

## **Comments by Fred Kuchler (ERS) on “Valuing Pathogenic Risk: Methods, Skill, & Rationality”**

**(by Jason Shogren, Tommy Stamland,  
Todd Cherry, and Thomas Crocker)**

I'm very happy to be able to comment on the paper by Shogren and others. The paper is very provocative. In a few pages, it sweeps away the most important developments in estimating value of statistical life (VSL), the values we Federal bureaucrats have used routinely for valuing reductions in fatal risks. Shogren et al. (henceforth denoted Shogren) argue that the potential for bias in values we have been using is enormous. The likely direction of bias is that the values we have used are grossly inflated. By implication, that means that the policy guidance economists have offered on health and safety issues for at least the last 17 years has been misleading from a welfare or efficiency perspective.<sup>1</sup> That is, if he is right, we have sometimes said net benefits of proposed regulations are positive when they are decidedly negative.

I would like to confine my comments to practical issues of regulatory cost-benefit analysis rather than theory, but the two are not totally divorced. My comments will be structured as answers to three questions.

1. Does the proposed explanation of the relation between behavior toward risk and VSL make more sense than the explanation we rely on now?
2. Does the proposed explanation lead to something that we can estimate or is it simply a good theory?
3. If we can make this estimate, what will happen if we adopt Shogren's ideas in regulatory cost benefit analyses?

Answering the first question is easy. Our current explanation of behavior and prices doesn't hold up, especially for valuing reductions in foodborne risks. The paper by Shogren is a very different approach and is internally consistent.

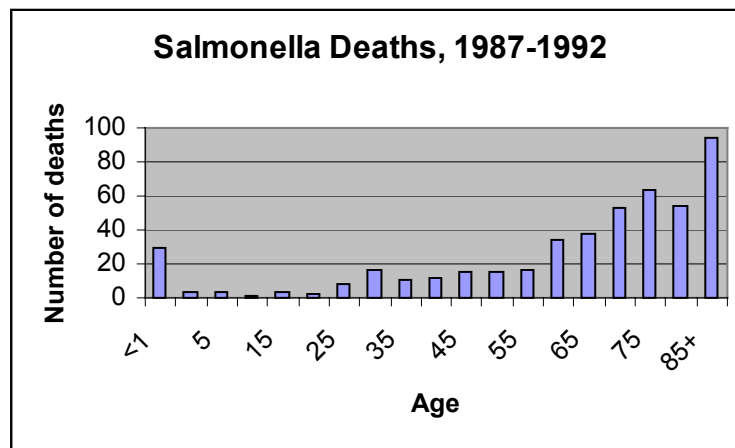
Almost every agency involved in health and safety regulations either uses the \$5 million value Viscusi (Viscusi, 1993) recommended or did roughly the same exercise he did to come up with a value of statistical lives. Viscusi arrayed the empirical estimates of VSL and put them on a common footing regarding assumptions. Then, he looked for a measure of central tendency. Most of these studies were wage-risk studies. EPA did an exercise similar in spirit to Viscusi's and came up with \$4.8 million.

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<sup>1</sup> Viscusi (1998) describes the transition in regulatory cost-benefit analyses from cost-of-illness to willingness-to-pay measures as occurring in 1983. The issue was a hazard communication regulation proposed by U.S. Occupational Safety and Health Administration. Initially, the regulation failed a cost-benefit test. But when benefits were valued using willingness-to-pay estimates, net benefits were positive, and the regulation was approved.

The estimates that are driven by results from wage-risk studies are very likely inappropriate ways to value foodborne risks. Principally, the people who are really at risk from the foods they eat are different and are likely to have different risk preferences than the people who make job choices based on wages and risks. Wage-risk studies reflect mostly preferences of middle-aged men in robust good health. That is, they are working and not home sick. Foodborne risks are primarily borne by the very young, the very old, and the immune compromised. The people who die by getting run over by a truck at work are not the same as those who die from foodborne illness.

Just to underline this point, I prepared a histogram of deaths in the United States from *Salmonella*. The histogram arrays deaths by age at death. These are deaths for which *Salmonella* was listed as the primary cause of death on death certificates. The 1987-92 data came from the National Center for Health Statistics (more recent data are not yet available). Although it is not shown on the histogram, the highest bars at the oldest ages are almost entirely women. At age 40, there are relatively few deaths.



So, transferring VSL estimates from wage-risk studies amounts to saying that middle-aged men's preferences reflect the way we value lives of children and elderly women. Viscusi, Magat, and Huber (1987) have studied values placed on reducing risks to children. They found much higher values for kids than adults. Cropper, Aydede, and Portney (1994) have studied values placed on reducing risks to the elderly. They found lower values for the elderly than for adults.

In effect, it makes little sense to think that one VSL will fit all at-risk populations and all risks (Golan and Kuchler, 1999).

Shogren has taken an entirely different approach. Instead of trying to transfer risk-dollar estimates from one set of individuals and risks to another set of individuals and another risk, he argues for starting with the individual and the full complement of risks each faces. Shogren argues it is both differences in risk preferences and differences in skill in mitigating health hazards that matters for value-of-life estimates.

Let's talk briefly about the bias in current estimates that Shogren identified. Current methods calculate VSL by dividing the marginal worker's wage differential by the statistical risk

differential. The latter is an average. The former is the highest wage differential among all workers. It is the worker who demands the highest compensation for his risk in the job. It is probably the worker who is least able to manage risk and the worker who is most concerned with risk. So, if workers differ in skill in managing risk and differ in risk tolerance, then VSL estimates overestimate benefits of risk reduction. Shogren's illustrative calculation suggests a factor of 5.

Reducing VSL estimates by a factor of 5 would have a clear impact on Federal cost-benefit analyses. Virtually none would pass a benefit-cost test.

Shogren shows in a formal way that we need individual value-of-life estimates for each risk. And he shows how to derive, in theory, those values. So, whether we should or shouldn't follow his suggestion, we have to pay attention to it.

My answer to the second question, raising practical estimation questions, is less certain. Shogren's analysis comes down to the following equation.

$$Vol_t = \frac{c_{it}}{\left(\rho_{it}^* - \underline{\rho}_{it}\right)x_i^*}$$

Here, he calculates value of life as an individual's willingness to pay to avoid risk of death. He divides individuals into classes,  $t$ . Each class is defined by ability to manage risk and risk tolerance. The denominator has two terms. The parenthetical is the difference in risk per unit of consumption between what the individual chooses and the lowest that is physically possible. This is like the risk of *E. coli* O157:H7 infection per hamburger, depending on how well you cook and clean. Microbiologists tell us that if we cook hamburgers to an internal temperature of 160 degrees and we use lots of chlorine bleach to reduce cross-contamination in the kitchen, we can drive the risk of infection to zero. Clearly, these averting behaviors are choices. The risk per unit is then multiplied by the number of units of risk, or hamburgers consumed, some proportion of which harbor *E. coli*.

Empirically getting at the denominator will be difficult, but is not necessarily impossible. Suppose that the epidemiologists and physicians come up with dose-response functions, relating exposure to pathogens to disease, and can do so for different types of people, distinguishing likelihood of infection by type of person (good health, elderly, child, able to control cross-contamination in the kitchen). Food consumption surveys might also tell us about  $x_i^*$ .

The impossible part to measure is the numerator. This is simply defined as the opportunity cost of activities that reduce risk. Some economists argue that opportunity cost is not something that an external observer can measure. I have copied a paragraph from James Buchanan's book, Cost and Choice (1969). He argues that opportunity cost is inherently unknowable.

You face a choice. You must now decide whether to read this Preface, to read something else, to think silent thoughts, or perhaps to write a bit for yourself. The value that you place on the most attractive of these several alternatives is the cost

that you must pay if you choose to read this Preface now. This value is and must remain wholly speculative; it represents what you now think the other opportunity might offer. Once you have chosen to read this Preface, any chance of realizing the alternative and, hence, measuring its value, has vanished forever. Only at the moment or instant of choice is cost able to modify behavior. (p. vii)

That is, opportunity cost is whatever a person thinks he is giving up by choosing a particular course of action. The result of a choice is one course that precludes all others. Thus, the other cannot exist. It was known to the person who did the choosing, but vanishes without a trace after the choice is made. Until we have a way of peering into the heads of people as they are making choices, the opportunity cost of their actions is necessarily unobservable. We certainly cannot directly estimate the values Shogren recommends.

Question 3—if we really could estimate individual values of life, that would raise some difficult ethical questions for economics. Suppose that we could accurately measure opportunity cost. Then our trouble would really start. We would have different values for different people. Some of the variation would be systematic. For instance, the opportunity cost rich people face would likely be much greater than that faced by poorer people, that is those with fewer opportunities. Chances are we would have relatively large values for the rich and small values for the poor.

The policy guidance offered by cost-benefit analyses would then depend on who was at risk. We would see relatively large benefits from putting in stop signs in rich neighborhoods and relatively small benefits in poor neighborhoods. This is a straightforward aspect of demand analysis--quantity demanded depends on relative prices and income. In our case, willingness to pay depends a lot on ability to pay. Some will say, “of course willingness to pay depends on ability to pay--it is worth more to the rich to be safe.” Others will find this troubling, and will be really disturbed by policy guidance that gives greater attention to small risks in rich communities than to large risks in poor communities. I think economists would be better off recognizing this minefield before we walk into it.

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