INTERPRETATIONS OF UTILITY AND THEIR IMPLICATIONS FOR THE VALUATION OF HEALTH*

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The term 'utility' can be interpreted in terms of the hedonic experience of an outcome (experienced utility) or in terms of the preference or desire for that outcome (decision utility). It is this second interpretation that lies at the heart of the methods that economists have developed to value non-market goods, such as health. In this article, we argue that decision utility is unlikely to generate meaningful data on the utility associated with different experiences, and instead economists should look towards developing measures that focus more directly on experienced utility.

The concept of utility is central to both normative and descriptive debates in economics. The word 'utility' has two distinct meanings: it can refer either to the hedonic experience of an outcome or to the preference or desire for that outcome. These have been labelled experienced utility and decision utility, respectively (Kahneman *et al.*, 1997). Jeremy Bentham first defined utility in hedonic terms, as a measure of pleasure and pain (Bentham, 1789/1948), and economists followed that usage until the twentieth century. Francis Edgeworth even imagined a 'hedonimeter', an instrument that measures the utility of moments of experience and plots experienced utility as a continuous function of time (Edgeworth, 1881/1967). He proposed that the area under the curve represents the individual's total happiness over a given period.

Economists abandoned experienced utility early in the twentieth century, in favour of a new interpretation, in which utility represents 'wantability' (Fisher, 1918). A person's decision utilities are revealed by her choices. Of course, the two definitions have the same extension if people want what they will eventually enjoy – an assumption that is implicitly adopted in many economic analyses. If we assume that individuals are rational, fully informed and seek to maximise utility, then the choices they make are, by definition, those that maximise expected utility. Neoclassical welfare economics rests on a concept of decision utility that is cleansed of any reference to hedonic experience and which assumes that decision utility can be inferred from the preferences that agents reveal in their market choices.

Where markets do not exist, as in the valuation of public goods or of states of personal health, economists have developed procedures to measure decision utilities by eliciting hypothetical choices.[1] To elicit the utilities of states of health, economists and decision analysts have developed methods that require a respondent to state the

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    [1] The contingent valuation method is frequently used to measure the value of public goods, in the contexts of environmental litigation or cost-benefit analysis. This method involves surveys in which respondents are asked to state their willingness to pay for a given benefit, such as a hypothetical improvement in their health, or the continued existence of a species of birds.

probability mix of full health and death that makes them indifferent between that gamble and the certainty of an intermediate health state – the standard gamble (SG) method – or else requires them to state the length of time in full health that they consider to be equivalent to a longer period of time in poor health – the time trade-off (TTO) method (Dolan, 2000; Byrne *et al.*, 2005).[2] The unit of the scale is a quality-adjusted life year (QALY), which 'assigns to each period of time a weight, ranging from 0 to 1, corresponding to the health-related quality-of-life during that period, where a weight of 1 corresponds to optimal health, and a weight of 0 corresponds to a health state judged to be equivalent to death' (Weinstein and Stason, 1977). Some health systems are now using QALYs to help determine priorities in the allocation of resources.[3]

The main goal of this article is to question the validity of measures of decision utility for the evaluation of the weights assigned to different health states, although our critique applies to any revealed or stated preference method designed to elicit values for non-market goods from real or hypothetical choices.[4] The methods used to elicit weights express what respondents want at the time of the assessment in relation to future profiles of health that differ in their quality of life and risk of death or length of life. As such, they are unlikely to measure the utility corresponding to health 'during that period'. However, the choices that respondents make in SG or TTO questions should, to some great extent, be guided by accurate assessments of the utility corresponding to the health state in question over the specified period; see Kahneman (1997) for a discussion of this requirement more generally. The focus of our critique of QALYs based on decision utilities is that there are good reasons to suppose that this requirement will not be satisfied.

In Section 1, we discuss some of the evidence pertaining to the experienced utility that flows from different health states and other important factors, which, on the whole, suggests that people quickly adapt to many, but not all, states. Because QALYs are principally designed to inform resource allocation in health care, we consider in Section 2 some of the normative issues surrounding the role of adaptation in the context of allocating public resources. All else equal, if adaptation to one condition is more complete than to another, then the former will be given less priority than the latter. Whilst we may need to be cautious about using adapted preferences in some contexts, the problems associated with allowing for adapted preferences have been overstated, especially when deciding how to allocate resources once the budget for health care has been determined.

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[2] A third method, the visual analogue scale, which requires respondents to rate health states on a scale with defined endpoints, such as 0 for dead and 100 for full health, has also been used but it is not favoured by most economists and decision analysts involved in medical decision making because it does not require the respondent to make a choice.

[3] For example, the National Institute for Health and Clinical Excellence (NICE), which offers guidance on the use of new and existing medicines and treatments within the National Health Service in England and Wales, is much less likely to recommend that an intervention should receive government reimbursement if the cost-per-QALY of that intervention is high as compared to if it is low. Whilst no explicit threshold exists, a rule of thumb has developed, which suggests that interventions that cost less than £30,000 per QALY will be recommended for funding, whilst those that cost more than this will not be recommended or, if the cost-per-QALY is expected to fall over time, will be recommended for funding as 'experimental treatments'.

[4] Our critique is focused on the use of measures of decision utility to elicit values of this kind, rather than their usefulness in other contexts, such as predicting behaviour.

Forecasts of future utility should therefore take due account of adaptation but the evidence we present in Section 3 suggests that the intuitive forecasts of lay people generally fail to do so. In Section 4, we discuss the results from health state valuation studies, which are consistent with the idea that people underestimate the extent to which they and others will adapt to changed circumstances. In particular, we consider how those asked to imagine what it would be like to be in certain health states ('the public') have their attention drawn away from the possibility of adaptation and instead towards transitional changes in the health domain alone, and towards their immediate affective response to the health state in question.

These considerations might lead one to conclude that decision utilities should be elicited from those with direct experience of the health states in question ('patients'). However, decision utilities will always reflect the focus of the respondent's attention at the time of the assessment, rather than what they will attend to while experiencing a particular health state. Patients' decision utilities may be free of some of the biases associated with public values but they do not take due account of any losses associated with adaptation that may have already taken place. Whilst the public may overestimate the losses associated with a given state of health, patients may underestimate such losses and, importantly in a policy context, the relative ranking of different health states may well vary from one another – and from the rankings implied by experienced utility. Patients could be asked to consider their previous experiences when making hypothetical choices about the future but there is also evidence that people are not very much better at remembering the impact of past experiences than they are at predicting the impact of future experiences.

Against this background, we are rather pessimistic about the use of decision utility to generate QALYs, although our critique of decision utility may prompt others who are more sympathetic to this interpretation of utility to refine and develop the methods of preference elicitation. In Section 5, we argue that more elaborate studies designed to elicit decision utilities cannot overcome the fundamental problem with such utilities, which is that they do not accurately represent the utility streams associated with different health states. We therefore suggest that economists should instead look towards developing measures that focus more directly on experienced utility, and we provide some suggestions about how this might be done. Our recommendations, which involve eliciting proxy values for utility as it is experienced moment-to-moment, will also provide economists involved in estimating the welfare effects of non-market goods besides health with an alternative to existing revealed and stated preference methods. In Section 6, we provide some concluding remarks.

1. Experienced Utility

Much of the evidence on the impact of a range of factors on utility can be summed up in one word – adaptation. Adaptation – the process of adjustment to new or changed circumstances – occurs at different levels and in different ways, ranging from molecular changes at the cellular level that diminish the perceived or experienced intensity of an objective stimulus (such as moving from light to dark) to overt behaviour that reduces exposure to the stimulus. Hedonic adaptation occurs when

there is a 'reduction in the affective intensity of favourable and unfavourable circumstances' (Frederick and Loewenstein, 1999). Such adaptation includes both sensory adaptation e.g. adjusting to an unpleasant smell and cognitive adaptation e.g. changes in interests, goals, values, or – importantly for much of the discussion that follows – redeployment of attention.

In a widely cited study, Brickman *et al.* (1978) found that accident victims who sustained paraplegia or quadriplegia in the last year reported happiness levels that were, on average, closer to those of a control group than might have been expected (2.96 on a 0–5 scale for paraplegics as compared to 3.82 for controls). Schulz and Decker (1985) found that reported happiness levels of a group of middle-aged and elderly paraplegics and quadriplegics were only slightly lower than population means of non-disabled people of a similar age. Similarly, Wortman and Silver (1987) found that quadriplegics reported no greater frequency of negative feelings than controls.

Tyc (1992) found no difference in quality of life or psychiatric symptomatology in patients who had lost limbs to cancer as compared to a control group. In a review of studies examining adaptation to burn injuries, Patterson *et al.* (1993) found high levels of psychosocial adaptation by one year after accident. More recently, Wu (2001) found that those who have had a heart condition in the past are less likely to report worse self-assessed health and emotional health due to the onset of new condition than those who have not previously had exposure to heart trouble, which, it is claimed, is 'quite supportive of the theory of hedonic adaptation'.

Whilst adaptation to changed health appears widespread, it is certainly not universal. There is, for instance, evidence of increased sensitisation to pain (Thompson *et al.*, 1973). In a diary study over four weeks of 80 patients with unexplained pain, Peters *et al.* (2000) found that patients with less than six months of pain reported significantly less pain intensity, disability and fatigue than patients whose pain had persisted for more than six months. Moreover, there is also evidence that coping with repeated episodes of pain leaves patients more vulnerable to stressful events (Lennon *et al.*, 1990). There is some evidence that people do not adapt to progressive diseases – see Livneh and Antonak (1994) in degenerative disorders and Antonak and Livneh (1995) in multiple sclerosis – but interpreting these results is problematic because the health states associated with such conditions are constantly changing and, therefore, the hedonic state could be deteriorating at a slower rate than the condition, which would still be consistent with adaptive processes (Frederick and Loewenstein, 1999). There is generally the need for more longitudinal studies that control for the effects of confounding variables.

It could also be that some of these results are explained by response shift (Sprangers and Schwartz, 1999). Paraplegics, for example, might compare their happiness to other paraplegics, elevate their current ratings to reflect the contrast with the extreme despair immediately following the onset of disability, or adopt lower standards for the intensity of positive affect, all of which would lead to over interpretation of the degree of adaptation. As possible evidence of this, in the Brickman *et al.* (1978) study, the accident victims remembered their happiness as having been much higher in the past than did the controls (4.41 as compared to 3.32, respectively). Similarly, Postulart and Adang (2000) show that kidney-pancreas

transplant patients remember their pre-transplant quality of life to be lower than they reported at the time.[5]

However, it is also entirely possible the paraplegics etc., when asked to imagine their life before an adverse change in their health, may focus on those things that made their life different to now rather than on those many things that have been unaffected by paraplegia etc. And whilst response shift makes intertemporal and interpersonal comparisons of self-reports problematic, it cannot explain all changes in preferences that take place. For example, there is strong evidence of adaptation even when physiological or behavioural measures are used, both of which should be less prone to response shift: Krupat (1974) found that that prior exposure to threat reduced galvanic skin conductance (a physiological measure of threat); and Dar *et al.* (1995) found that war veterans with more severe past injuries could hold their finger in hot water for longer before classifying it as painful than veterans with less severe past injuries.

There is now evidence to show that individuals' life satisfaction adapts to changes in a number of other factors and life events. There is a small positive relationship between income and happiness in cross-sectional analyses but virtually no relationship at all in time-series analyses (Easterlin, 2001).[6] There is evidence that the income an individual considers to be 'sufficient' is primarily determined by her current income (van Praag and Ferrer-i-Carbonell, 2004), and that adaptation appears to offset about two-thirds of the benefits of any increase in income (Frey and Stutzer, 2002). Using data from a 15-year study of over 24,000 Germans, Lucas *et al.* (2003) show that, on average, people experience an increase in happiness in the years surrounding marriage but after the second year of marriage they appear to return to their baseline. Even in the case of widowhood, adaptation is close to complete after about eight years. These data are generally supportive of the idea that people are on a hedonic treadmill (Brickman and Campbell, 1971). However, it is worth noting that the average results mask some important individual differences. In particular, those who reacted strongly (either positively or negatively) were still far from baseline levels years after the event.

The same German data also highlight the point that adaptation is not found for all conditions. In the case of unemployment, for example, average life satisfaction falls from around 7.2 on a scale from 1–10 to the 6.3 in the first year and is still only 6.5 in the fourth year of unemployment (Clark *et al.*, 2004). There is also evidence to suggest that people do not adapt to noise that is poorly understood or unpredictable in its timing.[7] In a study of first year college students, Weinstein (1978) found that annoyance with

[5] To offset problems with response shift partially, respondents are now sometimes asked to rate a standardised vignette alongside ratings of satisfaction with own health, so that the latter can be recalibrated against the former (Salomon *et al.*, 2004). Such an approach serves to increase the age gradient in self-reported health; that is, self-reported health declines more rapidly with age once each individual's health rating has been recalibrated against his/her rating of the vignette.

[6] Whilst there are other possible explanations for this apparent paradox (i.e. some relationship between income and life satisfaction at one point in time and no relationship over time), it is likely that hedonic adaptation is playing a big part. One other possible explanation is that the rise in income over time has brought with it economic 'bads' (such as greater income inequality, rising crime and higher divorce rates), which offset any increase in life satisfaction from an increase in income.

[7] When noise is predictable, has been heard many times before, changes little from one time to the next, and is easily assimilated to people's prior schemas (e.g. the sound of a clock ticking), there is likely to be adaptation; see Wilson and Gilbert (2005), and how this evidence is consistent with their *AREA* model of emotional adaptation in which people *attend* to novel events, *react* to those events, *explain* the events, and as a result *adapt* to them.

noise in college increased. The same author also observed increasing pessimism about adaptation to highway noise: after four months, under one-third spontaneously mentioned noise as something they disliked in the neighbourhood, whereas over one half did after 16 months (Weinstein, 1982).

2. Adaptation in a Policy Context

It would seem that adaptation to many – but not all – conditions is widespread. The fact that people's preferences undergo some form of transformation in a process of adaptation would not, normally, be regarded as any more significant than the changes to preferences over time that may occur because of all the other experiences that they encounter. But in the context of resource allocation, adaptation raises a normative problem because, all else equal, the more a patient adapts to her condition, the less priority she will receive in the competition for resources that improve quality of life. In the extreme case, where there is complete adaptation to a health state (such that it gets a quality-adjustment weight of 1.0), there can be no increase in utility from its treatment or cure.[8]

The extent to which giving lower priority to those who have adapted most is unjust will depend largely on elements of the adaptation process; see Menzel *et al.* (2003) for a detailed discussion. Sen (1992) has discussed one particularly regrettable element of adaptation; namely, entrenched deprivation. In his critique of utilitarianism, he claims that 'desire fulfilment' is 'neglectful of the claims of those who are too subdued or broken to have the courage to desire much... In situations of long-standing deprivation, the victims do not go on grieving and lamenting all the time... The extent of a person's deprivation, then, may not at all show up in the metric of desire fulfilment...' However, Sen is concerned with a special case. People who adapt to changed health status are not generally 'subdued or broken', and their tastes and preferences should not be ignored. Whilst Sen's argument forces us to pause about too readily using adapted utilities, it does not justify a rejection of values shaped by adaptation.

The use of adapted values raises a real dilemma when patients successfully adjust their activities or their goals in line with their changed circumstances (Menzel *et al.*, 2003). Paraplegics, for example, may take up aerobic wheelchairing if they still desire physical exercise or they may develop an interest in music to replace a previous interest in physical activity. In light of such laudable effort and achievement, it may be considered unjust to withhold treatment from paraplegics on the grounds that the potential for gains in experienced utility are limited. However, if this argument is accepted, then an advantage gets created for those who have adapted. Treatments for such people will get greater priority than are warranted by the size of the actual utility gain from them. Resource allocation decisions will then be made as if adapted patients' gains in experienced utility count for more than the gains of patients who adapt less. This also seems unfair.

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[8] The opposite is true, of course, for life-saving or life-extending interventions, where complete adaptation to a health state would mean that the number of QALYs gained from saving someone's life in that state would, all else equal, be the same as the number of QALYs gained from saving the life of someone in full health. The increased priority given to adapted patients that comes from the use of 'adapted utilities' in life-extending contexts is often ignored by those who argue against the use of such utilities but it is in the context of life-enhancing treatments that the issue of adaptation presents us with a potential problem.

Herein lies a 'vexing moral problem' (Murray, 1996) that we cannot hope to resolve here. But, in general, it seems entirely appropriate to give greater priority to those states that people do not adapt to over those that they do adapt to. This would seem to be particularly true when allocating resources *amongst* patients once the budget for health care has been determined i.e. once we have decided the priority afforded *to* patients in relation to other groups. Given this, we need to consider how well people predict changes – including any adaptation – in their future preferences.

3. Predictions About Experienced Utility

How accurately do people predict their future utility and how well do they predict adaptation that is relevant for resource allocation? The evidence on these questions comes from various sources and it is not very encouraging. For example, Sieff *et al.* (1999) asked people testing for HIV to rate the degree to which they agreed or disagreed with a number of items about affect e.g. 'I feel angry most of the time'. The responses were standardised on a 0–100 scale, where 100 represents complete distress. The anticipated distress from a positive score was 95, whereas the actual distress was 78. The anticipated distress from a positive score was 49, whereas the actual distress was 55. Smith *et al.* (2006) report data from colostomy patients, half of whom had their colostomies reversed at some point. The current quality of life rating on a 0–100 scale did not differ between these two groups (71 for former patients, compared to 67 for current patients) but the current patients predicted that their quality of life with no colostomy would be 83 i.e. 12 points higher than what was actually reported by the former patients. It is, however, difficult to determine whether these differences, which are statistically significant, are significant in a 'utility loss' sense, and better methods of measuring experienced utility are required before we could make this claim (see Section 5 below).

A study of laryngeal cancer patients provides evidence that the decision utilities attached to 'end of therapy' health states (as measured using the TTO method) are similar in anticipation of those states and when they are experienced (Llewellyn-Thomas *et al.*, 1993). However, the time interval between evaluations was only nine days and it is possible that some respondents remembered their earlier valuations. Importantly, there were significant differences in the expected direction for those reporting the most severe end of therapy states. It is now widely recognised that it is changes in states, rather than the states themselves, that are the carriers of utility (Kahneman and Tversky, 1979), and the results here are consistent with the idea that people are able to predict their emotional response to such changes with a fair degree of accuracy, at least over the very short term.

In studies outside of health, it seems that people generally fail to recognise the importance of a range of adaptation processes, expecting both good and bad feelings to last a lot longer than they really do. For example, Gilbert *et al.* (2002*a*) asked voters in Texas during the 1990 election for governor (which was won by George W. Bush) how they would feel one month after the election if their candidate had lost. Respondents expected to feel miserable but when asked how they felt one month later, people were just as happy whether their candidate had won or lost. These and other results suggest that, whilst people can generally predict the valence and type of emotion

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from events reasonably well, they overestimate the intensity and especially the duration of their reactions to those events (Wilson and Gilbert, 2003).

One important reason for this is that we fail to appreciate our ability to 'make sense' of the things that happen to us (Wilson and Gilbert, 2003).[9] In relation to adaptation to negative events, such as adverse changes in health, Wilson and Gilbert (2003) suggest that we fail to appreciate the power of our psychological immune system (PIS), which detects and neutralises events that challenge our sense of well-being. Of course, some adverse events, like paraplegia, may result in permanent losses in well-being but those losses would be a lot worse if we did not possess psychological defences that hasten our recovery from them. As with 'sense making' more generally, the PIS functions largely outside of conscious awareness and is more effective by operating 'behind the scenes'. It is little wonder, then, that we fail to anticipate it.

In a study of lay predictions of adaptation, Cohn (1999) – see Kahneman (2000) – asked 362 respondents to evaluate the well-being of fictitious members of various categories of people, including lottery winners and paraplegics. Half of the respondents were told that the event (winning the lottery, becoming paraplegic) had occurred one month before, and the other half were told that event had occurred one year before. Respondents were also asked to indicate whether they personally knew a lottery winner or a paraplegic. Those who did not know a lottery winner or a paraplegic were largely insensitive to the time variable. Those who knew a lottery winner or paraplegic, however, were much more sensitive to the time course of the event: the between-groups comparison showed that these respondents correctly predicted that lottery winners would become less happy and paraplegics less miserable over time. The two groups did not differ significantly in their judgments of well-being one month after the event, which supports the idea that people are better able to predict initial changes in utility.

4. Decision Utilities in Health

Over the last thirty years or so, utilities for many different states of health have been elicited from patients and the public.[10] Consistent with the evidence presented above, there is now plenty of evidence to suggest that members of the general public overestimate the losses (and underestimate the adaptation) associated with a range of health states. In the first empirical study on this issue, Sackett and Torrance (1978) asked the public and home dialysis patients to value a remaining lifetime with chronic dialysis using the TTO method. The average utility from the general public was 0.39, as compared to 0.56 from dialysis patients. If it were possible to return dialysis patients to full health, then the gain would be 0.61 QALYs per year (1.0–0.39) if we used public utilities and 0.44 if we used patient utilities. In this case, using public values would reduce the cost-per-QALY of organ transplantation by nearly 40%.

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[9] Frederick and Loewenstein (1999) note the possibility that both adaptation and sense-making could be spuriously correlated through their common relation to a third factor, such as innate happiness, which causes people to both adjust successfully to their new condition and to make sense of it. However, this is less plausible in light of studies by Wilson *et al.* (2005), which manipulated the ease of sense making and found that the harder it was to make sense of a good event, the longer the affective reaction lasted.

[10] The general public is, of course, a heterogeneous group in terms of its health and will contain many people whose health is very poor but, on average, the general public are in better health states than the ones they are asked to imagine experiencing in most valuation studies.

Since then, whilst some studies have found little difference in public and patient valuations, most have produced similar results to those found by Sackett and Torrance, with similarly important implications for the results from cost-per-QALY ratios.[11] In a review of 39 studies, including their own, de Wit *et al.* (2000) found that 23 studies report patient values to be higher than public ones, 2 report public values to be higher, 11 report no difference and 3 report contradictory findings. It is not clear why there are differences across studies, although the small samples in some of the studies might help to explain why some of them report no differences. Interestingly, the two studies where patient values are actually lower than public ones are in samples of menopausal women and women in childbirth.

4.1. *Utilities from the Public*

There are at least three other factors that tend to reduce the public's assessments of health states that are different to their own, all of which draw respondents' attention away from the possibility of adaptation. First, attention is drawn to the transition from one health state to another and the transitory change in well-being that will result. So, when people are asked to value paraplegia, they will tend to focus on becoming a paraplegic, which will initially be the focus of much attention – they will be a paraplegic 'full-time' – and hence the source of much misery. But after this transitional period, a paraplegic will only be a paraplegic 'part-time', as they attend to other things in their life that are unaffected by their paraplegia. So valuations are likely to be affected by a 'Peak-Start Rule' (Dolan and White, 2006), where respondents focus on the peak loss and the immediate loss (which in most cases are likely to occur at the same time). This is also consistent with the idea that changes in states are the real carriers of utility (Kahneman and Tversky, 1979).

Second, and even allowing for the transition phase, attention is focused on the health domain rather than on other domains (such as personal relationships) which may be unaffected, or even enhanced, by changed health status. Health states are typically described using only a limited number of dimensions and always in ways that draws the respondent's attention to those dimensions that will be adversely affected. But one of the ways in which we adapt to changed circumstances is by redeploying our attention. So, if adaptation to paraplegia takes the form of not thinking about it (but rather thinking about domains of life other than health), this will not be part of the way anyone thinks about paraplegia in advance of the event.

Third, it is possible that SG and TTO responses reflect immediate affective reactions to the health state in question (Wilson *et al.*, 2002), which in the case of some severe health states is likely to be an initial shock reaction to, or fear associated with, that state. So, not only might respondents be channelled to consider a limited number of (possibly relatively unimportant) aspects of the future, they might even be channelled away from thinking about the future at all and towards focusing on current feelings. From

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[11] There is the possibility that some of these results could be explained by response shift (Ubel *et al.*, 2003). However, Baron *et al.* (2003) found that making the response scales more precise with well-defined demarcations served only to increase the discrepancy between the values of patients and the public.

this perspective, the apparent failure to take account of adaptation is a product of the way in which current emotions intrude on assessments of the future, as well as any additional failure to fully consider that future.[12]

Of course, policy makers may wish to devote resources to the health states that people fear the most. Fear has a very real effect on an individual's utility and on her behaviour, including her consumption. Insofar as fears surrounding particular health states can be reduced by expenditure on the treatment and prevention of those states, policy makers may be able to increase utility by such expenditures (Dolan and White, 2006). Moreover, the public, through the democratic process or pressure groups, may demand that certain health states, such as those associated with certain kinds of cancer, be given greater priority. However, accounting for fear is a quite separate issue from accounting for the losses in utility from a given health state, and SG and TTO utilities conflate fears that people have about experiencing poor health with their assessments of how their lives will be affected by poor health.[13]

In any event, we are unaware of any economists arguing for the SG or TTO on the grounds that they pick up people's legitimate affective responses to the health states in question. Indeed, economists have described health in terms of dimensions of health (mobility etc.) rather than in terms of conditions, like cancer, in order to avoid introducing too much emotion into the responses. The SG and TTO are assumed to tap into people's cognitive assessments of the utility associated with those states, despite the lack of any evidence to support such an assumption. Respondents themselves may think that they are giving a considered response to the utility assessment question but may in fact be using their immediate fear of the health state as a proxy for their future assessment of it (Gilbert and Wilson, 2000).

Focusing respondents' attention on the transition from one state to another, emphasising the negative consequences for health, and picking up some affective response to the change in health, may together explain why many states are considered to be worse than death in those studies that are being used to calculate QALYs for use in policy settings.[14] Moreover, not only does it appear that respondents fail to anticipate how they will eventually adapt to many adverse health states, it seems that they think many states will get worse the longer they last. For example, Bleichrodt and Johannesson (1997) found that SG values for states lasting ten years were higher than when the same states lasted for 30 years and Sackett and Torrance found that TTO values declined over durations of three months, eight years, and the remaining life expectancy of the respondent. In some cases, a health state that is considered to be

[12] A classic example of the way current feelings affect decisions about the future is shopping at the supermarket when hungry: when people are hungry, they tend to shop as is they expect to remain permanently hungry, but shoppers who are given a muffin to eat before entering the shop are more likely to limit their purchases to those items on their shopping list (Gilbert *et al.*, 2002*b*).

[13] For a discussion of the role of fear assessment in the context of economic evaluation, see Adler (2004), and for a related discussion in the context of imagined risks, see Sunstein (2002).

[14] For example, the EQ-5D, which is used widely in evaluative studies, generates 243 possible states of health (five dimensions of health, each with three levels of severity) and one-third of these are, on average, considered to be worse than dead by a UK general population sample that valued these states using the TTO method (Dolan, 1997).

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better than dead for a shorter duration is seen as being worse than dead when it lasts for longer (Dolan and Stalmeier, 2003).[15]

4.2. Utilities from Patients

Eliciting SG and TTO utilities from those currently experiencing the health state in question will avoid some of the problems associated with eliciting utilities for hypothetical states from the public. However, the fundamental problem with utilities elicited in a decision context remains; namely, that the responses will reflect whatever the respondent's attention is drawn to at the time of the assessment rather than what it will be drawn to in future experiences. Patients may well have experience of the state they are being asked to value but they can be expected to consider only a limited sub-set of possible future experiences in the utility elicitation task.

In addition, the SG and TTO methods both require patients to consider how their future experiences would be different were they to be in full health. Whilst many patients would have had previous experience of full health, their recollection of this – at least in an evaluative sense – may be far from perfect (see below) and they are again likely to focus on only a limited number of ways in which their lives would be different from now. Different patients may focus on different aspects of their future lives and may have very different constructions of what full health would mean to them, and these different conceptualisations could go some way towards explaining the wide variation in utilities elicited from reasonably homogeneous groups of patients; see de Wit et al. (2000).

Moreover, to be of use in a policy setting, decision utilities from patients will need to reflect how being in that state impacts on the average patient's life, as it will be experienced in the future by that patient. Most patients will experience some initial utility loss even if they fully adapt to their health state. Adapted patients do not have their attention drawn to how the state impacted upon them in the past and so, to fully capture this, decision utilities would need to be elicited from patients at every stage of the condition's progression.[16] So, even if patients were able to forecast accurately how their current health would affect them in the future, their decision utilities would not fully reflect how that state had affected them in the past.

It might be possible to ask current patients to give due consideration to how the state impacted upon them in the past when considering their decision utilities about the future. Even if patients reconstruct the time course of their condition more or less accurately,[17] their decision utility for health will be affected by how they recall the previous change in their health changing their life. Patients are likely to use their

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[15] The conditions of logical rationality required by the QALY model have not been discussed in this article, as an extensive literature on this issue exists already (Tsuchiya and Dolan, 2005) but evidence such as this violates the assumption that the value of a health state is unaffected by its duration.

[16] Despite the fact that adaptation takes time, the literature has largely been silent on the issue of when in the adaptation process preferences should be elicited (Dolan, 1999 and Sharma et al., 2004, represent notable exceptions).

[17] There is some evidence that patients have a tendency to underestimate the true incidence of previous somatic symptoms (Simon and Gureje, 1999) and to combine separate episodes into a single one (Means et al., 1989).

current preferences to rationalise a previous change (Wilson *et al.*, 2003), so they may well remember the transition into their current health state as being less intense than it was felt to be at the time. As possible evidence of this, Barsky (2002) reports on a number of studies that show that retrospective recall of health is highly correlated with individuals' current health state and not so well correlated with their initial state.

More generally, there is now plenty of evidence to suggest that our memories do not recall past utilities and their duration particularly well. For example, Redelmeier and Kahneman (1996) asked patients undergoing a colonoscopy to report their level of pain every sixty seconds throughout the procedure and to subsequently rate the 'total amount of pain experienced' on a similar scale. The correlations between the 'on-line' and global ratings suggested that respondents' memories of the experience were influenced primarily by the most painful moment of the procedure and the level of pain at the very end of the procedure: the duration of the procedure was largely ignored. Therefore, it appears that patients use a 'Peak-End Rule', which ignores the full set of experiences and how long these experiences last (Kahneman *et al.*, 1997).

4.3. *Illustrating the Problem with Decision Utilities*

Given all of this, it is entirely possible that decision utilities from the public will lead to a different ranking of health states to decision utilities from patients and that both will misrepresent the utility loss associated with the experience of those states. To see this, and in the absence of any good data on the experienced utility associated with the changing nature of health conditions over time, consider Figure 1. The two solid lines show the experienced losses (from full health with $U = 1$) over time (from $T = 0$) for two health states, A and B. State A starts off as worse than state B but there is more adaptation to B than to A. Assuming that utility is interpersonally comparable and can be expressed on a cardinal scale, by $T = 1$, the total loss in experienced utility is the same for both states.[18]

Let us assume that respondents from the general public accurately assess the initial utility loss associated with each state but that they fail to forecast any adaptation over time. The utilities they generate for states A and B are shown by the dotted lines labelled A_{GP} and B_{GP}. Because A starts off as worse than B, $A_{GP} < B_{GP}$. Suppose that decision utilities are elicited from patients experiencing A and B at $T = 1$, and that these decision utilities accurately represent those patients' preferences at that time. The utilities patients generate for states A and B are shown by the dotted lines labelled A_P and B_P. Because there has been greater adaptation to A than to B, $A_P > B_P$.

In evaluating two interventions, one which prevented state A and one which prevented state B, the former would appear to prevent more QALY losses if the utilities of the public are used and the latter would appear to prevent more QALY losses if the utilities of patients are used.[19] In fact, the loss in experienced utility and the total utility from both states is identical over the period $T = 0$ to $T = 1$. It is our contention that,

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[18] The standard QALY model assumes that utility can be compared across people and the SG and TTO methods both assume that utility (even if it is risk-adjusted or time discounted) is cardinal; see Dolan (2000).

[19] In a similar way, in evaluating two interventions which would either leave patients who would otherwise die in state A or state B, the latter would generate more QALYS if the utilities of the public are used and the former would generate more QALYs if the utilities of patients are used.
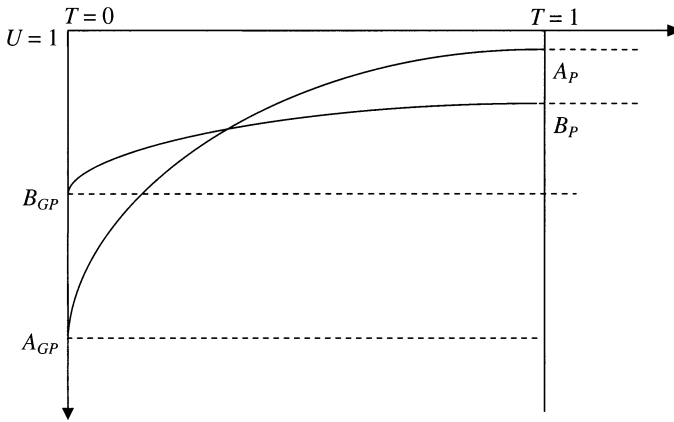
Fig. 1. *Losses in Experienced Utility from Two Health States, A and B, and Differences in Decision Utilities from the General Public (GP) and Patients (P)*

all else equal, the same priority should be accorded to the treatment and prevention of states A and B over the given period. To do otherwise is to distort priorities in favour of those who adapt if public preferences are used and against those who adapt if patient preferences are used.

5. Measuring Experienced Utility

It may be possible to develop more sophisticated measures of decision utility and to provide respondents with more information and context about the experiences associated with the states they are asked to value. An important advance in this regard has been the use of videos of real patients or actors to present a more complete picture of what life in a given health state really would be like; see, for example, Sloan *et al.* (1998) and Lenert *et al.* (2005). However, decision utilities will still reflect what the respondent's attention is drawn to at the time of the assessment. Ubel *et al.* (2001) devised a number of novel studies in which they attempted to draw respondents' attention away from the negative effects of different health conditions by asking them to consider how each condition would affect a range of different domains of life, but the valuations respondents gave were largely unchanged.[20] Many people may even be aware of their general propensity to mispredict future utility – and they can certainly be made aware in utility assessment studies – but they may still continue to mispredict it on a case-by-case basis, in much the same way as people can simultaneously be aware of their general tendency to procrastinate and still procrastinate on a case-by-case basis (O'Donoghue and Rabin, 1999).

In addition, decision utilities will need to conform to the conditions of logical rationality required by the QALY model. These conditions, set within an expected utility framework, require that the utility of a health state is unaffected by how long the

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[20] Only in one out of ten questionnaire variants did respondents' valuations of a hypothetical state (such as blindness and paraplegia) increase when they were asked to think the impact the state would have on a wide range of life domains.

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state lasts and unaffected by the states that come before or after it. Generally, respondents see health states as getting worse the longer they last and additive separability does not hold either, although there are no consistent patterns in the violations that would allow a simple algorithm to adjust the QALY model to better represent individual preferences over future health prospects (Tsuchiya and Dolan, 2005). Economists have responded to such evidence by deriving QALYs using generalisations of expected utility theory, such as rank-dependent expected utility and prospect theory (Doctor *et al.*, 2004). Such extensions to the standard QALY model are very much in keeping with the emphasis in economics and decision science on logical criteria of rationality, which can be assessed entirely by reference to a system of preferences in which only internal coherence matters (Sen, 1993) but they do not address the more substantive rationality requirement that individuals should correctly predict the effects of changes in health on their preferences.

So, rather than – or at least as well as – refining the methods for eliciting decision utilities, we suggest that economists should look for more direct measures of the utility associated with different states of the world. Economists are showing increasing interest in the use life satisfaction ratings as a basis for welfare assessment (Ferrer-i-Carbonell and Frijters, 2004), and the impact of different health states is yet to be fully exploited. Insofar as this work considers satisfaction according to domains of life such as health, income, etc., it has many parallels to the recommendation by Broome (1993) that we use a 'direct method', rather like a visual analogue scale that simply asks respondents to rate the 'goodness' of a health state. Economists, who have focused on the elicitation of decision utilities elicited using the SG or TTO, have largely ignored Broome's recommendation. However, as with decision utilities, satisfaction ratings are likely to be based on whatever the respondent's attention is drawn to at the time of the assessment.

In particular, such ratings will be determined by the comparisons people make between their own life or health at different times, and between themselves and other people (Dolan and White, 2006). So a key question about the usefulness of satisfaction ratings in policy settings is whether these comparison processes are an important part of utility in their own right or unhelpful distortions of experienced utility. The answer would seem to depend on the extent to which the assessment question taps into comparisons that the individual routinely makes in the moment-to-moment experience of his life. Put this way, it would seem that global assessments guide respondents to make comparisons that may not be the focus of attention in the experience of their lives, or at least not to the extent that their answer to satisfaction questions would suggest. In addition, satisfaction ratings are likely to reflect 'judgements that individuals form on the spot, based on information that is chronically or temporarily accessible at that point in time, resulting in pronounced context effects' (Schwarz and Strack, 1999).

For these reasons, satisfaction ratings may not provide the best proxies for the kind of experienced utility we have in mind here, and we instead need to develop measures of (or better approximations for) utility on a moment-to-moment basis. Experience sampling methods (ESM) (Stone *et al.*, 1999) and the day reconstruction method (DRM) (Kahneman *et al.*, 2004) provide promising ways of doing this. ESM typically involves using palm pilots that ask people at random times during the day to rate different feelings (happiness, frustration, worry etc.). However, this method is

invasive, it may interrupt the flow of an experience and there are often missing observations, which may be non-random (Csikszentmihalyi and Hunter, 2003).

The DRM has been developed to overcome these problems, and asks respondents to divide the previous day into a number of episodes and then to rate different elements of affect during those activities on a 0–6 scale. Using this method, Kahneman *et al.* (2004) show that one of the biggest determinants of good feelings is sleep quality, whereas marital status and income have much smaller effects. Large samples can be collected in a relatively short period of time and the method does not disturb the flow of experience as it happens. Kahneman *et al.* (2004) provide evidence that the results from the DRM provide a good approximation for those from the ESM.

To produce data that allow the relative cost-effectiveness of different interventions to be calculated requires the data from the DRM to be expressed on a cardinal scale. At present, respondents rate a range of feelings, including happiness, worry, and frustration, and there is no way to determine the relative weights that each respondent attaches to each of these. One simple rule that Kahneman and Krueger (2006) propose is to look at the feeling that gets the highest rating: if this is a negative one, score the time in that activity as one; otherwise score it as zero. It is then possible to calculate the proportion of time that people spend in an unpleasant state (which Kahneman and Krueger refer to as the 'U-Index').

The DRM can be administered to populations with a range of health conditions and at various stages of disease progression. By gathering data on people's health experiences, as well as data on age, sex etc., it will be possible to show how the activities people engage in, and the moment-to-moment utility associated with those activities, are affected by their health state. The great advantage of data of this kind is that it shows what affects what people do and how they feel on a moment-to-moment basis rather than reflecting what respondents think affects them at the time a decision utility or life satisfaction rating is elicited.

By collecting relevant background information, it will be possible to show how a range of health-related factors (including any costs associated with adaptation) affect experienced utility without the respondent having to attribute the utility they experience in any way. Indeed, the method could be used to show how a range of factors, including market and non-market goods and services, affect experienced utility. In any of these applications, there would be clear advantages to gathering longitudinal data where possible. As well as allowing the impact of different conditions to be traced over time, such studies would also allow for issues of causality to be addressed and, thus, facilitate a better understanding of the degree to which different levels and types of affect are able to predict future changes in health.

We recognise that the measure of experienced utility we propose may not capture everything that individuals (let alone policy makers) are trying to achieve. The method, as it currently stands, does little to incorporate our higher order preferences that give us our sense of identity and define who we are, and it ignores any preferences we may have over particular types of hedonic experience (Kelman, 2005). We may also make judgements about the purpose and meaning in our lives that may transcend our hedonic experiences (Seligman, 2002). Moreover, many people would seemingly choose a 'real' life, with its associated pain and suffering, over a life with greater hedonic experience if that latter life were to be artificially created by an 'experience

machine' (Nozick, 1971). Of course, there has been, and will continue to be, much debate about these issues, but the DRM could be augmented to account for some of these considerations. For example, questions could be added about the important goals that people have and how certain activities contribute towards them, and an 'extended U-Index' could be calculated as the proportion of time that people spend in pursuit of their goals.

6. Concluding Remarks

Modern welfare economics interprets a person's utility in terms of her preferences, and the methods that economists and decision analysts have used to elicit utility reflect this interpretation. The choices that respondents make in health state valuation and other studies should be guided by accurate assessments of the utility associated with the consequences of those choices. Even if people were to obey the axioms of rational choice in their preferences over health states, their preferences will still be sub-optimal if they are mistaken in their forecasts of the utility they will experience in the future (Loewenstein *et al.*, 2003). By and large, it appears that people adapt to changes in their circumstances but they often fail to appreciate the degree to which they will adapt to those changes. To the extent that our wants, as captured by our decisions, are based on predictions of what we will subsequently enjoy, we are often guilty of 'miswanting' i.e. we want things that do not make us happier or we do not want things that would make us happier (Gilbert and Wilson, 2000).

   Although many economists, as well as a consensus panel convened by the US Public Health Service (Gold *et al.*, 1996), recommend the use of utilities from the general public, eliciting decision utilities from those currently experiencing the health state in question will avoid some of the problems associated with eliciting decision utilities from the public. However, a patient's decision utility will still reflect what they want right now and may still not reflect the future utility associated with their health state. In short, there are good reasons to suppose that healthy members of the general public will focus on the transitional loss in utility associated with a change in health and ignore the adaptation that takes place, and that patients will focus on the adapted levels of well-being and ignore any transitional loss.[21]

   That decision utility and experienced utility do not produce the same results should not come as a great surprise to economists: Adam Smith (1759) argued that 'The great source of both the misery and disorders of human life seems to arise from over-rating the difference between one permanent situation and another'. The health state utilities that are currently used as the quality-adjustment weights in QALYs certainly result in differences between full health and dysfunctional states that are over-rated, and may also distort the differences between dysfunctional states.

   To represent the effect of different health states on people's well-being more accurately, we propose that economists in health and elsewhere shift their attention from the measurement of decision utility towards the measurement of experienced utility.

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[21] There is the possibility that patients may overstate transitional losses if they thought that by doing so there would be more resources devoted to the treatment of their condition but there is no evidence that respondents think in this strategic way.

We have suggested a way in which this might be done that requires people to state how they felt during various activities on the previous day. The method is a recent development and its successful use in future empirical studies in health and elsewhere will require an interdisciplinary approach involving economists and psychologists, and others with expertise in particular applications (such as clinicians in the case of health). We hope that some of the ideas presented in this article provide a catalyst for this endeavour.

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