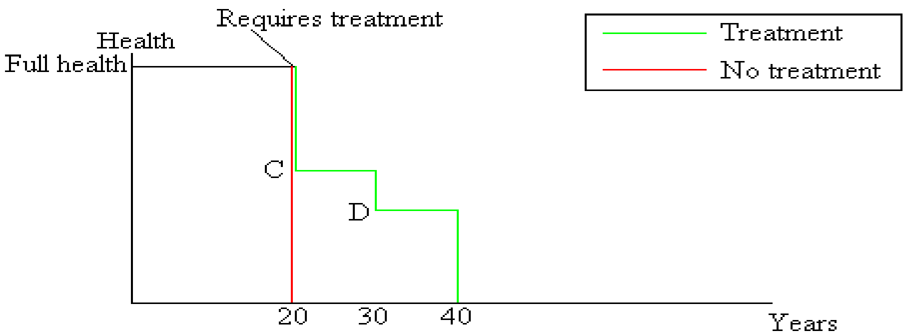
B:
- No problems with mobility
- No problems with self care
- No problems with usual activities
- Some pain/discomfort
- Some anxiety/depression

C:
- Some problems with mobility
- No problems with self care
- Some problems with usual activities
- Some pain/discomfort
- Some anxiety/depression

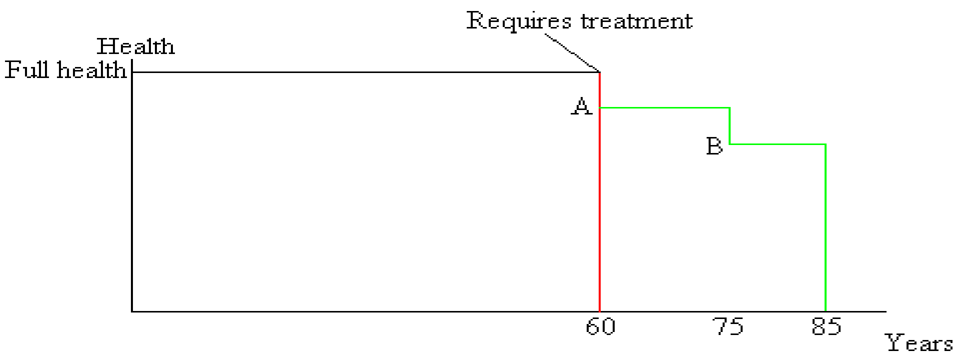
E:
- Some problems with mobility
- Some problems with self care
- Severe problems with usual activities
- Some pain/discomfort
- Severe anxiety/depression

Figure 2e. The fourth main priority-setting question

Patient P



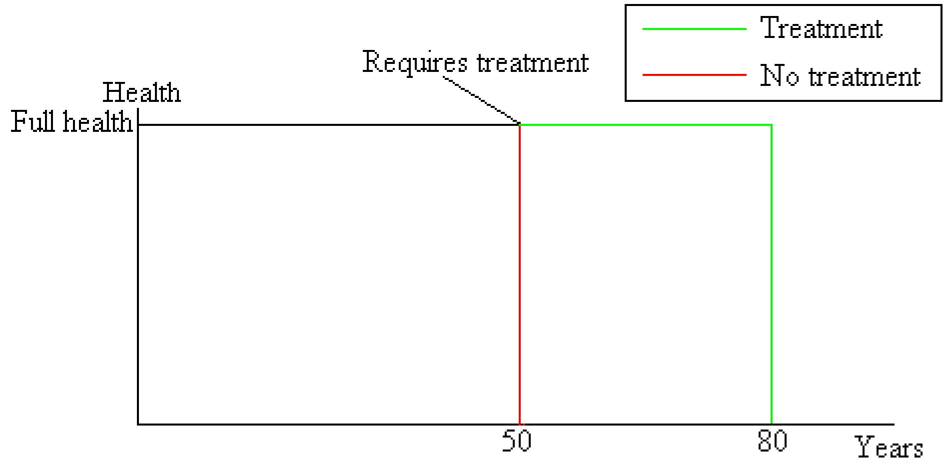
Patient Q



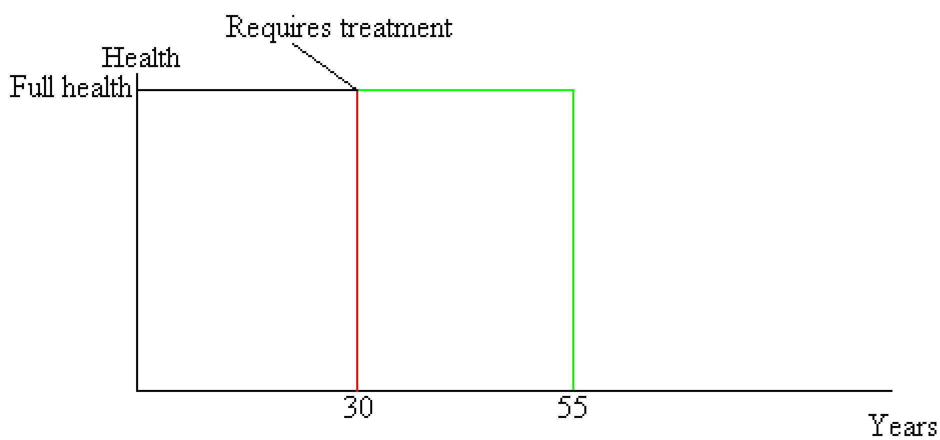
A:	No problems with mobility No problems with self care No problems with usual activities No pain/discomfort Some anxiety/depression	B:	No problems with mobility No problems with self care No problems with usual activities Some pain/discomfort Some anxiety/depression
C:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Some anxiety/depression	D:	Some problems with mobility No problems with self care Some problems with usual activities Some pain/discomfort Severe anxiety/depression

Figure 2f. The fifth main priority-setting question

Patient P



Patient Q



The respondents were asked to assume that they are the health care decision-maker, and for each question, were informed that there are sufficient available health care resources to treat only one of the two patients. They were therefore asked which of the two patients they would prefer to treat. Three of the main questions (Figures 2b-2d) were intragenerational decision contexts and the remaining two (Figures 2e and 2f) were intergenerational decision contexts. After inputting their time trade-off values for the different health states (and, where relevant, age weighting these values – described in the next subsection), the intention was to observe whether the respondents' answers to each question concurred with them maximizing post-treatment expected QALYs or minimizing the difference in total QALYs (which, it was thought, *may* be consistent with the fair innings argument). However, quantitative results are sufficient only for observing *consistency* with one or other of the decision rules. Some form of qualitative information is necessary to better understand the respondents' underlying thought processes, and they were therefore asked to write down the reasons for their answers.

2.2.3. Calculating the age weights

For the quantitative tests of the fair innings argument, 'raw' QALY scores are not sufficient and were not therefore used. The fair innings argument assumes that more weight should be given to a QALY gained for the relatively young than the relatively old, because (all else equal) the relatively young have thus far accrued less of their fair innings. Using survey data derived from the EQ-5D classification system and the TTO elicitation method, Williams (1997, p.126) estimated a fair QALE for UK males of 61 QALYs. He also provided expected lifetime QALY totals for social classes 1 and 2 combined and for 4 and 5 combined for those at birth, and for those at age 20, 40, 60 and 80 (Williams, 1997, p.125). In the absence of better available data, the age weights used in the current study were calculated from the data reported by Williams.

Since most, perhaps all, of the respondents in the current study better associate themselves with social classes 1 and 2 (skilled professional) than 4 and 5 (unskilled manual), the expected QALY totals for the former subgroups were used, although for the purposes of this study it would not matter if the data for social classes 4 and 5 had been used instead. For those at age 0, 20, 40, 60 and 80, Williams gave figures of 65.8, 66.0, 66.5, 67.6 and 73.9 expected lifetime QALYs, respectively. The age weights were derived by dividing the fair QALE by the actual QALE for each of these five ages.[3] For example, the age weight at age 20 was set equal to 61/66 = 0.924. The age weights for all other ages between birth and 90 were estimated through simple extrapolation by me. The data and their extrapolation are of course open to question, but they do possess the essential feature of the fair innings argument in that the weights decrease with age, and decrease at an increasing rate in old age.

[3] Strictly speaking, the weights should be calculated by $(\text{fair QALE}/\text{actual QALE})^{(1+r)}$, where r is a measure of an individual's (or group's) aversion to inequality. However, due to the absence of a widely accepted inequality aversion parameter in the literature, (fair QALE/actual QALE) is used to approximate the weights. In any case, Mara Airoldi has run a sensitivity analysis on the inequality aversion parameter, and has found that the results of this study hold even for extreme variations in the parameter.

To test the fair innings argument, the lifetime QALY totals for each patient under the assumption of both treatment and no treatment in each of the five main priority-setting questions were therefore adjusted by the age weights. Standard post-treatment QALY-maximization does not assume age weighting, but for all respondents and for all of the priority-setting questions, the application of the age weights did not in any case have any effect on which patient was estimated to have the highest number of post-treatment QALYs.[4]

3. Results

3.1. The health state values

The sample statistics for the TTO values elicited for health states A to E are presented in Table 2.

Table 2.
The health state values[i]

	A	B	C	D	E
Median	0.97	0.90	0.80	0.69	0.58
Low	0.80	0.70	0.14	0.08	0.00
High	1.00	1.00	1.00	1.00	1.00
Mean	0.95	0.90	0.75	0.64	0.54
Standard dev.	0.05	0.08	0.17	0.20	0.23
N	42	42	42	42	42

Note
[i]All numbers in the table are given to two decimal places.

Eight respondents demonstrated a strict violation of dominance in their TTO values, in that they valued an unambiguously inferior health state higher than an unambiguously superior health state. Only one of these appeared to do so due to a basic misunderstanding of the task presented to them in the main TTO questions, but the values elicited from these eight respondents are problematic and are not used in the calculation of the sample statistics.

[4] It is also possible that the respondents would have discounted life years in the health profiles presented in the priority-setting questions, but it is not clear what the discount rate (if any) was for each respondent, or which age in these profiles the respondents would have taken as ‘year 1’ (e.g. at birth, or the age the respondent was then at?). In order to avoid additional complications, discount rates are not applied in this study.

3.2. Quantitative results from the priority-setting questions

As noted above, the quantitative tests in the priority-setting questions relied on the inputting of the respondents' TTO values into the lifetime patient health profiles. Each priority-setting question was designed with the intention that choosing one of the patients would, for any particular respondent, be consistent with maximizing post-treatment QALYs while choosing the other patient would be consistent with minimizing the difference in lifetime QALYs across the two patients, with the latter being an indication of possible compliance with the fair innings argument. Table 3 provides a summary of whether the respondents tended 'maximize' or 'minimize' in the main priority-setting questions.

Table 3
The quantitative results of the priority-setting questions

	Number of respondents 'maximizing' or 'minimizing'				
	Figure 2b	Figure 2c	Figure 2d	Figure 2e	Figure 2f
Maximize[i]	21 (42%)	3 (6%)	19 (38%)	15 (30%)	6 (12%)
Minimize[ii]	7 (14%)	3 (6%)	18 (36%)	19 (38%)	26 (52%)
Unclear[iii]	22 (44%)	44 (88%)	13 (26%)	16 (32%)	18 (36%)

Notes
[i]'Maximize' indicates that post-treatment QALYs are maximized.
[ii]'Minimize' indicates that the difference in total age-weighted QALYs is minimized.
[iii]'Unclear' indicates that it was not possible to tell whether post-treatment QALYs are maximized or the difference in total age-weighted QALYs is minimized. This was either because, for a particular question, a respondent's TTO values meant that 'maximizing' *and* 'minimizing' required the prioritization of the same patient, or because a respondent's TTO values strictly violated dominance and could not therefore be used.

The reason why it is 'unclear' that a large number of the respondents either maximized post-treatment QALYs or minimized the difference in total age-weighted QALYs for the question replicated in Figure 2c is because most respondents, in selecting patient P in that question, both 'maximized' *and* 'minimized'. When the question was designed it was thought that the six extra years in health state A offered to patient Q following treatment would be sufficient to outweigh the additional QALYs generated by moving from health states D/E to A for patient P compared to moving from health state C to A for patient Q. It was thus expected that choosing patient Q would generally serve to maximize post-treatment QALYs. However, my expectations underestimated the difference in the TTO values given by the respondents for health states D and E compared to C. Consequently, for most respondents it is not even possible to guess at the preferred decision rule from the quantitative results for this particular question, although the qualitative explanations reported later will address this defect.

At face value, the results presented in Table 3 do not offer much quantitative support for either QALY-maximization *or* the fair innings argument as an *overarching* decision rule. It appears that the preferred decision rule may well depend on the context presented; for example, far more respondents ‘maximized’ than ‘minimized’ in the first question listed (an intragenerational context with marginal differences between the patients in both post-treatment QALYs and pre-treatment health status), whilst the reverse was the case in the last question listed (a simple intergenerational question with no diminished health functioning for either patient). In the other questions, neither decision rule appeared to dominate.

At this point the observant reader will say ‘wait a minute’: the fair innings argument involves consideration of a *trade-off* between the egalitarian concern of minimizing the difference in age-weighted QALE across the two patients *and* the efficiency concern of maximizing post-treatment QALYs. Therefore, although minimizing the difference in lifetime QALYs may offer an indication that the fair innings argument is at work, if the efficiency argument ‘dominates’ the egalitarian argument in the respondent’s ‘fair innings’ thought process, he may choose the patient that maximizes post-treatment QALYs. In short, some ‘apparent’ QALY maximizers may in fact have reached their decision through consideration of a fair innings.[5]

Importantly, the extent of the trade-off differs across questions, which may result in a fair innings-complying respondent prioritizing the patient that maximizes post-treatment QALYs in one question, but choosing the patient that minimizes the difference in lifetime QALYs in another question. For example, consider a respondent who is just willing to accept a one QALY reduction in post-treatment QALY gain for a three QALY reduction in the difference in total QALYs between the two patients. If that respondent were asked to choose, say, patient P over patient Q knowing that to do so would narrow the difference in total QALYs by two for every post-treatment QALY he sacrificed, he would decline; if it narrowed the difference by four for every post-treatment QALY he sacrificed, he would accept. Thus, in some questions, this fair innings-minded respondent may still ‘maximize’, but in others he would ‘minimize’.

For each priority-setting question used in this study, it is possible to calculate the maximum reduction in lifetime QALY inequality for each post-treatment QALY sacrificed for each respondent to still be allowed to ‘minimize’. To demonstrate how the ‘maximum allowed trade-off’ is calculated, consider Figure 2b. Assume that a particular respondent values health states B, C and D at 0.8, 0.7 and 0.6, respectively. For simplicity, ignore age weighting in this illustrative example. For patient P, the total lifetime number of QALYs with treatment and without treatment is 32.5 and 17.5, respectively, and the post-treatment QALY gain is therefore 15. For patient Q, the comparable figures are respectively 36.2, 20 and 16.2. If P is chosen over Q, the difference in lifetime QALYs is 32.5 – 20 = 12.5. If Q is chosen over P, the difference in lifetime QALYs is 36.2 – 17.5 = 18.7. The ‘maximum allowed trade-off’ is calculated by dividing the difference between these two differences, by the number of post-treatment QALYs sacrificed by treating P rather than Q (i.e. 1.2). Therefore, the maximum allowed

[5] An exception is the question replicated in Figure 4d. Here, the efficiency (or ‘maximize’) argument would require the respondent to express indifference, because the number of post-treatment QALYs is the same for the two patients. Therefore, any respondent who decided according to a fair innings would simply choose the patient that led to the smallest difference in lifetime QALYs.

trade-off is in this case (18.7-12.5)/1.2 = 5.17 QALYs. This would mean that if the respondent processes the question in accordance with the fair innings argument and is willing to trade-off each potential post-treatment QALY gained for a 5.17 reduction in the total lifetime QALY difference between the two patients, he will choose patient P. However, if he requires a greater reduction than 5.17 QALYs for each post-treatment QALY forgone, he will choose patient Q.

I calculated the maximum allowed trade-off for each respondent in each question on the basis of their TTO values, and found that it does indeed differ across questions (and across respondents), which indicates that more respondents *may* have been consistently using the fair innings argument than intimated earlier in the 'at face value' conclusions derived from Table 3. Table 4 presents the maximum allowed trade-off sample statistics for each of the questions and shows that the median allowed trade-off value is much lower for the question replicated in Figure 2b than that in Figure 2f, which is consistent with the results presented in Table 3 that show that more respondents chose to 'maximize' than 'minimize' in the former question, while more chose to 'minimize' than 'maximize' in the latter question.

Table 4
The maximum allowed trade-off in the priority-setting questions[i]

	Figure 2b	Figure 2c	Figure 2d	Figure 2e	Figure 2f
Median	5.07	3.55	-	5.02	11.70
Low	1.00	1.00	-	1.21	11.70
High	27.25	511.07	-	14.58	11.70
Mean	6.77	101.94	-	5.67	11.70
Standard dev.	6.35	204.00	-	2.74	0.00
N	42	6	-	42	42

Note
[i]In many instances, it was not possible to calculate a respondent's maximum allowed trade-off. This was: (i) because the respondent's TTO values meant that maximizing *and* minimizing required the prioritization of the same patient and thus there was not a trade-off to be made (as was often the case for the question replicated in Figure 2c); (ii) because the respondent's TTO values strictly violated dominance and could not be used; or (iii) because, in the case of the question replicated in Figure 2d, the patients had the same post-treatment QALY gain, and thus compliance with the fair innings argument would mean that the respondents would always choose to minimize the difference in total age-weighted QALYs irrespective of the size of the reduction on offer.

For the question replicated in Figure 2c, maximum allowed trade-off values could be elicited from only 6 respondents, a number too small to form any meaningful hypotheses. As noted in Table 4, there are no maximum allowed trade-off values for the question replicated in Figure 2d, because here the patients have the same post-treatment QALY gain, and thus a consideration of the fair innings argument would mean that the respondents would always choose to 'minimize'. That the respondents appeared to be divided approximately equally between 'maximizing' and 'minimizing' in this question (see Table 3) somewhat undermines both post-treatment QALY-maximization and the fair innings argument as overarching decision rules. The results in Table 4 for the question replicated in Figure 2e are also somewhat worrying for supporters of the fair innings argument; given that more respondents 'minimized' in this question than that in Figure 2b, one would have expected the median allowed trade-off to be greater than that for Figure 2b.

It is possible to speculate indefinitely on the basis of these quantitative results. However, for a richer understanding of the decision rules employed by the respondents when choosing between the patients, it might prove fruitful to turn to their qualitative explanations.

3.3. Qualitative results from the priority-setting questions

I summarized the written explanations that each respondent gave for their answers into a number of short decision rules.[6] The rules that the respondents used, together with the number of respondents who answered according to each rule, are presented in Table 5.

Table 5
The decision rules used in the priority-setting questions

	Number of respondents complying with the decision rule				
	Figure 2b	Figure 2c	Figure 2d	Figure 2e	Figure 2f
QALY max[i]	6	11	19	14	3
Life yr max[ii]	11	6	0	0	4
Rel QALY[iii]	8	0	4	0	0
Fair innings[iv]	8	18	19	14	9
Life yr equal[v]	0	1	0	11	16
QALY equal[vi]	1	0	0	0	0
Equal access[vii]	9	2	2	3	7
Productivity[viii]	1	1	0	3	9
Suffer min[ix]	0	8	0	1	0
Cost min[x]	0	1	0	1	0
Fair resources[xi]	1	0	1	0	0
Unclear[xii]	5	2	5	3	2
Summary					
Post-treatment	25 (50%)	17 (34%)	23 (46%)	14 (28%)	7 (14%)

[6] Summarizing the respondents' explanations into short decision rules is not, in every case, an easy task because some explanations are open to interpretation. Therefore, to allow interested readers to reach their own conclusions, and even perhaps test their own hypotheses, the complete set of qualitative explanations as reported by the respondents is available at: http://www2.lse.ac.uk/LSEHealthAndSocialCare/LSEHealth/documents/ADAMOLIVER/Afairtestofthefairinningsrespondentsexplanations.xls. A few of the respondents offered more than one explanation for their answer to a particular question; in these cases, I categorized according to what appeared to be the principal explanation.

health outcomes maximization[xiii]					
Concern with distribution of outcomes[xiv]	9 (18%)	19 (38%)	19 (38%)	25 (50%)	25 (50%)
Others (including 'unclear')	16 (32%)	14 (28%)	8 (16%)	11 (22%)	18 (36%)

Notes

[i]QALY max (QALY-maximization): The respondent indicated that post-treatment health states *and* lengths of life drove their decision.

[ii]Life yr max (Life-year maximization): The respondent indicated that *only* post-treatment length of life drove their decision.

[iii]Rel QALY (Relative QALY-maximization): The respondent indicated that compared to a patient who has a relatively poor pre-treatment health status, a patient who has a better pre-treatment health status will experience lower utility from a specified lower post-treatment health state. This decision rule may be linked to notions of adaptation, in that a person who has had a worse pre-treatment experience may adapt better to the post-treatment experience. Relative QALY-maximization was outlined formally as a possible health care decision rule by Johannesson (2001).

[iv]Fair innings: The respondent indicated that they traded-off the differences between the pre-treatment health experiences and the post-treatment outcomes in those cases where both pre-treatment health and post-treatment outcomes differ across the two patients. Where pre-treatment health states are not different (as in Figure 2c) or post-treatment outcomes are not different (as in Figure 2d), the fair innings argument only requires an explicit judgment on the basis of post-treatment outcomes in the former case or pre-treatment health status in the latter case. Sometimes respondents specifically stated 'fair innings' as their answer, and in these cases the admittedly strong assumption is made that the decisions of these respondents concurred with the technical meaning of a fair innings.

[v]Life yr equal (Life-year equalization): The respondent indicated that they attempted to make the life expectancies of the patients as equal as possible, but did not mention the differences in post-treatment outcomes. This differs from Harris' original fair innings argument in that according to Harris, to prioritize the younger person, the older person would have had to have reached an age that at least meets some pre-defined 'fair innings' threshold. If the respondents felt that patient Q in Figures 2e and 2f had met the fair innings threshold, then a decision consistent with life-year equalization would comply with Harris' original fair innings argument.

[vi]QALY equal (QALY-equalization): The respondent indicated that they attempted to make the total QALYs of the patients as equal as possible, but did not mention the differences in post-treatment outcomes.

[vii]Equal access: The respondent would not discriminate between the two patients.

[viii]Productivity: The respondent indicated that they believe that the patient who they think will be more productive for society/family ought to be prioritized.

[ix]Suffer min (Suffering-minimization): The explanations given for the question in Figure 2c were, on the whole, the most difficult to categorize. Some explanations seemed to suggest that in the absence of treatment one of the patients would suffer and the other would not and thus the suffering patient was chosen for that reason. These explanations have been categorized as being motivated by 'suffering-minimization'. Other explanations appeared to suggest that both patients would suffer in the absence of treatment, but that it would be better to treat the patient that has the

worst health without treatment. These explanations have been categorized as being consistent with the fair innings argument. This categorization is not important for the overall conclusions of this particular article.
[x]Cost min (Cost-minimization): The respondent indicated that they would treat the patient whose treatment they believe will be the least expensive.
[xi]Fair resour (Fair resources): The respondent indicated that they would treat the patient that would result in what they believed would be the most equal final distribution of health care resources.
[xii]Unclear: The reasoning process that the respondent used is not understandable.
[xiii]Includes QALY-maximization, life-year maximization and relative QALY-maximization.
[xiv]Includes fair innings, life-year equalization and QALY-equalization.

Table 5 shows that the respondents used a host of decision rules, the prevalence of which varied substantially across the questions. Detailed explanations of each of the decision rules are given in the notes to the table, but, briefly, in addition to QALY-maximization and the Williams fair innings argument, they included concerns for maximizing life-years, maximizing health after adjudicating for the possibility that different respondents may differentially 'appreciate' a particular health state depending on the health state to which they are accustomed, securing equal access to health care, minimizing the differences in life-years or QALYs across patients, maximizing productivity, minimizing suffering, minimizing health care costs, and distributing health care resources equitably. It is therefore clear that the rules were not confined exclusively to concerns about pre- and post-treatment health states.

In the bottom half of Table 5, the various decision rules are summarized into those that are formed by post-treatment health outcomes maximization of one form or another (the efficiency argument), those formed by egalitarian considerations (which includes the fair innings argument and its close relation, 'life-year equalization'[7]), and those formed by 'other' concerns. The general trend in the decision rules employed by the respondents across the questions correspond quite closely with the quantitative results reported in Table 3, and thus serve to underline the question mark against whether the application of any single overarching decision rule across all health care prioritization contexts is an appropriate strategy to pursue.[8]

4. Conclusion

Underlying value systems may influence people's preferred decision rules for allocating health care resources. The results of the study reported in this article suggest that for many people, values may well change with the decision context. Consequently, the

[7] Categorized under 'life-year equalization' are explanations that focus upon narrowing the distribution of time alive. Strictly speaking, this does not concord with Williams' fair innings argument, as no explicit mention is made of the difference in post-treatment outcomes. However, in some cases respondents may have considered the differences in both total life years and post-treatment outcomes, but might have just alluded to the difference in total life years for reasons of brevity.
[8] In a respondent-by-respondent breakdown of results, it is perhaps also worth noting that their qualitative explanations, almost without exception, do not conflict with their quantitative answers.

‘predominant’ decision rule can vary by context. Evidence-based medicine has generally assumed that post-treatment maximization is the appropriate overarching decision rule, and recommendations for ‘best practice’, both with respect to clinical and economic evaluation, have followed accordingly. Williams (1997) advocated the fair innings argument as an alternative rule, but the results of this study suggest that the search for (and application of) an overarching decision rule is misguided.

How might the context-dependent nature of preferred decision rules be incorporated into the policy-making process? Specific, quantitative calculations may be too ‘rigid’ to capture the complex pattern of decision rules used across contexts, and therefore deliberative judgements might be better employed to guide health care decision making. For instance, in the liver transplant example given in the Introduction, the policy maker may find that striving to offer equal access best aligns with ‘population’ values, whilst preferences over the type of intergenerational context presented in Figure 2f might suggest that the relatively young ought to sometimes take particularly high priority. To account for ‘context’, the priority-setting approach therefore perhaps ought to be undertaken on a deliberative health care ‘intervention-by-intervention’ basis, rather than always assuming that one rule (e.g. maximising post-treatment QALYs, or striving to produce a population-wide fair innings) should predominate.

It is of course recognized that the study reported in this article has caveats – the article is littered with acknowledgments of them. For example, the methodological limitations of the time trade-off technique [9], the use of anxiety/depression as the deteriorating dimension in the health states[10], the potentially biasing influence of the diagrammatic depictions in the questions, the approximations and secondary data used in the calculation of the age weights, and the difficulties of interpreting the respondents’ qualitative explanations to align with the specified decision rules, are all open to debate. Moreover, the design of the priority-setting questions may have caused some respondents to answer the questions in ways that were not intended. Some respondents incorporated information that they may have felt was important but that was not actually in the questions, for instance in forming their decisions on the basis of cost-minimization or a fair distribution of lifetime health care resources even though no information on the costs of care (other than that treatment for only one of the two patients could be afforded) was given. Also, some respondents probably used simple heuristics to reach their decisions by focusing on one particular aspect of the contexts before them rather than reaching fully ‘reasoned’ answers, although 46 of the 50 respondents varied their decision rules across the questions, which somewhat mitigates the concern that the respondents were rigid in their thinking. There are also other caveats. For example, is it appropriate (as is also common

[9] The TTO relies on the heroic assumption that respondents have a zero rate of time preference. See: Johannesson et al. (1994).

[10] Due to the possibility that some of the respondents may have felt that severe anxiety/depression would be difficult to bear for protracted periods, some may contend that lives that involve long periods of health states D and/or E are not worth living. This concern was not, however, represented in the TTO values (an evaluation technique that relies on the consideration of long periods of the health states in question), where 0 and 2 of the 50 respondents respectively valued health states D and E as low as death. Moreover, in the priority-setting questions, only one respondent explicitly stated that a life involving these health states (for the question in Figure 2e) was worse than death.

practice in the health economics literature) to elicit health state values in questions that focus on preferences for one's own health, and then apply these values to inform choices across others? In sum, this study is not an 'end', and other than showing a clear tendency for decision rules to vary across decision contexts, provides no specific, concrete conclusions. But the study is an exploratory first step, and it does, it is hoped, raise a number of hypotheses that will encourage others to take up the mantel of testing, both quantitatively and qualitatively, the ethical principles that some would prefer that we merely assume.

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