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A compensating income variation approach to valuing 34 health conditions in Iceland

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ABSTRACT

Using data from an Icelandic health-and-lifestyle survey carried out in 2007, 2009, and 2012, we employ a compensating income variation (CIV) approach to estimate the monetary value sufficient to compensate individuals for the presence of various sub-optimal health conditions. This method is inexpensive and easy on subjects and has been applied to several desiderata that do not have revealed market prices. The CIV literature is, however, still limited in its application to health and thus information about its suitability is limited. With the aim of shedding light on the method's appropriateness we thus provide a broad-view analysis including a spectrum of diseases and conditions that can be held up against more traditionally used methods. CIV for physical conditions vary greatly, but paralysis, fibromyalgia, chronic back pain, rheumatoid arthritis, urinary incontinence, severe headache and thyroid disease were among those consistently associated with substantial well-being reductions. Mental-health results using this method should be read with caution. The societal value of health interventions is multidimensional, including for example increased productivity in the population. However, one of the main positive aspects of increased health is undoubtedly the increased well-being of the treated subjects. Such quality-of-life effects should thus preferably be taken into account. For this reason, information on the value individuals place on recovery from various sub-optimal health conditions is useful when it comes to prioritizing scarce capital in the health sector. It is therefore vital to estimate the importance individuals place on various health states and hold them up against each other. Furthermore, this paper has scientific value as it sheds light on attributes of a potentially useful method in health evaluations.

1. Introduction

Valuing health remains a constant challenge. Although difficult, it is crucial to inform health policy, specifically on benefits and cost-benefits of various health interventions. Since a problem-free method to address this is not available, robustness of results across different approaches helps create a fuller picture. We add to this picture by calculating the willingness-to-pay (WTP) for a recovery from various sub-optimal health conditions.[1] Two frequently used methods to estimate the WTP for health improvements are contingent valuation, where subjects are asked directly how much they would be willing to pay for avoiding diseases or symptoms

[1] We use WTP here under the preference assumptions that allow for equality between compensating variation (CV) and equivalent variation (EV). WTP in the case of a compensating variation is the maximum amount of money that can be taken from an individual while leaving him just as well off as he was before an improvement in health. WTP in the case of an equivalent variation is the amount of money an individual is willing to forgo to prevent deterioration in health and makes his utility equal to what it would be if deterioration of health was not to occur. As the CIV method does not allow for a distinction between a health improvement or health deterioration, we refer to WTP under the preference assumptions that allow for equality or near equality between the two income-compensated money measures; CV and EV.

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(see for example Fu et al. 2011), and revealed-preference methods such as the hedonic-wage method, which is based on how much money a worker has to receive in order to take on an undesirable job (see for example Liu and Hammitt, 1999). Both methods have their limitations. The hedonic-wage method suffers primarily from self-selection, as workers in a certain sector are not a random sample of the population. The limitations of the contingent-valuation method are broadly summed up by Harris et al. (1989), and include for instance the reduced quality of decision-making under too much or too little stress, lack of judgement-making skills, and limited information processing skills.

A potential solution is to use the statistical association between income and health on the one hand, and income and well-being on the other, to generate an implied trade-off between income and health. This approach, known as the compensating income variation (CIV) method, is firmly rooted in economic theory (Hicks, 1939) and has been applied to different desiderata that do not have an apparent marginal utility based on revealed market prices. Examples include the value of product variety under monopolistic competition (Brynjolfsson et al., 2003), social capital (Groot et al., 2007), residential mobility (Weinberg et al., 1981), and fear of crime (Moore and Shepherd, 2006). The limited application within the field of health includes cardiovascular disease in Britain (Groot and Maassen van den Brink, 2006), migraine and headache in the Netherlands (Groot and Maassen van den Brink, 2004), and chronic pain in Australia (McNamee and Mendolia, 2014). Furthermore, Powdthavee and van den Berg (2011) contribute to the literature with a broader range study on British data, examining 13 health conditions, including four that are similar to the ones included in the current analysis. Those are diabetes, depression/anxiety, alcohol/drug related problems and migraine/frequent headaches. Another similarity to our study is that one of their overarching aims is to examine the suitability of the CIV method to health, and methodological sensitivities of the method.

To maximize societies' well-being within financial constraints, it is essential to examine the extent to which alternative health improvements increase well-being. Although there are the occasional but isolated examples of CIV measures for health conditions, this fragmented literature makes it difficult to assess the method's applicability to health. We use the CIV method to estimate the sufficient monetary compensation to offset the loss in well-being associated with the presence of one of 34 sub-optimal health conditions.[2] The CIV method is a low-cost method that can often be carried out on already-available data. Thus, the method can be of great value if it is deemed applicable to health. We furthermore examine the desirability of projections of those well-being measures into quality of life weights (QoLW) on a zero-one scale that can be held up against rankings based on other methods.

Such a broad-view analysis including a spectrum of diseases and conditions has largely been lacking up until now, with the exception of Powdthavee and van den Berg (2011) who make a contribution with an analysis of 13 diseases, with focus on the method's sensitivity to the well-being measurements being used. Similarly, the data used in the current study contains two validated well-being measures, allowing for comparisons across measurements. Subsequently we hope that further details can be added with additional diseases and more in-depth analyses of the specific conditions examined here. We thus aim to provide a base that other researchers can subsequently add to. For this reason we do not cover each health condition in as much depth as we would have in a single-disease analysis. For example, we do not include controls for disease-specific comorbidity in our models since that way we would not be able to investigate various sub-optimal health conditions using comparable modeling across diseases. The findings should then motivate further research, both of a broad nature and in which single health conditions are analyzed in greater detail.

Due to the lack of detail to each disease or condition, our aim is not for our current results to serve as final WTP measures for policy makers seeking to make informed decisions regarding efficiently allocating resources within health-care systems. We rather see this as a stepping stone towards quality measures of that kind being obtainable through a broader range of methods than is currently the case. This is done with the acknowledgement that the way in which health-care systems work is obviously a major issue for those in need of health-care services, and in order to evaluate the economic performance of those systems we need to identify the value created by various interventions. A badly functioning system cannot just result from it demanding a large proportion of available resources, but also from it not delivering a high level of well-being. Thus, it is vital to assess the importance individuals place on various health states, evaluate them in a critical manner, hold them up against each other, and compare across various forms of methodological approaches.

2. Data and methods

2.1. Data

The data stem from the health and lifestyle survey "Health and well-being", carried out by The Directorate of Health in Iceland in October 2007, 2009, and 2012. The survey contains questions about health and well-being, demographics and labor-market variables. A stratified random sample of 9711 Icelanders between the age of 18 and 79 received the questionnaire in 2007. The net-response rate in 2007 was 60.8%. The 2009 version was sent to all the 2007 participants who had agreed to being contacted again with a response rate of 69.3%, which corresponds to 42.1% of the original sample responding to the first two waves of the survey. In 2012, 10,093 subjects, 6434 new participants and 3659 from the original sample, received the third wave of the survey. The response rate was 55% for new participants, resulting in 3537 responses, and 88.7% for the original sample, resulting in 3246 individuals answering all three waves (Jónsson et al., 2011). Our final sample consists of 7516 observations on 5216 individuals after the exclusion of observations with missing values on right-hand-side variables, except for the health-impairment variables. The final sample of each regression then depends on the number of missing values for each health-impairment being examined.

We use measures on happiness and life satisfaction as proxies for well-being. At this point in the literature it is important to gauge sensitivity of CIV result to the well-being proxy used. Although the jury is still not out on which measure to use and various ones are currently being employed, we direct the readers to the life-satisfaction results as potentially being the preferred ones. The reason for this choice is that life satisfaction is a cognitive or judgmental state which refers to an assessment of life as a whole and may thus be more robust to short-term fluctuations in mood than the happiness measure. Results from both measures should be read with this difference in mind. Happiness was determined by responses to the question: Taking all things together, how happy would you say you are? The response options range from 1

[2] The conditions included are asthma, chronic bronchitis, myocardial infarction, coronary disease, high blood pressure, cerebral stroke, rheumatoid arthritis, osteoarthritis, fibromyalgia, chronic back pain, chronic throat disease, diabetes, allergy, ulcer, cirrhosis, cancer, benign tumor, severe headache, urinary incontinence, thyroid disease, leg paralysis, arm paralysis, ophthalmic disease, irritable bowel syndrome, cold, chronic fatigue syndrome, alcohol/drug addiction, chronic anxiety, chronic depression, other mental disorders, ADD/ADHD, sexually transmitted diseases, eating disorders, and post-traumatic stress.