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ScienceDirect
The Social Science Journal 46 (2009) 776–786
The SOCIAL SCIENCE JOURNAL
www.elsevier.com/locate/soscij

Elicitation of health values from mortality risk reduction

Brian H.S. Kim [a,*], Euijune Kim [a], Jeasun Lee [b], Minsu Son [b]

[a] *Department of Agricultural Economics and Rural Development, Seoul National University, San 56-1 Shillim-dong, Gwanak-gu, Seoul 151-921, Republic of Korea*
[b] *Department of Urban Planning and Engineering, Yonsei University, 134 Shinchon-Dong, Seodaemun-Gu, Seoul 120-749, Republic of Korea*

Received 22 September 2008; received in revised form 21 April 2009; accepted 6 May 2009

Abstract

There are concerns regarding uncertainty about the accuracy of applying available empirical willingness-to-pay (WTP) estimates for reducing accidental deaths to value changes in risks of pollution-related deaths. In this study, we develop a theoretical model on defining WTP, and its determinants, and derive WTP estimates for changes in pollution-related mortality risks with varying morbidity and timing attributes. A survey is designed and conducted with 100 subjects. Each subject was to complete five choice sets and provided a range of implicit values of statistical life (VSL). The choices are estimated using the logit procedure. And, using the results of estimated multinomial logit model, the VSL is estimated to about $6.2 million.

Keywords: Willingness-to-pay; Mortality risk; Value of statistical life; Multinomial logit model

1. Introduction

Analysts have been exploring the dimensions of mortality risk that may be relevant to determining willingness-to-pay (WTP). Many studies have used either revealed preference (RP) or stated preference (SP) approaches to estimate average WTP (or WTA) for small changes in risks of accidental death. Literatures that discuss these applications include Fisher, Chestnut, and Violette (1989), Miller (1989), Cropper and Freeman (1991), Viscussi (1993), Viscussi, Hakes, and Carlin, 1997), Larson et al. (1999), Krupnick, Alberini, Cropper, and Simon (1999), and Krupnick, Cropper, Alberini, and Simon (2004). While the large number of SP studies would

* Corresponding author. Tel.: +82 2 880 4717; fax: +82 2 873 5080.
E-mail addresses: briankim66@snu.ac.kr (B.H.S. Kim), euijune@snu.ac.kr (E. Kim), jeasunlee@yonsei.ac.kr (J. Lee), minsu.son@yonsei.ac.kr (M. Son).

0362-3319/$ – see front matter
doi:10.1016/j.soscij.2009.05.003

appear to indicate that the methodology has matured, SP is still very much an evolving methodology and one for which there are significant methodological concerns, including sources of potential error and bias[1], the cognitive aspects of survey questions, and overall reliability of results. Even with these weaknesses, the SP methodology continues to evolve as critical public policy tools, especially in the areas of the environment and health (Dennis, 2007). The results from previous studies using SP methodologies are being used as the basis for the monetary valuation of mortality risk in assessments of the potential benefits of regulatory and policy decisions.

For the most part, available empirical WTP estimates for reducing mortality risks are for risks of accidental death, such as on-the-job or transportation accidents. Risks of accidental death usually involve an immediate relationship between cause and effect and little, if any, morbidity prior to death. Risks of accidental death are not very age dependent, staying at fairly constant rates relative to age. On the other hand, many pollution-related mortality risks are increasing with age. Also, some air pollution-related risks of premature death may fall disproportionately on the already ill segments of the exposed population, may involve substantial latencies between exposure and onset of a health effect, and may involve prolonged and painful illnesses preceding premature death. Because of these different attributes of the mortality risk, there is considerable uncertainty about the accuracy of applying available empirical WTP estimates for reducing accidental deaths to value changes in risks of pollution-related deaths.

One of the issues that has been raised about how WTP to reduce mortality risk may vary is that the value of reducing risk may be a function of the number of life-years at risk. Applying a single WTP for all mortality risks assumes that the value is invariant with the remaining life expectancy of the person at risk. Many analysts have noted that death is never entirely prevented; it is merely delayed to some degree or another. However, plausible it may seem that WTP to reduce mortality risk is related to the remaining life expectancy for those at risk, exactly how WTP to reduce mortality risk varies with the remaining life expectancy of the individual has not been determined empirically. Remaining life expectancy is, of course, closely related to age.

The question of how WTP to reduce mortality risk varies with the attributes of the risk cannot be addressed without taking into account the morbidity component of these health effects in addition to the risk of premature mortality. The purpose of this study is to develop a theoretical model on defining WTP, and its determinants, and derive WTP estimates for changes in pollution-related mortality risks with varying morbidity and timing attributes. The instrument used in this study is based on a stated preference approach designed to elicit subjects' preferences between alternative scenarios that involve varying mortality risks and attributes of these risks.

2. WTP estimation model

2.1. Choice model for attributes survey

In this section, a theoretical model is developed in an effort to focus on defining WTP, and its determinants, for reductions in risks of serious illnesses with a high probability of mortality.