

**Title page**

**Full Title:** **Losing sight of the wood for the trees: Some issues in describing and valuing health and another possible approach**

**Short Title:** **Problems in describing and valuing health and a possible solution**

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## **Abstract**

The ability to value health in a way that allows the comparison of different conditions across a range of population groups is central to determining priorities in healthcare. This paper considers some of the concerns with the ‘received wisdom’ in valuing health – to describe it using a generic descriptive system and to value it using the hypothetical preferences of the general public. The literature on the dimensions of health that matter most to people is reviewed and the paper discusses the use of global measures of subjective wellbeing (SWB) as a possible alternative. Using data from the British Household Panel Survey, it is shown that a focus on SWB would place greater emphasis on mental health conditions. The implications for health policy are considered.

## 1. Introduction

The provision of publicly-funded healthcare to improve the health and wellbeing of citizens remains central to modern government [1, 2]. An important role of healthcare is to make people feel better for longer. Ideally, the benefits of health technologies should be compared to one another using a common currency, and resources allocated to those treatments that confer the greatest benefit for their cost.

The currency most often considered is the quality adjusted life year (QALY). The Q in the QALY is calibrated on a cardinal scale between 0 (for dead) and 1 (for full health). One QALY represents one year of life in full health, or two years in 0.5 health, and so on. The influence of health technology assessment agencies, such as the UK's National Institute for Health and Clinical Excellence (NICE), means that the cost-per-QALY of health technologies has become significant [3]. The way the 'Q' in the QALY is calculated, however, raises a number of issues.

QALY calculations rely on the ability to describe the most important experiences of health. Generic health state descriptive systems, such as the EQ5D and SF6D, allow individuals to describe their current health by answering a number of questions, the answers to which generate specific health states. QALYs then require that those states are valued. NICE favours using the hypothetical preferences of the general public, who are asked to consider sacrifices in terms of risk of death (standard gamble, SG) or length of life (time trade off, TTO) for improvements in quality of life. There now exist general population 'tariffs' for the EQ5D [4] and the SF6D [5].

There are two main issues with this approach. First, in describing health in terms of a fixed and deliberately simplified descriptive system, we may fail to capture what is important to people in terms of their health, and miss important benefits of healthcare. Second, in valuing health in terms of hypothetical preferences, we may fail to adequately anticipate the real impact that different health states have on our lives. In continuing with the status quo, we may therefore run the very real risk of misallocating resources.

The aims of this paper examine both of these issues: first, to determine what we really know about which dimensions of health matter to people; and second, through new analyses of a large scale dataset, to examine the effect that different health states have on reports of subjective wellbeing (SWB). Addressing the first aim will allow us to see whether the existing widely used descriptive systems are fit for purpose. Addressing the second aim will show us what dimensions of health actually have the greatest impact on SWB, as opposed to the impacts that the general public imagine those dimensions to have.

In section 2, we review the existing literature on what dimensions of health matter most to people. There is surprisingly little evidence, but what there is suggests that communication and sexual functioning are not being adequately captured in measures like the EQ5D and SF6D. In section 3, we review the literature on SWB, principally global assessments of life satisfaction, to learn from this body of work what areas of health are most important to people. This also relates primarily to the first aim of the paper, and provides the backdrop for our new analysis. We then go on to provide fresh evidence on the relationship between life satisfaction and the SF6D from analysis of the British Household Panel Survey (BHPS). The results suggest that physical

functioning matters less than people imagine and that mental health problems impact upon our lives more than we expect them to. Section 4 considers some of the implications of these results, and discusses the use of SWB as an alternative to preference-based measures of health.

## **2. Do generic health state systems pick up what matters most?**

There are very few studies that have directly asked which factors are important to health. The involvement of the public and patients in developing measures has largely been to ask about the impact that certain conditions and health states would have on overall quality of life [6] and focussing on particular states limits the degree to which the measures can claim to reflect what matters most overall [7]. A notable exception is the study by Bowling [8], which surveyed 2031 people with the aim of providing population norms on the dimensions of health that people perceived to be important. Energy/tiredness, sexual functioning, communication and sleep were important, which are missing from the EQ5D and only partly covered by the SF6D. Respondents did include physical functioning, pain and mental health as important (all of which are domains in the EQ5D and SF6D) but, interestingly, no respondents volunteered self-care or activities of daily living as of great importance, both of which are also covered in the EQ5D and SF6D.

There has been some research to show that different patients attach different weights to the same health states at different stages in their treatment [9]. For example, it has been shown that towards the end of life, health and independence are weighted more strongly than other domains of life. It makes a great deal of sense that the dimensions of importance will change as people progress through a condition, particularly as end of life becomes more salient. Accounting for these changes could potentially represent a departure from existing methods. A great deal of current pharmacological innovation and research is directed towards developing novel chemotherapeutic agents targeted at advanced cancers. A focus on end of life care is far from the central theme of this paper, and warrants a much broader discussion. This issue does, however, illustrate one area in which the methods currently used may require further development.

Moreover, the domains of health that are important to individuals living with such diseases, especially at advanced stages, may not be the same as those that would be important to the general population imagining life in those circumstances. Accordingly, health technologies that confer real benefits to these individuals may either go undetected or incorrectly valued using existing measures of health. As an example, in focussing on groups of patients with recently diagnosed malignant cord compression, which can lead to paraplegia, Levack et al (2004) [10] found that only 29% of respondents considered independence as being important.

There is some evidence in the end-of-life literature that the domains of life deemed important to different people affected by and involved in a health conditions may also differ quite markedly. Over time, domains such as “relieving burden” become more important to the individual with the condition than independence or mobility [11]. Clinicians still place more emphasis on physical functioning [12] whilst patients seem to value being mentally aware most highly [13]. Differences between clinician and patient preferences have been well documented elsewhere [14] and we do not focus on them further here.

How individuals respond to changes in their health is central to issues concerning the allocation of health resources. We know, for example, that individuals generally adapt well to certain conditions [15], and that this notion of adaptation may be overlooked by the general public when valuing changes in health [16]. It seems to make sense that conditions that are hardest to adapt to will affect us the most, and we should account for this. It is not so much that these conditions should be automatically prioritised over those that are more readily adapted to, rather that we should ensure that any resource allocation system can deal, where appropriate, with differences in adaptation processes.

The limited evidence available suggests that what actually matters to people with respect to their health may not be being adequately captured using existing measures. The exclusion of a domain representing energy or vitality from the EQ5D is perhaps the best example of this, although the inclusion of other domains, which may be of lesser significance in the experience of people's lives, is also clearly important. Sexual functioning, sleep and communication have also showed up as important domains of health and they are not included in the EQ5D or SF6D. What matters also seems, to some extent at least, to be a moveable feast across people and over time, which further complicates matters and should make us cautious about a 'one size fits all' approach.

The narrow focus of descriptive systems can lead to overlooking some important dimensions of health whilst at the same time overvaluing others in terms of their relative impact on people's lives. It is also the case that different things matter to people at different times and so population values that attach the same value to each state irrespective of context may be inappropriate given these changing circumstances.

Utility weights derived from patients currently experiencing a condition differ from those who have recently experienced the condition [15], yet in many conditions conducting SG or TTO exercises with patients during severe illness is practically and ethically problematic. Furthermore, the current experience of illness, and fear of dying, may influence risk attitude or willingness to trade. For example, Konig et al (2009) [17] conduct TTO exercise on patients in psychiatric hospital with affective disorder and find that over 29% are not willing to trade. Moving to preferences of patients is not a panacea to our understanding of the relative importance of different health attributes. Moreover, valuation exercises that derive values from those experiencing these conditions may also be unreliable due to the focusing effects inherent in these exercises [18].

Measuring SWB in a way that does not focus the respondent on their health, and allowing regression analysis to determine the relative impact of conditions on the lives of individuals is one way around these significant problems without relying on stated preferences.

### **3. What can we learn about the value of health from measures of SWB?**

The recent Stiglitz report [19] and other researchers [e.g. Layard, 2005 [20]; Helliwell, 2006 [21]; Dolan and Kahneman, 2008 [18]] have begun to show how data on SWB might be used to inform public policy. The UK Government has recently made a significant commitment to monitoring SWB [22]. Examining the relationship between health and SWB can provide further insight, into the importance of different dimensions of health. We first consider the existing

literature, in relation to the first aim of this paper, and then address the second aim by presenting new analysis of the BHPS.

### **3.1. Existing literature**

In terms of what matters to people when we look at the determinants of SWB, we find that health is one of the most important dimensions: as Graham [23] points out, “health is among the handful of measurable variables that account for observed variability in human happiness”. We know that other factors affect SWB. Being married (or living as married) is consistently associated with higher SWB levels [24, 25], as is being employed [26, 27] and having lots of social contact [28]. For a more in depth review of factors associated with SWB in large datasets, see Dolan et al (2008) [29]. Understanding what determinants of health affect our lives as a whole, as measured by SWB, is important insofar as it will tell us where we might focus health resources. For the purposes of this work, it also allows us to examine the existing approach, namely what people think will be the important domains (from the general public preference based tariffs) alongside what is actually important (from SWB data).

Marmot [30] demonstrated the association between low overall SWB and poor general health in the Whitehall samples of British civil servants. Unpicking how exactly healthcare impacts on each of the individual determinants of SWB has yet to be established, although it is likely that improvements in health will lead to improved social and interpersonal functioning, and vice versa. Life threatening illnesses can also substantially lower SWB: Verbrugge et al [31] found that the SWB of people with serious chronic illnesses, such as congestive heart failure, declined over one year. There is a strong negative association between SWB and mental health. For example, Diener and Seligman [32] found that the happiest people showed very low levels of symptoms of mental illness. People with depression, anxiety disorders, or schizophrenia generally tend to have lower SWB [33], as do individuals with other psychiatric diagnoses [34].

The impact of mental health conditions on our lives and on our SWB is partly due to difficulties in adapting to these conditions compared to other diagnoses. We know, for example, that people with chronic health conditions or who are physically disabled show considerable levels of adaptation to these conditions [35, 36]. The improvement in SWB (although not to pre-morbidity levels) has been explained by the fact that paraplegia etc. are ‘part-time’ experiences, affecting SWB only when attention is drawn to the various limitations [18]. This is not to trivialise such conditions but to more accurately place them in the context of the richness of our lives.

Many mental health problems, such as depression, are more ‘full-time’ in their attention-seeking and impact on our lives. It makes intuitive sense that mental health conditions are among the hardest to adapt to but there is very little published work that directly compares adaptation to physical and mental health conditions. There is, however, some indirect evidence to support this. For example, while patient valuations of their own health states are generally higher than public valuations for physical conditions [37], own health valuations are lower than public valuations for depression [38].

In the only paper we could find that elicited EQ5D and SWB, Graham et al [39] showed that anxiety/depression was strongly and significantly negatively correlated with SWB (as measured

by the ladder of life) in a South American population; in contrast mobility was much more weakly associated and not significant. Beyond this, the dimensions that matter most have not been considered too closely in the literature thus far, with the emphasis on broad categories of disability [40] or specific health conditions, such as stroke and acute myocardial infarction [41].

SWB may also be affected by less attention seeking conditions. In a study using data on 16 countries, Blanchflower and Oswald [42] show that nations with higher SWB also report lower levels of self-reported hypertension. This is interesting because hypertension is often asymptomatic and so there may also be latent effects of a condition on SWB. In general, though, conditions that are hard to adapt to, for example mental health conditions, are associated with the greatest losses in SWB. We would ideally like to say something more specific about the weights attached to different dimensions compared to one another and, ideally, in panel datasets that allow us to control for individual heterogeneity in the relationship between health and SWB.

### **3.2. Analysis of the BHPS**

#### **3.2.1. Data and methods**

Since 1991, the BHPS has annually surveyed each adult member of a nationally representative sample of about 5,500 households, resulting in a total of approximately 10,000 individual interviews (rising to about 15,500 by 2005).

The SF-6D reduces the eight dimensions of the SF-36 into six dimensions: physical functioning, role limitations, social functioning, pain, mental health and vitality. Each dimension has 4, 5 or 6 levels, giving a total of 18,000 possible health states [5]. The general public preference-based values attached to each level and dimension of the SF6D were derived from SG valuations conducted with a representative sample of 611 members of the UK population [5]. The valuations were then derived from a linear random effects model. These valuations were revised in 2008 partly to deal with missing item level data, and partly to address some of the inconsistencies in the initial values [43].

The BHPS contains a number of measures of SWB and the SF36 was included in 1999 and 2004, thereby allowing SWB-based weights for the SF6D to be estimated in these years. From 1997 (excluding 2001) respondents have been asked “*how dissatisfied or satisfied are you with your life overall*” using a response scale from 1 (not satisfied) to 7 (completely satisfied). The responses are rescaled onto a 0-1 scale.

The impact on SWB of each level for each dimension of the SF6D may be estimated through a linear model predicting each SWB outcome measure with the SF6D levels as determinants. The BHPS therefore provides an excellent opportunity to explore whether valuing changes in health of the general population via changes in SWB leads to different weights being attached to the different dimensions of health, as compared to a well-used utility score in which weights are taken from general population preferences. Table 1 summarises the distribution of SF6D responses in the BHPS and Table 2 gives descriptive data for the SF6D and the life satisfaction responses.



Since the SF6D can be calculated for two waves of data for the same person, we have a panel. Fixed effects analysis estimates the coefficients from a ‘within’ person comparison, comparing each individual to themselves at a different point in time when their circumstances are likely to be different (effectively removing the unobserved individual effect from the model). For example, if it is the case that people with a generally happy disposition are likely to respond more positively to life satisfaction questions and underestimate the physical limitations of their health condition then the estimate for the coefficient on physical health is likely to be an overestimate without accounting for the fixed effect. It has been shown that overlooking the unobserved individual effects when predicting SWB may result in bias in the coefficients [44], consequently it is important to test for potential bias. The fixed-effects analysis requires the life satisfaction scale to be treated cardinally. This assumption is widely adopted, and supported by the fact that, when fixed effects are not used analysis which does not assume cardinality, we (and others working in the area too [44]) obtain very similar results to analysis assuming cardinality.

The SF6D dimensions are included as dummy variables for each of the levels, and as movements away from the best level. The SF6D model also contains a ‘most’ term, which is present when at least one dimension is rated as severe. This is included here in order to facilitate a direct comparison with the SF6D tariff [5]. The impact of the SF6D is presented as a reduced model with only the dimensions/levels and also including a number of other control variables. These include gender, age, age-squared, gross household income, marriage status, employment status, and a year dummy to control for fixed time effects.

The addition of controls should improve the accuracy of the coefficients on the SF6D dimensions but it may also present problems where there may be a reverse causal relationship between health and the additional control variable. If we think that the impact of health is picking up the impact of other factors then without additional controls our coefficients will be biased. For example, poor health might be a consequence of unemployment and the true loss in SWB might be caused by the unemployment rather than health – but poor health might itself be a cause of unemployment in which case controlling for unemployment might understate the impact of health on SWB. Controlling for being on sick leave is particularly problematic. Given the uncertainty surrounding which additional control variables to include, they are included sequentially to investigate the impact that their inclusion has on the results.

### 3.2.2. Results

The impact of the SF6D on life satisfaction is shown in Table 3. This shows both the reduced model, with only the SF6D dimensions, and the full model with additional control variables. The addition of control variables has minimal impact up the size of the coefficients, and so for simplicity we will focus only on the reduced model. The R-squared improves only slightly, from 0.09 to 0.10. The explanatory power is broadly comparable to other analyses in the literature on the determinants of SWB [29]. There is, of course, a lot of unexplained variance and some of this could be due to other health dimensions and effects. We tested for any differences across males and females and these are small and insignificant.

Age is negatively correlated to physical functioning, but shows a non-linear relationship to life satisfaction such that the decline in physical functioning occurring in old age is compensated for

by an age-related increase in life satisfaction. The negative impact of physical functioning only occurs at the extreme end, level 6 (bathing and dressing are limited a lot) and only a small percentage (2%) of the sample fall into this level.

Against expectations, the impact of being in level 2 for role limitation (physical health limits the kind of work or other activities but accomplishments are not less due to emotional problems) compared to no limitations is positive but it is no longer significant when the controls are added. There is some inconsistency in the coefficients for role limitation level 3 (accomplishments are less due to emotional problems) and 4 (physical health limits the kind of work or other activities and accomplishments are less due to emotional problems), but a Wald test does not reject a hypothesis that these two coefficients are equal. A similar inconsistency arises for social functioning levels 4 to 5, again these coefficients are not significantly different.

The findings for the pain dimension show a significant detriment only for level 6. The random effects analysis (available from the authors) found that those reporting more pain are less satisfied with their lives, yet the within person change (fixed effects analysis) shows only a reduction in life satisfaction when individuals report the highest level of pain. For degenerative conditions, the pain may have got worse and be reported as such, but the individual is better able to deal with the higher pain levels. For stable conditions, the pain may be the same but the individual, due to adaptation reports a lower level of pain. Alternatively, this effect could be due to personality, or a fixed trait-like component. If those more inclined to be miserable report higher pain levels for the same level of pain, controlling for unobserved heterogeneity will reduce the impact of pain on life satisfaction.

Mental health results in the largest detriment of all the dimensions. The most severe level of mental health (level 5) results in a reduction of -0.145 of life satisfaction on a 0-1 scale, or about 2/3rds of a standard deviation (the s.d. is 0.219). The next most severe level (level 4) reduces life satisfaction by -0.09. Only 1.7% and 4.7% of the sample fall into these categories' however. The detriments arising from level 2 (-0.037) and 3 (-0.066) are potentially more important as 22% and 30% of the sample fall into these categories, respectively.

The vitality dimension follows a similar pattern to that of mental health. Its impact reduces by about a third in the fixed effects model, again possibly due to controlling for personality. The frequency of level 2, 3 and 4 (44.8%, 29.6% and 11.7%, respectively) also suggests that the detriment at these levels is important (-0.020, -0.044 and -0.085, respectively). The 'most' term is positive but not significant. This suggests the detriment for being in any of the most severe levels is captured in the individual dimensions. There may be some interaction effects such that being in most severe level for more than one dimension is not as bad as the combination of the detriments.

Overall, the findings from the analysis on the BHPS data show that the dimensions of the SF6D have a generally consistent and expected impact on life satisfaction; that is, (with a few exceptions) each additional level of severity results in a greater detriment of life satisfaction. The dimensions of mental health and vitality have the largest impact upon life satisfaction, with even the less severe levels showing considerable detriment. For the other four dimensions (physical, role and social functioning, and pain), less severe levels have a very limited impact.

### 3.2.3. Comparison with preference weights

The coefficients from the six domains of the SF6D can be compared to the SF6D tariff estimated by Brazier et al [43] (see Table 3 and Graph 1). We can show how a change in a health domain impacts upon evaluations of life compares with how much a change in a health domain is imagined to matter through SG preferences. In considering this comparison it should be borne in mind that the scales do not share the same anchors. The SF-6D scale is anchored at dead (0) to full health (1), whereas, in the case of life satisfaction, for example, the bottom of the scale represents 'not satisfied' with your life overall. The models also have different lowest value (when all health dimensions are at their lowest level) e.g. the lowest value in the Brazier et al tariff is 0.301 whereas in the life satisfaction data it is 0.427. The comparison is made with the model in which control variables are included which gives largely the same results as no controls.

The Brazier et al coefficients for physical functioning are larger for each level of physical functioning. The life satisfaction data show that limitations in physical functioning may not matter much until it is severe, and even then the impacts on life satisfaction are still relatively small. The weights from Brazier et al show a constant negative impact of role limitations, whereas the coefficients on life satisfaction suggest that Role 2 does not matter much, but Role 3 and 4 are detrimental to life satisfaction. The coefficients for social limitations are smaller for life satisfaction. Things are similar for pain, where the Brazier et al tariff provides much larger negative coefficients for all levels of pain than life satisfaction. For mental health and vitality, the life satisfaction coefficients are greater than the Brazier weights. The detriment for vitality is slightly larger on life satisfaction for more severe losses in energy and, unlike the Brazier et al tariff, the negative impact is also felt at the least severe level.

There are many reasons why preference-based weights and those derived from a direct impact upon life satisfaction will differ. The SF6D measures health, whereas the life satisfaction measures capture broader wellbeing concerns. As such, we would anticipate the absolute size of the impact of each health dimension to be greater in the case of the SF6D. This may be particularly so if the SG valuation procedure focuses respondents' attention on the health domain of their life, at the expense of other important attributes [18]. This makes the relatively larger coefficients found on mental health and vitality all the more interesting.

The important point for this paper, though, is that preferences and experiences appear to be different and the comparison of them allows us to think more carefully about just how different dimensions of health impact upon our wellbeing. This information should be useful to policymakers, whatever the final weights they give to different considerations.

## **4. Discussion**

Publicly funded healthcare systems have a duty to ensure that the best use is made of available resources. This requires that changes in health are valued in ways that capture the things that matter most to people. The foundations of current approaches are grounded in generic health descriptive systems that privilege certain domains of health over others with no firm basis for the

specific dimensions and levels. We fully appreciate that these descriptive systems have brought us a long way forward in determining how best to allocate healthcare resources. We are now at the stage where we can potentially go further and more accurately account for the domains of health that matter most in the experiences of people's lives.

The review of existing evidence in section two suggests that alongside vitality/energy (which is not included in the EQ5D), domains of sexual functioning, communication and sleep were important to people in terms of their health. In thinking about which dimensions to measure and value (in advance of considering the weight to attach to them), there is a tendency in the literature to make distinctions between the sometimes confused terms of health related quality of life, quality of life and wellbeing [45]. Famously, the World Health Organisation (WHO) has defined health as '*a state of complete physical, mental, and social well-being*' not 'merely the absence of disease and infirmity' [46]. Ever since, different perspectives in healthcare have sought to narrow this definition in some way or another.

Constructing descriptive systems often clouds the central issue of these endeavours, which, to a large extent, should be to accurately capture the effects of treatments on people's lives. A focus on measures like the EQ5D and SF6D requires external justification for some things to matter more than others. Any further distinction between health and wellbeing, at least for the purposes of generating a descriptive system for informing resource allocation decisions, is somewhat arbitrary, particularly when the descriptive systems contain various elements of mental health.

Health state descriptive systems have a difficult balance to strike between the need for sensitivity (with all attributes that matter assessed at the appropriate number of levels for discrimination) and the need for a limited number of dimensions and levels to allow for valuation. An approach that uses SWB as the measure of healthcare benefit allows us to consider whether we actually need to pre-select specific dimensions of health as having privileged status. It would allow us to examine the impact of healthcare (and other domains of life) on individual's SWB using a regression analysis, where information regarding SWB was collected alongside health information and more general background information. This may go some way towards dealing with the problems of the lack of sensitivity and coverage of the existing "right hand side" health state descriptions and simultaneously addresses concerns with preference utility scales on the "left hand side" of a regression model.

If we accept that there may be a case for valuing health directly, and that there is an argument for reconsidering the use of descriptive systems, then we need fuller discussion of how best to do this. Hypothetical valuation exercises are likely to be at odds with patient experience. Where the public conduct valuations their understanding of different health state will be limited. Even if the patients conduct valuations, although they may more closely reflect patient experience, these are still hypothetical choices, and hence subject to focussing effects and forecasting errors [21]. Moreover, patient valuations may be unduly influenced by other considerations, such as strategic behaviour or desire to validate previous decisions [47]. Comparisons between patient and public utility valuations are not clear cut, and when and what patients are asked to value impacts upon the differences between patient and public valuations [48]. If patients change the importance they place on different dimensions as their condition progresses, closely reflecting patient experience would require the use of different dimension weights at different times.

The use of SWB as our outcome measure with values elicited directly from patients would go some way to addressing these real and significant issues. It would switch what matters from hypothetical preferences of the general public to real experiences, and would demonstrate the impact of treatment upon all aspects of their life and well-being. There are of course methodological challenges with using measures of SWB in this way. Critically, SWB measures, as they currently stand, do not have a clear means of combining extending length of life with improving quality of life. The anchor point equivalent to dead has not been located on any SWB scale, and this is therefore something that could be considered in future studies. We also recognise that direct patient values may be prone to response shift, and that an individual's reference standards may change so that valuations before and after illness may not lie on the same scale [49]. Further research is certainly needed to explore the inter-personal comparability of SWB scales, and whether the same implicit anchors are used across people.

Taking this further a number of options may be possible. Firstly, it could simply be left as two separate outcome measures (changes in well-being and changes in length of life) leaving decision makers to apply their own weighting. Secondly, dead could be 'assumed' to be at the bottom of the scale, representing 'no well-being' and the top of the scale to represent maximum 'well-being'. This is problematic if people would consider the 'pits' state of SWB scales to be worse than dead. Whilst this cannot be overlooked, states worse than dead may not arise in most interventions we wish to evaluate. Thirdly, trade off exercises (TTO, SG, PTO) could be conducted to locate dead on the SWB scales. This of course brings back all the problems we know about preferences [18], and trade off exercises [50].

SWB measures may also be insufficiently sensitive to show significant change with feasible sample sizes, particularly where treatments are expected to bring only small improvements in quality of life. One option to overcome this would be to use health dimensions as intermediate outcome measures, which could be converted into a SWB effect using the information from analysis on the determinants of SWB derived from large panel datasets. Such analysis would need to more fully understand the determinants of SWB, address endogeneity in the relationship between health and SWB, and account for indirect effects of health on other well-being bringing attributes (such as employment and relationships).

There is also a need for further studies examining the details and causes of SWB changes for hospital populations. We acknowledge that at present it is difficult to disentangle improvements in health from degrees of adaptation for such groups. Prospective studies, however, that follow individuals over time and measure SWB around periods of adaptation will go a long way in allowing us to quantify these effects. Methodological developments in terms of the valuation of SWB can then be based on such work, for example a peri and post SWB function could be applied to SWB levels in given conditions to account for adaptation effects. This paper does not claim to have all the answers to all the questions in this respect, but by presenting this research and rationale, we hope to stimulate a more general and transparent debate around current methodology. This is both in light of aforementioned normative concerns and our finding that mental health has a greater impact upon our experience of life than we appear to give credit for in preference elicitation studies.

From our new analysis of the BHPS, mental health is found to have the largest and most significant effect on SWB. Whilst mental health matters to the preferences of the general public, its importance relative to physical functioning and pain is underestimated in the imaginations of people. In a comparison between different health and wellbeing measures for knee replacement surgery and cataract surgery Mukuria et al [51] also found that pain and physical functioning had a small or even positive effect on happiness when other dimensions of health were controlled for. The discrepancy between preferences and experiences is further supported by new work into the effect that “thoughts” about health have on our SWB [16].

The fact that mental health conditions are among the most resistant to adaptation underlines the longevity of suffering associated with these conditions [10]. Issues of adaptation and the changing dynamics of how dimensions interact with one another apply to the description as well as the valuation of health. For example, an individual who previously described themselves as having problems walking due to mild arthritis before they underwent a bilateral lower limb amputation may also describe themselves as having problems walking after they have adapted to their condition and began walking again with prosthetic limbs. In a related way, there could be ‘reference shifts’ within the assessment of each dimension [52-55]. So individuals might think that their pain is moderate, but when they then experience extreme pain, it shifts their reference to moderate pain, which might now actually feel like very little pain.

Policymakers will still wish to give weight to people’s preferences over hypothetical future health states when making resources allocation decisions, not least our views of socially funded health care systems will be partly determined by the degree to which those systems satisfy our preferences. Those bearing the costs of healthcare must approve of the way in which it is provided, and wholesale shifts away from popular policies could precipitate a lack of societal approval for such changes.

Our preferences may also provide external justification about why some things matter, and why some health states might matter more than others, such as those that prevent or limit the ability to work. Moreover, the dangers of undervaluing health conditions to which people adapt well to is often cited as a criticism of adopting experience-based methods of valuation: see, for example, the critique from the ‘capabilities approach’ [56, 57]. These lines of argument highlight the fact that many individuals report high levels of SWB despite living with or in severe conditions. It follows that those individuals that do adapt could lose out in the competition for scarce resources because they have come to terms with their loss in health and therefore are not seen to be suffering quite so much. In moving forward with the SWB approach, we must be sensitive to these normative issues [58] but we should also take serious notice of the conditions that are hardest to adapt to.

Notwithstanding these important concerns, we should develop research into establishing the effects that different health states have on SWB and consider the consequences for agencies such as NICE of accounting for such effects. Given the importance of mental health as a determinant of SWB, a focus on SWB means that treatments bringing about reductions in anxiety or depression (or other psychiatric symptoms) will be shown to be relatively more cost-effective than when using preference-based methods. This still means that treatments for physical functioning, pain etc. can be effective – but that they will be even more so if they have positive

consequences for mental health too. The impact of physical functioning on SWB could then perhaps be seen indirectly through its effect on mental health and directly where there are no effects on anxiety or depression but where SWB is nonetheless lower.

This analysis has shown that the weights given to the dimensions of health differ when people are asked to make hypothetical judgements about how they think these dimensions will impact upon their life compared with weights derived based on the impact each dimension has upon peoples SWB. Critically, mental health and energy and vitality have a greater impact on SWB compared to standard gamble valuations, and pain and mild physical functioning have less impact. It is important that the source of these differences is more fully understood. Policy makers may take it is as normatively appropriate to give less weight to changes in mental health than would be implied from the actual suffering caused by mental health but, if they do not, then it will be necessary to reconsider the preference weights being used and how they can make use of this new information on SWB.

**Footnote: The Short Form 6D (Brazier et al., 2002)**

Physical functioning

- 1 Your health does not limit you in vigorous activities
- 2 Your health limits you a little in vigorous activities
- 3 Your health limits you a little in moderate activities
- 4 Your health limits you a lot in moderate activities
- 5 Your health limits you a little in bathing and dressing
- 6 Your health limits you a lot in bathing and dressing

Role limitations

- 1 You have no problems with your work or other regular daily activities as a result of your physical health or any emotional problems
- 2 You are limited in the kind of work or other activities as a result of your physical health
- 3 You accomplish less than you would like as a result of emotional problems
- 4 You are limited in the kind of work or other activities as a result of your physical health and accomplish less than you would like as a result of emotional problems

Social functioning

- 1 Your health limits your social activities none of the time
- 2 Your health limits your social activities a little of the time
- 3 Your health limits your social activities some of the time
- 4 Your health limits your social activities most of the time
- 5 Your health limits your social activities all of the time

Pain

- 1 You have no pain
- 2 You have pain but it does not interfere with your normal work (both outside the home and housework)
- 3 You have pain that interferes with your normal work (both outside the home and housework) a little bit
- 4 You have pain that interferes with your normal work (both outside the home and housework) moderately
- 5 You have pain that interferes with your normal work (both outside the home and housework) quite a bit
- 6 You have pain that interferes with your normal work (both outside the home and housework) extremely

Mental health

- 1 You feel tense or downhearted and low none of the time
- 2 You feel tense or downhearted and low a little of the time
- 3 You feel tense or downhearted and low some of the time
- 4 You feel tense or downhearted and low most of the time
- 5 You feel tense or downhearted and low all of the time

Vitality

- 1 You have a lot of energy all of the time
- 2 You have a lot of energy most of the time
- 3 You have a lot of energy some of the time
- 4 You have a lot of energy a little of the time
- 5 You have a lot of energy none of the time



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**Table 1 summarises the distribution of SF6D responses in the BHPS.**

	Physical functioning	Role limitations	Social functioning	Pain	Mental health	Vitality
Level 1	53.8%	76.9%	72.6%	47.0%	41.4%	5.4%
Level 2	26.8%	10.9%	9.7%	21.4%	30.2%	44.8%
Level 3	9.3%	4.6%	9.3%	14.7%	22.0%	29.6%
Level 4	3.6%	7.5%	6.1%	6.6%	4.7%	11.7%
Level 5	4.4%		2.3%	7.5%	1.7%	8.4%
Level 6	2.0%			2.7%		

**Table 2 Summary data for the SF-6D and Life satisfaction in the BHPS, 1999 and 2004**

	Life satisfaction (rescaled 0-1)	SF-6D
Mean	0.704	0.840
Standard Deviation	0.219	0.145
Range	0-1	0.301-1

**Table 3. Impact of the SF6D on life satisfaction (scaled as 0 to 1) using fixed effects models**

	Reduced	Full	Brazier et al weights
Physical 2	0.003 (0.005)	0.003 (0.005)	-0.035
Physical 3	-0.009 (0.007)	-0.007 (0.007)	-0.035
Physical 4	-0.018 (0.012)	-0.012 (0.012)	-0.044
Physical 5	-0.028** (0.012)	-0.021* (0.012)	-0.056
Physical 6	-0.091*** (0.019)	-0.075*** (0.019)	-0.117
Role 2	0.005 (0.006)	0.006 (0.006)	-0.053
Role 3	-0.045*** (0.010)	-0.045*** (0.010)	-0.053
Role 4	-0.038*** (0.009)	-0.037*** (0.009)	-0.053
Social 2a	-0.010* (0.006)	-0.009* (0.006)	-0.057
Social 3	-0.023*** (0.007)	-0.022*** (0.007)	-0.059
Social 4	-0.054*** (0.009)	-0.051*** (0.009)	-0.072
Social 5	-0.043*** (0.016)	-0.034** (0.016)	-0.087
Pain 2	-0.001 (0.004)	-0.001 (0.004)	-0.042
Pain 3	-0.006 (0.005)	-0.005 (0.005)	-0.042
Pain 4	-0.007 (0.008)	-0.008 (0.008)	-0.065
Pain 5	-0.013 (0.009)	-0.013 (0.009)	-0.102
Pain 6	-0.048*** (0.014)	-0.043*** (0.014)	-0.171
Mental 2	-0.037***	-0.036***	-0.042

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	(0.004)	(0.004)	
Mental 3	-0.066***	-0.066***	-0.042
	(0.005)	(0.005)	
Mental 4	-0.090***	-0.087***	-0.1
	(0.010)	(0.010)	
Mental 5	-0.145***	-0.143***	-0.118
	(0.016)	(0.016)	
Vital 2	-0.020**	-0.019**	0
	(0.008)	(0.008)	
Vital 3	-0.044***	-0.043***	-0.071
	(0.009)	(0.009)	
Vital 4	-0.085***	-0.085***	-0.071
	(0.011)	(0.011)	
Vital 5	-0.097***	-0.093***	-0.092
	(0.012)	(0.012)	
Most	0.014*	0.013*	-0.061
	(0.007)	(0.007)	
Log hh income		0.004	
		(0.003)	
Age		-0.024*	
		(0.013)	
Age squared		0.001	
		(0.001)	
Male			
Unemployed		-0.030***	
		(0.011)	
Long term sick		-0.065***	
		(0.013)	
Retired		-0.002	
		(0.009)	
Family carer		-0.016*	
		(0.009)	
Job other		0.017*	
		(0.009)	
Married		0.009	
		(0.008)	
Separated		-0.035**	
		(0.015)	
Divorced		-0.002	

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		(0.014)
Widowed		-0.022
		(0.017)
Wave nine		-0.113*
		(0.064)
Constant	0.796***	1.912***
	(0.008)	(0.617)
Observations	27865	27773
R-squared	0.093	0.100
Number of individuals	19230	19185

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Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Graph 1: Detriment for each level of each dimension on life satisfaction and on the standard SF6D tariff

