

How do you prefer your gain in life expectancy to be delivered? An experimental approach linking hypothetical and incentivised choices

This paper demonstrates the potential for economic experiments to inform regulatory decision making and/or policy formation in the domain of health and safety. Many governmental or industrial interventions in this area generate a number of externalities, including prevention of premature deaths or gains in life expectancy, that are of benefit either to society as a whole or affected sub-groups, such as the workforce.

The allocative question that arises is which intervention to implement in a resource-constrained world? Economic efficiency and benefit-cost analysis (BCA) dictates that the project decision should be welfare improving and based on individual preferences. But how should we establish these preferences? This paper addresses this question via an experimental methodology that identifies individual preference orderings over safety programmes that deliver identical life expectancy gains in a number of different ways, in the sense that the changes in the conditional probabilities of survival vary over the lifetime of the programme. For the purposes of this study we consider three example programmes, although the methodology is in principle generalizable to many more.

During recent years there has been an increasing tendency for public sector agencies to employ the so-called willingness to pay-based “Value of Preventing a Statistical Fatality” (VPF) (Jones-Lee, 1989) in the appraisal of proposed investment projects or regulatory intervention that can be expected to have an effect on the safety of human life. Yet, it is important to appreciate that the one-period risk reduction that occurs under this type of programme and hence generates a reduction in risk of death during the forthcoming period will not only reduce the expected number of fatalities within the affected group during that period, but will also increase life expectancy for each person in the group. Hence, there has been a tendency to use such estimates to derive a willingness to pay- based “Value of a Life Year” (VOLY) (Chilton *et al.*, 2004). The VOLY turns out to be not entirely free from conceptual subtleties and an alternative may be to estimate it directly by eliciting an individual’s preferences for a programme that delivers an ongoing and sustained reduction in risk over the remainder of their life. This notion forms the basis of our other two programmes examined in the experiment i.e. one in which the reduction in risk is absolute and the other where it is proportionate.

Thus, the core of our experimental design is to elicit choices over the three programmes via a series of paired comparisons, using a variant on the risk-risk trade-off method (Viscusi *et al.*, 1991). At this stage, we face two key problems. The first is peoples’ well-documented inability to deal with changes in small probabilities (see, for example, Corso *et al.*, 2001), much less *distributions* of these probabilities. The second is that the task must, by necessity, be hypothetical in nature. As such, economic theory has nothing to say about the rationality or otherwise of these choices. Our experiment fully addresses the first problem and, we will argue, goes some way to addressing the second by requiring subjects to first carry out a decision making task in an incentivised experiment that has the same (economic) structural characteristics as the choice over life expectancy gains. In this sense, the

subjects gain some understanding of key aspects of the mechanism and learn the consequences of different decisions in a related situation.

We report the results of an artefactual field experiment (n=130) (Harrison and List, 2004) in which the VPF and the VOLY are integrated in the same conceptual framework by means of the survival curve and the preferences for each are tested. We draw on financial portfolio theory for the analysis of an individual's responses to the different moments of the probability density function of asset return and discuss the implications in the context of life expectancy. The experiment takes place in two stages in which the hypothetical risk-risk trade-offs are preceded by an incentivised finance experiment. In the latter, subjects used three groups of five bags with each bag containing 1,000 cards reflecting their 'game-specific' conditional survival probabilities and probability of dying in the next five decades. Following a choice of which 'game' (i.e. set of bags) to play, depending on the result of a draw they either 'survived' a bag and continued in the game, arrived at the end of the game or were eliminated prematurely. The purpose of this exercise was to inform subjects about the elements needed in order to be able to trade-off different probability distributions with the same expected gain. More specifically, to educate them about conditional probabilities, to let them experience the consequences of different probability distributions and hereby demonstrate to them that different probability distributions can have the same expected pay-off. This mirrors the process whereby different changes in the survival curve can lead to an identical gain in life expectancy. Hence, when subjects arrived at the stage where they were to make choices over life expectancy programmes they were already familiar with the notion of a remaining lifetime of different (conditional) risk distributions, depending on the type of programme implemented.

We find that preferences for the different life expectancy programmes are distributed more or less evenly across the subject pool. These are clearly dictated by a mix of individual risk and time preferences in that some subjects prefer programmes that deliver a relatively large one-off risk reduction 'now' while others prefer risk reductions to be spread (differently) over time, although all lead to the same change in life expectancy. More importantly, though, we show that the mechanism delivers consistent and credible quantitative choices in the hypothetical setting that are backed up by a high degree of face validity (associated qualitative evidence).

We argue that this mechanism provides respondents with a more accurate understanding of how gains in life expectancy are delivered (and what they mean) than past endeavours in this area to date. Finally, on a more general note, it demonstrates the potential for the development of methods that precede hypothetical choice tasks – the only realistic method by which decision makers can obtain information on peoples' preferences in many situations - with incentivised tasks to encourage more reliable responses.

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