Why Must Costs and Benefits Influence Health and Safety Choices?

It is impossible to protect everyone from every threat to their health and safety. The resources to eliminate even a small portion of all hazards do not exist. Viscusi (1996) states:

> The need for economic balancing is inevitable in a world of constrained resources. Suppose that we were to devote the entire U.S. gross domestic product to the prevention of fatal accidents. Even then, we would be only able to spend $55 million per fatality...That expenditure would leave literally nothing for other goods, such as other risks or environmental pollution, let alone basics like food, housing and medical care. (p. 120)

The physical inability to eliminate all hazards means that some hazards will never be eliminated and some risks will always persist. There is no way to avoid choosing to mitigate some hazards and choosing to accept the risks of all others. How should society select which hazards to control?

Many Federal decisions regarding health and safety are made on the basis of risk standards. Regulatory agencies must take action to reduce any risk exceeding standards.[1] Under risk standards, decisionmakers (the regulatory agencies) cannot discriminate on the basis of cost among risks they might address. Hazards that are very expensive to rectify are accorded the same priority as those that are less expensive. If regulators were allowed to consider cost, they might make somewhat different choices and a larger number of deaths, illnesses, or injuries might be prevented at lesser cost.

Viscusi and Hamilton (1996) claimed that much of the resources of government agencies charged with protecting public health is used to reduce small risks at great expense while more substantial and more easily mitigated risks persist. They characterized this outcome as a "90:10 phenomenon." Namely, society spends 90 percent of its resources to achieve the last 10 percent of risk-reduction benefits. When the 90:10 phenomenon characterizes the outcome of risk mitigation choices, more deaths, illnesses, and injuries are likely than when expenditures all produce similar risk reductions. The 90:10 phenomenon is an outcome entirely consistent with decision making based on risk standards.

To illustrate the 90:10 phenomenon, Viscusi and Hamilton examined the cost of cleaning Superfund toxic waste sites and the likely number of cancers prevented by doing so.[2] They found that cost per cancer avoided was "staggering" (p. 58). At only one site the cost per cancer avoided was $5 million or less. At six sites, the cost ranged from $5 million to $100 million per cancer avoided. At 18 sites, the cost ranged from $100 million to $1 billion. At two sites, no cancers were prevented, and costs were therefore infinite. Most (67 sites) fell into the range Viscusi and Hamilton denoted as over $1 billion.

An earlier and more encyclopedic view of health and safety interventions (Morrall, 1986) showed that the variance of cost per life saved for health and safety regulations is large. The National Highway Traffic Safety Administration's 1967 rule on steering column protection was estimated to save 1,300 lives annually at a cost of $100 per life saved. At the other end of the scale, the Occupational Health and Safety Administration's 1985 formaldehyde regulation was estimated to save 0.010 life annually at a cost of $72 billion per life saved, in 1984 dollars. The upper end of the distribution has not gone away. Many small risks now can be mitigated only with enormous expenditures. (See, for example, updated information

[1] For example, the three Delaney Clauses in the Federal Food, Drug, and Cosmetic Act all require zero risk by demanding zero exposure to carcinogens. The Food Quality Protection Act of 1996 eliminated the applicability of the Delaney Clause to pesticides, instead requiring that risk levels be so small they can be considered negligible. Of course, standards can be set at any level of risk.

[2] EPA's Superfund risk assessments are based on extremely conservative assumptions, and do not reveal what likely risks are. See Lichtenberg (1991) for a discussion of the relation between likely risks and conservatively estimated risks.

in Lutter and Morrall (1994) in Viscusi (1996), and in Tengs et al. (1995).) The tabulation by Tengs et al. shows that the upper end of the distribution has extended in recent years. The cost per life saved varied over 11 orders of magnitude among government interventions.

When the public sector controls risks where the cost per life saved is denominated in hundreds of billions of dollars, there may not be resources available to address a risk that can be controlled at a lower (more cost-effective) price. The practical importance of failing to address the relatively large risks that can be controlled at relatively modest expense is that regulatory compliance costs (which operate like any other production cost) or government expenditures (financed through taxes) may be many orders of magnitude higher than they would be for a different bundle of regulations and the same overall level of risk reduction. In a follow-up study, Tengs and Graham (1996) showed that with some simple rules for allocating costs among life-saving interventions (expanding those that are most cost-effective and contracting others), the number of lives saved could be more than double the current number. Alternatively, the current number of lives saved could be maintained at a savings of $31 billion per year, in 1993 dollars.[3]

Tengs and Graham based their calculations on a decision rule that prevents as many deaths as resources permit. In effect, their rule selects hazards to mitigate by comparing costs and benefits (cost-benefit analysis) and choosing to finance those programs that maximize benefits net of costs (net benefits). This decision rule overcomes the problems inherent in decision making based on risk standards. As a practical matter, their decision rule first selects those hazards that are both relatively risky for many people and inexpensive to fix. Last on the list of corrective actions would be those hazards that pose small risks for few individuals and are relatively expensive to correct. The goal of protecting as many lives as resources allow can be met only by comparing costs and benefits (cost-benefit analysis), and guiding the selection of hazards to mitigate with that information.

Health and Cost-Benefit Analysis

In competitive markets, prices lead to an efficient allocation of resources and there is no efficiency argument for government intervention and therefore no need for cost-benefit analysis. In these markets, producers maximize profits by setting price equal to marginal cost, and consumers maximize utility by purchasing goods to the point where marginal utility is equal to price. This condition is duplicated for all goods and services so that throughout the economy, the marginal value of production is equal to the marginal cost. In such a system, not only do prices lead to an allocation of resources in which the value of marginal production equals the cost, but they also lead to the maximum societal welfare. If individuals choose consumption to maximize utility and if the welfare of society is the sum of individual welfare, then given correct prices, the bundle of goods actually purchased maximizes societal welfare. Or, as Little (1956) stated:

> Thus the theory of value, or price, and the theory of economic welfare were hand in glove, both being based on the utility theory of consumers' behavior.

When markets do not function correctly, prices do not indicate marginal cost. When markets are absent, there is no price signal at all. In these cases, prices do not lead to an efficient allocation of resources or to maximum societal welfare. Policymakers must find another way to achieve economic efficiency and maximize societal welfare, such as cost-benefit analysis. Chakravarty (1987) explained the need for cost-benefit analysis:

> The whole raison d'être of 'cost-benefit analysis' is the very fact that the world is imperfect and suitable corrections are called for in arriving at a proper estimate of how much net benefit accrues to society as a result of committing resources in a specified direction. (p. 690)

[3] Tengs and Graham noted that the Federal government is not completely flexible in its allocation of life-saving resources. They experimented with a variety of constraints on allocations among programs. With constraints, their measure of the opportunity cost of the current allocation was reduced. Their conclusion that the current allocation could be improved was not overturned by adding such constraints.

The Federal Office of Management and Budget (1996) lists four conditions under which markets may fail to maximize productive or allocative efficiency and therefore warrant cost-benefit analyses: externalities, natural monopolies, market power, and inadequate or asymmetric information. Cost-benefit practitioners often add public goods (goods that are nonrival in consumption and have high exclusion costs) to the list.

Health and safety fit the criteria for cost-benefit analysis because these commodities are not exchanged for money (see, for example, Fuchs and Zeckhauser, 1987, p. 263). Thus, there are no obvious or recorded prices that might be used to monetize health benefits. In addition, many of the commodities that individuals use to directly influence their own health (including legal medications, illegal drugs, tobacco, and surgery) are largely traded in markets characterized by distortions. For example, health insurance drives a wedge between prices health care buyers pay and prices health care providers receive.

Though markets for health may not exist or prices may fail to reveal the value of health, markets for risky goods exist and frequently result in efficient allocations. In many cases, consumers are aware of the risks associated with consuming goods and services and assume them voluntarily (for example, skiing is not risk free). However, consumers are often unaware of the health risks associated with some goods. In many cases, markets for risky goods are characterized by market failure in the form of asymmetric information or even missing markets. For example, consumers may be unable to distinguish on the basis of price between hamburgers contaminated with *E. coli* O157:H7 and uncontaminated hamburgers. In these cases, consumers cannot gauge the true value of the food, including its health-influencing characteristic. In these kinds of cases, cost-benefit analysis may be needed to design policies to reduce health risks.

Whether benefits and costs guide development of interventions to protect life and health depends on government decisionmakers' ability and willingness to consider such estimates. Formal demands for consideration of costs and benefits in regulatory programs began with President Nixon. Presidents Ford, Carter, Reagan, and Clinton each issued Executive Orders demanding some consideration of costs and benefits in regulatory analyses (Executive Office of the President, 1989, pp. 13-15 and Weidenbaum, 1997). Demands to balance costs and benefits have also come through the Legislative Branch. The Regulatory Flexibility Act (1980), for example, requires special attention to regulatory impacts on small businesses. Another, the Unfunded Mandates Reform Act (1995), requires Federal agencies to assess costs and benefits of regulatory actions that may result in expenditures by State, local, tribal governments, or the private sector of at least $100 million.[4]

Even with political and economic consensus that both costs and benefits ought to guide decisions, finding a consensus on the best measure for costs and benefits is daunting. Paradoxically, while market failure is the condition that makes cost-benefit analysis useful, market failure also makes cost-benefit analysis difficult to do. Layard and Glaister (1994, p. 3) stated:

> . . . the main problem in cost-benefit analysis is to arrive at adequate and consistent valuations where market prices fail in some way.

For policy that has an impact on morbidity or mortality, this task is even more daunting. To use cost-benefit analysis to evaluate policy that influences health, an economic value for life and health must be estimated. As innocuous as this observation appears, it has led to one of the most heated debates in economic theory. How can an economic value for life and health be contemplated when these possessions are invaluable? What unit should be used to measure the value of life and health?

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[4] Conversely, Federal decisions are often legally constrained to ignore costs or benefits. Van Houtven and Cropper (1996) note that ambient standard-setting cannot take costs into account under the 1970 Clean Air Act and benefits cannot be considered in effluent standards under the Clean Water Act. Despite these legal constraints, Van Houtven and Cropper showed that costs have exercised a small, but consistent, influence on health and safety intervention decisions. Statistical analysis of EPA decisions, both under laws mandating consideration of costs and benefits and under the 1970 Clean Air Act, showed that, on average, decisions were influenced by costs and benefits. After a legal decision stating that EPA improperly considered costs in emission standards for hazardous air pollutants, EPA greatly reduced (but did not eliminate) the influence of cost on its decisions.