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The $6.1 Million Question

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Abstract

What is the dollar value of saving a human life? Cost-benefit analysis of health and environmental regulation requires such a number, yet the concept raises numerous ethical and philosophical questions. There are good general reasons to reject the entire enterprise of monetizing life, and specific reasons to criticize the methods used to create such values.

Valuations of life are most often based on analysis of the wage premium for risky jobs. Recent EPA analyses have relied on an extensive but dated database of wage-risk estimates, leading to an inflation-adjusted estimate of $6.1 million per life in 1999 dollars. A more appropriate interpretation of that database implies an estimate of at least $9-11 million. Some newer studies suggest much lower values – perhaps due to the weakened bargaining position of labor, a factor that has nothing to do with the value of environmental risk. The risk premium for working women is five times as great as for men, underscoring the impossibility of a "one size fits all" estimate of the value of a statistical life. Such values are not necessary for reasonable decision-making about how to reduce fatal risks.

Introduction

How much is one human life worth? According to EPA, $6.1 million.

Whether or not this is precisely the correct answer, cost-benefit analysis demands some such number. The most significant benefits of environmental protection are often the deaths prevented by regulation. To decide whether the benefits of regulation are larger or smaller than the costs, it is essential to assign a dollar value for lives saved.

Putting a price on human life makes most people uncomfortable. It is clearly unacceptable to virtually all religions and moral philosophies. Nonetheless, the quantitative valuation of life has become central to recent analyses of public policies, forcing us to pay some attention to the details of the strange calculation, and to the troubled theories on which it rests.

The estimate of $6.1 million per life was developed in 2000 in order to evaluate the benefits of removing arsenic from drinking water. As we will see, there is an established but debatable rationale for the belief that $6.1 million is the right number. The debate matters because the value of life is easily the most important single number in the economics of health and environmental protection, accounting for the great majority of the benefits in many cost-benefit studies. In two recent EPA studies, more than 90% of the monetized benefits of removing arsenic from drinking water, and more than 80% of the benefits of the first 20 years of the Clean Air Act, consisted of avoided deaths.[1]

When costs and benefits are similar in size, the exact value of a life becomes crucial. With arsenic in drinking water limited to 10 parts per billion (ppb), the regulatory standard that was ultimately adopted, the estimated dollar value of health benefits is almost equal to the costs of arsenic removal. This conclusion stands or falls on the value of a life. Raise the value of a life to $12 million, and the same cost-benefit analysis could justify even 3 ppb, the most protective, and most expensive, standard. Cut the value of a life to $3 million, and the analysis would swing all the way in the other direction, with costs overwhelming monetary benefits even at a lax 20 ppb standard.

Traditional Values

Monetizing life did not begin with cost-benefit analysis, and debate about the practice extends far beyond the economics profession. In varying forms, the monetary valuation of life, and the accompanying moral dilemmas, are as old as ancient English history and as new as the aftermath of the World Trade Center collapse.

Aethelbert I, the first Christian king of Anglo-Saxon England, issued his "dooms," or legal code, in 601-604 AD.[2] Aethelbert's dooms included the principle of "wergild", the monetary compensation that the killer had to pay to the family of a murder victim. Wergild varied with the victim's status; it was much more expensive to kill a prince than a peasant. In an era that had not yet established a criminal justice system, payment of wergild was thought to be a superior alternative to the long, bloody feuds that could otherwise result from a killing. Wergild was an established custom in medieval Norse, Germanic, and Russian societies, and plays an important part in *Beowulf*, the old English epic poem written in 1000 AD or earlier. In contemporary literature, Jane Smiley's detailed historical novel, *The Greenlanders*, portrays wergild as part of Norse laws and customs in the fourteenth century.

A second tradition emerged in the medieval Catholic Church, and was widely accepted in Western Europe by the twelfth century. Aggressively seeking expanded sources of revenue, the church sold indulgences, or pardons, for all manner of crimes up to and including murder. That is, the church was willing to accept cash in lieu of the burdensome and time-consuming penance (punishment) that would otherwise have been required. In this case, the price depended on the wealth of the person seeking the pardon, as well as on the nature of the sin. By the fourteenth century, the sale of indulgences had come to seem disreputable and sleazy to many: one of the pilgrims portrayed by Chaucer in *The Canterbury Tales* was The Pardoner, who made his living selling tawdry relics and pardons of dubious authenticity to credulous peasants. Anger at such abuses only grew stronger as time went on; Martin Luther's challenge to church authorities in 1517 over the sale of indulgences was one of the sparks that ignited the Protestant Reformation, while the Catholic Church itself abolished the practice in 1562.[3]

A third tradition, all too well known, was slavery. A market that established a price for human beings was one of the underpinnings of American economic development, and remained an integral part of Southern agriculture until the end of the Civil War. Ownership of slaves often included the right to kill them; the purchase of a slave was, indeed, the purchase of a life.[4] Once again, there was a price list: since prices for slaves depended on their expected economic value, it was no surprise that younger, stronger, and healthier slaves were worth more.

These glimpses of history seem alien and remote, looking back into a world that is thankfully no longer with us. The modern American legal system does not draw directly on the traditions of wergild, indulgences, or slavery. Yet the courts routinely assign prices to human lives, particularly in lawsuits seeking compensation for the wrongful death of loved ones. Younger and healthier victims again tend to be worth more, as payments depend in part on the loss of expected future income. However, awards in these lawsuits vary capriciously from one jurisdiction to another, and often attach great weight to trivial aspects of the victim's life. For example, insurance adjustors have found that settlements are usually much larger for people who enjoyed outdoor recreation than for those who stayed home reading or watching television.[5]

After the terrorist attacks of September 11, 2001, the Federal Victim Compensation Fund was established to provide compensation to the families of the deceased. Elaborate formulas were developed to calculate the payments that would be made from the fund.[6] To begin with, one uniform sum was allocated for each deceased individual's pain and suffering, plus a uniform additional award for each spouse and dependent, if any. An additional payment was based on the loss of expected earnings, depending on age, family status, and income at the time of death. The total projected payment for a poor, elderly, single and childless victim was a small fraction of that for a young, high-income victim with a spouse and children. The goal was not to achieve equity, but to discourage the families from suing for compensation. Therefore the payment schedule was based, in part, on a guess about how much the families of different victims might have won in court. Even in the twenty-first century the government offers wergild to the families of the dead, hoping to prevent a long legal feud.

The valuations from death settlements, whether established by federal agencies in the aftermath of disaster or in individual court cases, may not apply directly to cost-benefit analysis of public policy. Death settlements are personal and retrospective, providing compensation to relatives of someone who has already died. Public policies for health and the environment are social and prospective, expressing society's commitment to prevent deaths and other harms that have not yet happened. To refuse, prospectively, to protect someone from harm caused by another person is to grant a kind of license to harm to the person doing the harming – a license that can be purchased for a finite cost. The values of life for retrospective and prospective purposes could be very different numbers – if, that is, both of these values are in fact numbers.

What does it mean to say that the value of a life is $6.1 million? There are two very different ways in which the statement can be interpreted, giving rise to two distinct sets of problems. First, there are underlying ethical and philosophical questions about whether any such number exists. Second, if such a number does exist, calculation of the number involves puzzling problems of economic analysis. The controversies surrounding the calculation lead back, in the end, to the fundamental questions about the meaning and plausibility of any single dollar estimate for the value of a life.[7]

Life, Risk, and Ethics

A cascade of conceptual problems surrounds the subject of valuation of life. The decision to proceed with valuation, for cost-benefit analysis or other purposes, is in effect a decision to set aside these problems or to pretend they have been resolved. Yet the debates about the conceptual questions remain pressing and contentious.

How could saving one life have a monetary value? We do not ordinarily act as if money is involved when lives are at stake. A missing child, or a person trapped in a collapsed or burning building is cause for calling in the rescue squad, and for making immediate, heroic efforts to save the person. This is our society at its best; we would not be nobler if we stopped to do a cost-benefit analysis and ponder the economic value of the life at risk, before deciding to proceed. Human life is the ultimate example of a value that is not a commodity, and does not have a price. In an age that has left wergild, indulgences, and slavery behind, you cannot buy the right to kill someone for $6.1 million, nor for any other price.

Most systems of ethical and religious belief maintain that every life is sacred. A common inference is that the value of life must therefore be infinite. That statement, however, leads to paradoxes of its own: if life has an infinite value, should all available resources be spent on risk-reducing or life-saving measures? A more careful restatement of the ethical objection is that there is no "price" for life because its value is immeasurable.[8]

The standard economic response is that a value like $6.1 million is not a price on an individual's life or death. Rather, it is a way of expressing the value of small risks of death; for example, it is one million times the value of a one in a million risk. If people are willing to pay $6.10 to avoid a one in a million increase in the risk of death, then the "value of a statistical life" is $6.1 million.

It is true that risk (or "statistical life") and life itself are distinct concepts, but both are involved in many questions of health and safety. Regulations often reduce risk for a large number of people, and avoid actual death for a much smaller number. A complete cost-benefit analysis should include valuation of both of these benefits. In practice, however, analysts often ignore the distinction between valuing risk and valuing life, and act as if they have produced a valuation of life itself.[9]

To clarify the distinction, imagine that the fast-evolving field of "reality" television comes up with a new show called "You Bet Your Life." The show's contestants all agree to undergo 100 exotic and dangerous events, each of which has a 1 in 100 risk of death. It turns out that the odds are that 4 out of every 11 contestants will survive and 7 will die.[10] The survivors each experience the loss of a statistical life, since they suffer 100 separate 1/100 risks of death. The other contestants have a rather different and worse experience.

Economists have calculated only the value of a statistical life, not the value of life itself: numbers like $6.1 million attempt to measure what happens to the contestants who survive but not those who die. Yet, just as in the imaginary television show, loss of statistical life for some and loss of life itself for others frequently have the same causes. In an economy that makes widespread, routine use of toxic chemicals, we are all involuntary participants in a form of "You Bet Your Life," albeit with somewhat better odds than the imaginary version. A complete measure of the damage done by toxic chemicals cannot stop with a value for the risk to everyone who is exposed; it must also value the costs to the smaller number who actually die as a result of that exposure.

But what is the dollar value of an actual life or death? If the value of life itself was based on the compensation required in exchange for it, the price would be infinite, as "no finite amount of money could compensate a person for the loss of his life, simply because money is no good to him when he is dead."[11] In the discussion of risk and the value of a statistical life, the paradox of monetizing the immeasurable value of human life has not been resolved, it has only been glossed over.

Another problem with the standard approach to valuation of life is that it asks individuals (either directly through surveys, or indirectly through observing wage and job choices, as explained in the next section) only about their attitudes toward risks to themselves. A recurring theme in literature, religion, and cultural tradition suggests that our deepest and noblest sentiments involve valuing someone else's life more highly than our own: think of parents' devotion to their children, soldiers' commitment to those whom they are protecting, lovers' concern for each other. Most spiritual beliefs call on us to value the lives of others - not only those closest to us, but also those whom we have never met.

In valuing nature, economists often ask about existence values: how much is the existence of a wilderness area or endangered species worth to you, even if you will never personally experience it? If this question makes sense for bald eagles and national parks, it must be at least as important when applied to safe drinking water and working conditions for other people. How much is it worth to you to prevent a death of an unknown person far away? The answer cannot be deduced solely from your attitudes toward risks to yourself. We are not aware of any attempts to quantify the existence value of another person's life. But we are sure that, if the value of life is a number in the first place, then there is a substantial existence value to the life of a stranger, let alone a relative or friend.

Another dubious assumption is that there is a single value for all equal risks to life, such as $6.10 for a one in a million risk. That is, the process of valuation assumes that there is a single thing called "risk", with a price that applies to it regardless of context. Yet despite the finality of death, there is no reason to think that all deaths are equivalent and interchangeable. Nor are all one in a million risks of death directly comparable to each other.

For example, the death rate is about the same - just over one in two million - from a day of downhill skiing, from a day of working in the construction industry, or from drinking about 20 liters of water containing 50 parts per billion of arsenic, the old regulatory limit that was in effect until 2001.[12] This does not mean that society's responsibility to reduce risks is the same in each case.

Most people view risks imposed by others, without an individual's consent, as more troubling and more worthy of government intervention than risks that an individual knowingly accepts. On that basis, the highest priority among our three examples is to reduce drinking water contamination, a hazard to which no one has consented. The acceptance of a risky occupation such as construction is at best quasi-voluntary - it involves somewhat more individual discretion than the "choice" of public drinking water supplies, but many people go to work under great economic pressure, with little information about occupational hazards. In contrast, the choice of risky recreational pursuits such as skiing is entirely discretionary; obviously safer alternatives are readily available. Safety regulation is thus more urgent on construction sites than on ski slopes, despite the equality of risk.[13]

There are other ways in which equal risks of death may not look equally bad. For example, the circumstances preceding death are important: sudden, painless death in pleasant circumstances is different from agonizing, slow deterioration surrounded by medical technology. One economist who has explored these issues, E.J. Mishan, argues that there is no meaning to the value of a statistical life, divorced from the particular policy that increases or decreases risk.[14] That is, even for an ultimate value such as life and death, the social context is decisive in our evaluation of risks.

It is useful, where possible, to collect quantitative information about the lives saved and health improved through public policy, but it may be pointless or confusing to express those lives in terms of their dollar "equivalents." This conclusion is only strengthened by a closer look at the source of those dollar figures.

Young, Rich, and Valuable

The value of lives saved by public policy could be based on expected future earnings, as in wrongful death settlements. This approach has been tried in the past, but has fallen out of favor as its drawbacks have been recognized. A future earnings standard is highly unequal; it makes some people appear more valuable than others, because they will earn more in the rest of their lifetimes. Is it then more "efficient" to spend more on protecting the health of those with higher expected earnings? A price list with different values for different lives is difficult to reconcile with ideals of democracy and equal treatment under the law, let alone the sacredness of every human being.

One of the worst results of a future earnings standard is that it implies that the lives of retired people are worth nothing – or perhaps less than nothing, since they merely consume scarce goods and services without earning or producing anything themselves. If society's values were all about money, there might appear to be a net social benefit to something that kills a lot of retired people – such as tobacco.

Several years ago, states were in the middle of their litigation against tobacco companies, seeking to recoup the medical expenditures they had incurred as a result of smoking. At that time, W. Kip Viscusi, a professor of law and economics at Harvard Law School, undertook research concluding that states, in fact, *saved* money as the result of smoking by their citizens. Why? Because smokers died early, saving their states the trouble and expense of providing nursing home care and other services associated with an aging population. According to Viscusi, the financial benefit to the states of their citizens' premature deaths was so great that, if some of his results were "taken at face value," then "cigarette smoking should be subsidized rather than taxed."[15]

Amazingly, this cynical conclusion has not been swept into the dustbin where it belongs, but instead has been revived. The tobacco company Philip Morris commissioned the well-known consulting group Arthur D. Little to examine the financial benefits, to the Czech Republic, of smoking among Czech citizens. Arthur D. Little found that smoking was a financial boon for the government – partly because, again, it caused citizens to die earlier and thus reduced government expenditure on pensions, housing, and health care.[16]

Expected future earnings depend on wealth, as well as age. Are the lives of the rich worth more than the lives of the poor? After all, the rich have higher expected earnings, and they are also able and willing to pay more for risk reduction. An actual "price list" with different values for rich and poor lives made a brief and embarrassing appearance in the discussion of global climate change in 1995. Every few years, the Intergovernmental Panel on Climate Change (IPCC) publishes a massive assessment of the state of knowledge on climate change, with thousands of experts from around the world contributing to chapters in their areas of specialization. For the 1995 report, the economists writing about costs and benefits of greenhouse gas reduction decided to assign monetary values to the lives that would be lost to global warming. A careful reading of the fine print revealed that they were valuing lives in rich countries at $1,500,000, in middle-income countries at $300,000, and in the lowest-income countries at $100,000.[17]

A furor naturally ensued when these figures were publicized, shortly before the report was completed. The IPCC was created by a United Nations-sponsored conference, and reports its findings to the governments of the world – many of whom were livid at discovering their citizens being valued at 1/15 of a European or North American life. Despite widespread criticism, the economists insisted that there was not enough time before the publication deadline to change the numbers. The final 1995 report relies on the unequal values of rich and poor lives, surrounded with last-minute verbal qualifications and suggestions of alternative perspectives. The next IPCC report, published in 2001, recommends the use of a worldwide average value of a life.[18]

As the IPCC realized, grave moral and political problems can be avoided by using a single value of life for the entire population under consideration – the world for global issues, or the nation for US policies. For those who want to assign a numerical value to life, the challenge is to produce an estimate, such as $6.1 million for the US, which applies to society as a whole. This is where the story gets confusing, because there is no clearly correct answer.

Behind The Numbers

The $6.1 million figure used in policy circles today comes from wage-risk studies. These studies try to infer the value of a life from the extra wage, or wage premium, paid for risky jobs. This is by far the most popular method for deriving a value for a statistical life. If two jobs are similar in many respects but differ in the risk of death, a higher wage is often required to attract workers to the more dangerous job. The wage difference between the two jobs could be thought of as the amount of compensation that workers demand in exchange for accepting the additional risk. (In real life almost no one has ever thought this way about taking a job; but in economic theory ordinary people are endlessly and effortlessly engaged in complex calculations.) Once we know the "price" of risk in the workplace, it is easy to compute the value that workers apparently place on a statistical life. If the entire population places the same value on risk, independent of its social context, then the workplace value of a statistical life can be applied to other risks of any variety.

If this strikes you as implausible and misleading, you have correctly anticipated the conclusion of the next few pages. However, wage-risk calculations are widely accepted and increasingly employed in analyzing and shaping public policy. For that reason, it is worth spelling out the flaws in the wage-risk logic.

Here is how the calculation works. Hypothetically, suppose that a job with a 1 in 10,000 annual risk of death (a typical risk for male blue-collar workers) paid 30 cents per hour, or $600 per year, more than a similar but completely safe, risk-free job. Then workers who took the risky job would be accepting $600 compensation for a 1 in 10,000 chance of death, or "1/10,000 of a statistical life," implying that they valued a statistical life at $600 x 10,000 = $6 million.

As in this example, it is possible to take the data on wages and risk, do the math, and come up with a wage-risk estimate. But several debatable steps are required in order to interpret that number as society's true value of a statistical life, suitable for use in cost-benefit analyses unrelated to job risks. Limitations at each step suggest that society's true valuation of risk – if there is such a thing – is higher than wage-risk estimates would imply.

Wage-risk analysis assumes not only that there is a well-defined value of a statistical life, but also that workers' job choices accurately reveal that value. This means that workers must know exactly how risky their choices are; a standard assumption of the underlying economic theory is that workers are perfectly informed about risks. In reality, of course, workers do not always understand the dangers they face at work. Hispanic workers in the U.S. now die on the job at a higher rate than whites or blacks. Among other reasons, workers with limited knowledge of English sometimes misunderstand written or spoken safety warnings. "If someone yells, 'Watch out,' you don't necessarily act as fast if it's not your native language," says AFL-CIO educator James Platner.[19] If workers are uninformed about job risk, they will not demand appropriate compensation for risky work.

If workers' choices tell us the value of risks, workers must be free to choose among jobs at varying levels of risk; this, too, is a standard assumption in theory. However, the workers who end up employed in risky occupations may lack the skills or mobility needed to find alternatives. Some of the most dangerous jobs are in forestry, mining, fishing, and agriculture, industries that are often located in remote areas with few other employers. Alaska is the state with the highest rate of death on the job, followed by Wyoming, Montana, Idaho, West Virginia, and Mississippi.[20] Also, minority workers may end up in undesirable, risky jobs as a result of discrimination. If workers are stuck in high-risk occupations due to geography or prejudice, statistical estimates of wage payments for risk will be too low; workers who were truly free to choose would demand more for accepting risk – or they might even choose a safer line of work.

If workers are well-informed and able to switch occupations, a process of self-selection will occur: those who are most willing to accept dangerous challenges will take the risky jobs, while those most concerned about safety will work elsewhere. Those workers who are most afraid of heights don't end up working as roofers; they presumably don't even apply for the job. Their valuation of the risk of climbing around on roofs is much greater than the wages paid for the job. (Roofing is, in fact, one of the most dangerous jobs in construction.) Society's average valuation of risks should reflect the choices made by those who would never dream of doing dangerous work, as well as by those who do accept the job at the going wage. Correction for this bias would clearly raise the value of a statistical life above the wage premium that is actually paid for risky work.

It is not only risk-averse workers who are left out of wage-based calculations of the value of risk. Many people are not in the paid workforce; their attitudes toward risk may not be the same as those of workers. Two large groups, college students and at least some of the growing number of early retirees, could have applied for dangerous jobs; since they declined to do so, their valuation of risk must exceed the going wage. Other groups outside the workforce include people who are particularly vulnerable to environmental hazards, such as children, pregnant and nursing women, the disabled, and the elderly. Health and environmental regulations are often of greatest benefit to these vulnerable, non-working parts of the population; shouldn't the value of a life reflect their needs and preferences, as well as the behavior of workers who take dangerous jobs? Inclusion of these groups again seems likely to raise the value of a statistical life above the wage-risk estimates.

One large part of the population is virtually invisible in wage-risk calculations, namely women. As academic studies and common stereotypes both agree, women are much more risk-averse than men.[21] This shows up in employment patterns: most of the workers in the riskiest jobs are male. In the 1990s men accounted for only about half of the paid labor force, but almost all fatalities on the job. As a result, any calculation of the wage premium for risky work in general primarily reflects what it takes to get men into the most dangerous jobs.

A recent wage-risk study, using data from 1996-98, estimates the value of a statistical life separately for different groups of workers.[22] White-collar workers face essentially no risk of death on the job, so no estimate can be developed for them. Among blue-collar and service workers, the value of a statistical life is $2.3 million for men and $11.0 million, more than five times as high, for women.

Using these numbers, what standard should be adopted to represent the value of risk to society? The male and female figures could be averaged, but these figures only apply to blue-collar workers. Many white-collar workers presumably could have taken risky jobs, but did not; does that mean that they are at least as risk-averse as blue-collar women? The same question applies to people who are not in the paid labor force. If white-collar workers and all non-workers are at least as risk-averse as blue-collar women, then the great majority of the population has a value of a statistical life of at least $11 million.

The same study looked at racial differences, but for black workers it was unable to find any statistically significant wage premium for risky work. That is, black workers doing dangerous jobs are not consistently paid more for the risks they face at work. The obvious fact of racial discrimination can easily explain this result, while the textbook model of well-informed job choice cannot.

A final observation about this study is that it reveals the incredibly narrow wage differences on which the entire pyramid of analysis rests. The average female blue-collar worker faces risks on her job that merit a wage increase of a mere 6 cents per hour over completely safe, risk-free work. For her male counterpart, the comparable risk-based wage increase for the average job is only 11 cents per hour. Although the wage premium is larger for the most dangerous occupations, there are almost no jobs where it reaches a dollar an hour.[23] From pennies per hour added to paychecks, the value of life is divined. And with that value, judgment is passed on the merits of life-saving health and environmental regulations for the nation as a whole.

Since wage-risk analysis presents so many problems, one might wonder if there are other approaches to valuation of a statistical life. The leading alternative is "contingent valuation," a form of public opinion polling that is widely used to assign monetary values to health and environmental benefits. For valuation of life, polling a cross-section of the population about what dollar values they place on risks of dying seems like a curious and problematical enterprise. Nonetheless, it has occasionally been tried. One recent attempt by well-known environmental economists involved such a complicated questionnaire that the researchers had to pay the participants to spend several hours filling it out at a computer center.[24] Thus the study was in danger of selecting for people who are not very busy, and who respond well to small monetary incentives – not necessarily a representative cross-section of society when it comes to valuing risk. Moreover, such surveys can only elicit hypothetical evaluations of risks in contrived, artificial scenarios. Unlike wage-risk analyses, surveys do not reflect actual decisions made when real lives or real money are at stake.

The Washington Consensus

The value of $6.1 million per life, developed in 2000 for the EPA's cost-benefit analysis of arsenic standards for drinking water, was not the first such estimate. Between 1988 and 1999, federal agencies adopted monetary values for life at least fifteen times in the course of evaluating regulations, as summarized in Table 1.[25] Some of the values adopted in 1996, and all of the ones thereafter (below the line in Table 1) were between $4.8 million and $5.8 million. Adjusted for inflation, these figures are in close agreement with the more recent estimate of $6.1 million. It appears that a consensus emerged in Washington in the late 1990s that the value of a life is around $5 - $6 million.

Table 1: Valuations of Life in Regulation

Agency	***Subject of regulation***	***Year***	***Value (million $)***
EPA	Protection of stratospheric ozone	1988	3.0
FAA	Establishment of airport radar	1990	1.5
FDA	Food labeling regulations	1991	3.0
Dept of Agriculture	National school lunch/school breakfast program	1994	1.5, 3.0
Dept of Agriculture	Pathogen reduction in food inspection	1996	1.6
FDA	Restriction of tobacco sales to minors	1996	2.5
FAA	Flight simulator use in pilot training	1996	2.7
FAA	License requirements for aircraft launch	1996	3.0
FDA	Manufacturing standards for medical devices	1996	**5.0**
EPA	Children's exposure to lead paint	1996	**5.5**
EPA	Ambient air quality standards: particulate matter	1997	**4.8**
EPA	Ambient air quality standards: ozone	1997	**4.8**
FDA	Mammography standards	1997	**5.0**
EPA	Disinfectants and byproducts in drinking water	1998	**5.6**
EPA	Radon in drinking water	1999	**5.8**

Source: Matthew D. Adler and Eric A. Posner, "Implementing Cost-Benefit Analysis When Preferences are Distorted," *Journal of Legal Studies* 29 no. 2, part 2 (June 2000), 1146.

The estimates of $5 - $6 million emerge from the work of the same economist who wrote about the benefits of smoking. W. Kip Viscusi has authored or co-authored a number of studies of the value of a life, and has written several influential reviews of the available literature on the subject.[26] In his view, the value of a statistical life is around $5 million in 1990 dollars. An EPA re-analysis of Viscusi's data produced the more precise estimate of $4.8 million, also in 1990 dollars.[27] This value, adjusted for a decade of moderate inflation, crept up to $6.1 million in 1999 dollars in the arsenic study. In other words, in the late 1990s regulators seemed to treat the EPA/Viscusi estimate as an established empirical constant, needing adjustment only for inflation.

Viscusi's literature reviews, published in the 1990s, encompass the majority of the available U.S. work on the subject – some of it by him and his co-workers, but most by other researchers. The estimates he cites are extremely diverse, ranging from about $900,000 to more than $21 million in today's dollars.[28] Averages of these disparate values are used to arrive at figures such as $4.8 million, $5 million, or (adjusted for inflation) $6.1 million.

The individual estimates cited by Viscusi – the basis for the average valuations of a statistical life – are very old: even in his 1998 survey, the newest study he mentions was published in 1991, while the most recent U.S. data are from 1982.[29] The data underlying his surveys date, on average, back to 1976; the experience of the 1970s and the early 1980s is heavily represented, while more recent experience is entirely absent.

These aged data were carefully adjusted for inflation to arrive at the recent EPA estimate of $6.1 million for a statistical life, but were not adjusted to reflect any other changes in job markets or attitudes about risk that have occurred in the last 25 years. Yet significant changes have occurred.

Even if attitudes toward risk and job choices remain constant, the value of a statistical life should rise at least as fast as incomes. Wealthier countries usually have stricter environmental regulations and safety standards; a common explanation is that such protections are luxuries that individuals and nations turn to after basic needs have been met. If this is true, then the value placed on health and the environment must be increasing faster than income. Likewise, if a worker's income rises and her attitude toward risk does not change, one would expect the extra payment she demands for doing dangerous work to increase at least as fast as her income.[30]

For the purpose of adjusting Viscusi's numbers, assume that the value of life rises exactly in proportion to average personal incomes. Then instead of $6.1 million, the number should be $8.8 million in 1999. A plausible variation on Viscusi's method (excluding the few foreign entries inappropriately included in Viscusi's largely U.S.-based survey data) would produce an even higher figure, $11.1 million.[31] In round numbers, that is to say, the Viscusi estimate adjusted for income growth as well as inflation reached $9-11 million by 1999.

Is Life Getting Cheaper?

If attitudes toward risk and job choices had stayed constant since 1976, then Viscusi's average value, adjusted for income growth, might still be appropriate. In that case one would expect more recent studies of the value of a statistical life to produce estimates around $9 - 11 million. For the most part, though, that is not the case. Some newer studies have found much lower values, around $2 - 4 million.[32] As the newer research gains wider attention, there will likely be efforts to lower the value of a life for regulatory purposes – implying a devaluation of health and environmental protection in general. Already, the Office of Management and Budget has criticized the value of $6.1 million as applied to deaths from air pollution, reasoning that the people who die from air pollution are older and sicker – and therefore worth less, in monetary terms – than the workers whose preferences underlie the $6.1 million figure.[33]

Why should the estimated value of a life be lower than it used to be? Workers are still dying in noticeable numbers. There were 5,915 fatalities on the job in the United States in the year 2000, and more than 6,000 a year in the 1990s, caused by a broad range of hazards. Fishing boats are lost at sea, as Hollywood has graphically reminded us. Airplanes crash, killing their pilots; here media images are often misleading, since small planes account for many more deaths than scheduled airlines. Miners are trapped underground. Loggers, farm workers, and construction workers die in accidents with their equipment. Traffic accidents kill truck drivers, taxi drivers, and others. Homicides, usually connected with robberies, kill taxi drivers, retail clerks, and others. A handful of the most dangerous industries and occupations are highlighted in Table 2.

Table 2: Fatal Injuries on the Job

	Number of fatalities	Rate per 100,000 workers
All workers (1997)	**6238**	**4.8**
High-risk industries (1997)		
Mining	158	25
Agriculture, forestry, fishing	831	24
Construction	1107	14
Transportation, utilities	1008	13
High-risk occupations (1997)		
Timber cutters	121	129
Fishers	60	123
Water transportation	49	92
Aircraft pilots	100	83
Extractive (mining, oil &gas)	75	52
Construction laborers	333	41
Taxi drivers	100	40
Truck drivers	862	28
Farm workers	616	27
Roofers	55	27
All women workers (1994)	**521**	**0.9**
High-risk women's occupations (1994)		
Taxi drivers	6	24
Construction laborers	6	19
Truck drivers	20	16
Messengers	5	13
News vendors	7	10
Farm workers	12	9

Data on all workers from National Institute of Occupational Safety and Health (NIOSH), *Worker Health Chartbook 2000*, 36-37. Data on women workers from Andrew Knestaut, "Fewer women than men die of work-related injuries," *Compensation and Working Conditions Online*, June 1996 (from Bureau of Labor Statistics), Table 4.

However, dangerous jobs are not standing still. Fortunately, risks of death on the job are declining in every major occupation; the overall death rate today (per 100,000 workers) is less than half the rate in 1976.[34] Regulations adopted by OSHA, EPA, and other agencies have played a part in this dramatic improvement. In addition, some (not all) of the most dangerous industries, including agriculture, fishing, mining, and logging, employ a declining proportion of the labor force.

It is not only dangerous occupations that have declined. Male blue-collar workers – who fill virtually all the high-risk jobs – have faced worsening job opportunities since the 1970s, as overall industrial employment has fallen.[35] If people are desperate for work, an employer does not have to pay as much to attract them to dangerous jobs. Hispanic workers, whose numbers have grown rapidly, are filling some of the most risky jobs in construction and elsewhere, as shown by their high death rate on the job. Immigration status and language barriers may stop many Hispanic workers from asking for or getting higher pay for more dangerous work.

In dangerous industries that are declining, such as agriculture and fishing, workers of any ethnicity are typically in no position to demand wage premiums for risk. On the other hand, in several dangerous industries that have expanded, such as trucking, construction, and air transportation, unions have lost ground and workers are in a weaker bargaining position than they were in the past. Average real wages for truck drivers declined 30% between 1977 and 1995, due to the combination of deregulation and the declining power of the Teamsters union; in the same period, average real wages for all manufacturing production workers declined only 8%.[36] Thus there was a sharp drop in the wage premium for truck driving relative to other blue-collar jobs, for reasons that had nothing to do with workers' attitudes toward risks.

These are important stories about employment, wages, and workplace risk. However, they have little to do with society's valuation of health and environmental protection in general. Job market conditions have shifted since the 1970s in ways that reduce the wage premium for dangerous work, but there is no reason to think that there has been a similar reduction in the benefit of preventing deaths due to pollution. Yet that would be the implication for cost-benefit analyses if regulatory agencies use newer wage-risk studies to justify a lower valuation of life.

Private Markets and Social Values

To see how inappropriate estimates of the value of a life can give a decision maker precise and technical reasons for doing the obviously wrong thing, one need look no further than Ford's unhappy experience with the Pinto and its exploding gas tank.

The Ford Pinto, one of the best-selling cars of the 1970s, had a defective gas tank with an unfortunate tendency to burst into flames in rear-end collisions, even at moderate speeds. Crash tests of prototypes in 1969-70, and of Pintos produced in 1971 and 1972, had demonstrated the severity of the problem, yet Ford delayed fixing it, apparently aware that it was saving money by postponing the needed redesign.[37] The story has grown in the retelling, and there is no definitive proof that Ford did a cost-benefit analysis that rejected the Pinto redesign. But the truth is not much better.

In the mid-1970s, at exactly the time when Ford should have been fixing the Pinto, the company was instead lobbying against a proposed federal regulation about fuel tank safety in crashes – a regulation that eventually forced them to make the Pinto safer. As part of the lobbying effort, Ford prepared a cost-benefit analysis of one part of the regulation, concerning fuel tank safety in rollover accidents. Other provisions of the regulation dealt with rear-end collisions, the more common source of Pinto explosions. According to Ford's engineers, it would cost $11 per car, or a total of $137 million per year for the industry as a whole to meet the rollover standard, while saving an estimated 180 lives per year, along with an equal number of serious burn injuries and a few thousand wrecked cars.[38]

Ford's cost-benefit analysis valued those lives at a mere $200,000 apiece. That number was calculated by the National Highway and Traffic Safety Administration (NHTSA) at the request of the auto industry, based mainly on lost wages, plus medical and legal costs and a small amount for pain and suffering. At $200,000 per head, 180 deaths are "worth" only $36 million, not nearly enough to "justify" a $137 million expenditure. A value of about $750,000 per life is needed to make the benefits equal the cost in this exercise. The accuracy of these calculations has been questioned – for instance, cheaper options may have been available for achieving gas tank safety – but that is not the point. The numbers presented here are the facts as Ford perceived them at the time; as Ford saw it, it was just not worth it to spend an extra $11 per car to fix the gas tank. (These numbers are in 1972 dollars; to correct for inflation since then, they should be multiplied by about 4 to convert them to today's dollars. The cost per car would be up to $44 today, while the value of a life at which costs equal benefits is about $3 million.)

The decision making that Ford engaged in can be done in either direction, depending on what you are sure of when you start. If you are sure that you know the value of a statistical life, you can calculate whether it makes sense to save 180 lives per year by installing safer auto gas tanks; this is the standard cost-benefit approach. On the other hand, if you are sure that auto companies should be required to fix the gas tanks at $44 per car, you can calculate that the value of a life, for this type of risk, must be at least $3 million today.

Despite Ford's lobbying, the gas tank safety regulation was adopted, taking effect for the 1977 model year. Ford responded by immediately, and inexpensively, making the 1977 Pinto safer. However, the damage had been done. It became all too apparent that Ford had knowingly produced a dangerous car from 1971 through 1976, leading to hundreds, perhaps thousands, of easily preventable deaths. As the company lost a disastrous series of lawsuits, recalled all 1971-76 Pintos for retrofits, and finally discontinued the model in 1980, the executives might have reflected that society's implicit value of a statistical life was quite a bit higher than they had been led to believe.

If you are sure about the merits of risk-reducing or life-saving expenditures, you can do similar calculations on other issues, running cost-benefit analysis in reverse to find the implied value of a statistical life in each case. For example, in a country where consumers are willing to spend huge sums on bottled water partly because they believe it is safer than tap water, the value of life implied by decisions about drinking water is very high indeed. There is no need to get the same answer every time, since the cause and context of risk, and society's obligation to reduce risk, vary from one situation to another. It may be interesting to compare the resulting values, and to point out any cases where the implied value of a life is measured in billions rather than millions of dollars. However, as we have shown in other work, the most famous, repeatedly cited examples of regulations costing astronomical amounts per life saved turn out to be entirely fictitious.[39]

Conclusion

To summarize our story, cost-benefit analysis assigns a misguided priority to using the same value of life in every case, in the name of economic efficiency. Empirical estimates of the value of a life rest on a series of hypotheses about job choices and workplace risk, each of which should be questioned: there is no need for workplace and environmental risks to have the same value; wages paid for dangerous jobs do not always represent workers' well-informed, free choices; and the workers who do dangerous jobs are not typical of society as a whole.

Ignoring all such doubts, a consensus emerged in the late 1990s around regulatory use of a very dated wage-risk estimate of the value of life, adjusted for inflation but not for real income growth. Newer estimates of the value of a life are often lower, reflecting changes in the labor market and the weakening of the labor movement, but telling us nothing about changing attitudes toward environmental protection. It would be a cruel irony if setbacks for labor were thus transformed into setbacks for health and the environment, imposing a perverse equity in retreat.

The myriad problems with valuation of life lead back, in the end, to the underlying questions about the meaning and validity of any such value. All methods of valuation obscure the crucial distinction between risk and life itself. Mechanical application of $6.1 million, or any other value, as a standard of efficiency comes close to selling indulgences once again: is a corporation or public agency that endangers us pardoned for its sins once it has spent $6.1 million per statistical life on risk reduction? New, lower values would only sell society's pardons more cheaply.

Cost-benefit analysis as practiced today assumes that the value of a statistical life is known from the outset, or can be found through objective research, while the policy decision – whether to fix the gas tank – is unclear. But sometimes the correct policy choice can be found just by putting yourself in the consumer's shoes: given a choice between a Pinto with the exploding gas tank feature, and a Pinto with a safer gas tank for $44 more, which would you buy? The answer does not depend on the latest estimates of the economic value of a life. Rather, the Pinto episode shows that reliance on an intricately calculated, "one size fits all" value of life is not the way that reasonable people do, or should, make important decisions.

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NOTES

[1] Calculated from *The Benefits and Costs of the Clean Air Act, 1970 to 1990* (EPA, 1997) and *Arsenic in Drinking Water Rule: Economic Analysis*, December 2000 (EPA 815-R-00-026)

[2] We first encountered Aethelbert's role in the valuation of life in Adam Davidson, "Working Stiffs: The Necessary Parasites of Capitalism," *Harper's Magazine* vol. 303, no. 1815, August 2001, 48-54.

[3] Thanks to Steven Marrone for helpful insights into medieval church history.

[4] For example, a 1705 Virginia statute allowed killing a slave in the course of disciplining him - A. Leon Higginbotham, Jr. & F. Michael Higginbotham, "Yearning to Breathe Free": Legal Barriers Against and Options in Favor of Liberty in Antebellum Virginia, 68 NYU L. Rev. 1213, 1223 (1993).

[5] Davidson (see note 2).

[6] Justice Department website, http://www.usdoj.gov/victimcompensation/

[7] A number of the issues raised here are presented in more, formal mathematical language in Peter Dorman, *Markets and Mortality : Economics, Dangerous Work, and the Value of Human Life*, (Cambridge University Press, 1996).

[8] For an argument against valuation on grounds like these, see Elizabeth Anderson, *Value in Ethics and Economics* (Harvard University Press, 1993). For an extended exploration of issues of incommensurability, see Cass Sunstein, "Incommensurability and Valuation in Law," 92 *Michigan Law Review* 4: 779-861 (1994), reprinted in Sunstein, *Free Markets and Social Justice* (Oxford University Press, 1997).

[9] For further elaboration, see Lisa Heinzerling, "The Rights of Statistical People," 24 *Harv. Envtl. L. Rev.* 189, 203-06 (2000).

[10] The probability of surviving each event is 0.99, so the probability of surviving 100 independent events is $0.99^{100} = 0.366$. This is very close to 4/11 = 0.364.

[11] John Broome, "Trying to Value a Life," 9 *J. Pub. Econ*. 91, 92 (1978).

[12] Skiing: in 1999 there were 30 fatalities and 52.2 million skier/snowboarder visits to ski slopes, for a death rate of 0.57 per million skier-days. (National Ski Areas Association, www.nsaa.org)

Construction: in 1997 there were 14.1 fatal injuries per 100,000 full-time construction workers; assuming 250 days per full-time year, the death rate was 0.56 per million days of work. (NIOSH, *Worker Health Chartbook, 2000*, p.36.)

Arsenic (extrapolating from limited available data): male lifetime cancer rates per ppb of arsenic are 2.53×10^{-5} for bladder cancer and 2.75×10^{-5} for lung cancer; see EPA, *Arsenic in Drinking Water Rule: Economic Analysis*, December 2000 (EPA 815-R-00-026), Exhibit B-2, p. B-8. (Female cancer rates are higher.) Death rates are 26% for bladder cancer and 88% for lung cancer, for a combined male mortality rate of 3.08×10^{-5} per lifetime ppb of arsenic.

The EPA analysis is based on a person who drinks 2 liters of water per day. So lifetime consumption over 70 years is $2 \times 70 \times 365 = 5.11 \times 10^{4}$ liters. If risk is proportional to arsenic consumption, the risk per ppb per liter = $(3.08 \times 10^{-5}) / (5.11 \times 10^{4}) = 6.03 \times 10^{-10}$ per ppb per liter, or 3.01×10^{-8} per liter of 50 ppb water. At that rate, the risk from 19 liters of 50 ppb water equals the risk from a day of skiing.

[13] For an effort to quantify the additional value of avoiding involuntary risks, see Richard L. Revesz, "Environmental Regulation, Cost-Benefit Analysis, and the Discounting of Human Lives," 99 *Colum. L. Rev*. 941, 968-71 (1999).

[14] Mishan, E. J., 1988. *Cost-Benefit Analysis: An Informal Introduction*, fourth edition (London: Routledge).

[15] W. Kip Viscusi, *Cigarette Taxation and the Social Consequences of Smoking*, Working Paper No. 4891, at 33 (National Bureau of Economic Research October 1994); published in James M. Poterba, ed., *Tax Policy and the Economy*, vol. 9 (MIT Press, 1995).

[16] See, among many sources, Gordon Fairclough, "Smoking Can Help Czech Economy, Philip Morris-Little Report Says," *Wall Street Journal*, July 16, 2001. The original report, *Public Finance Balance of Smoking in the Czech Republic*, is available at http://europe.com/2001/BUSINESS/07/16/czech.morris./index.html.

[17] James P. Bruce, Hoesung Lee, and Erik F. Haites, editors, *Climate Change 1995: Economic and Social Dimensions of Climate Change* (Cambridge University Press, 1995), Chapter 6, especially 196-197. The differing values of life are presented explicitly in one of the principal sources for the IPCC report: Samuel Fankhauser, *Valuing Climate Change: The Economics of the Greenhouse* (Earthscan, 1995), 47-48. Fankhauser based his estimates on willingness to pay for risk reduction, and described the middle and low-income estimates as "arbitrary" (*ibid*, 47). The first prominent critics of the IPCC valuations were the Global Commons Institute; the issue is discussed on their website, http://www.gci.ork.uk. Our description of the controversy also relies on personal communication from William Moomaw, one of the lead authors of the IPCC reports in 1995 and in 2001.

[18] Bruce et al., *Climate Change 1995* (note 17); Bert Metz, Ogunlade Davidson, Rob Swart and Jiahua Pan, editors, *Climate Change 2001: Mitigation* (on-line at www.ipcc.ch, published by Cambridge University Press, 2001). In the 2001 report, discussion of the value of life controversy appears in section 7.4.4.2.

[19] Steven Greenhouse, "Hispanic Workers Die at Higher Rate," *New York Times*, July 16, 2001, A11.

[20] National Institute for Occupational Safety and Health, *Worker Health Chartbook 2000*, 39.

[21] See, for instance, Thomas DeLeire and Helen Levy, "Gender, Occupation Choice and the Risk of Death at Work," National Bureau of Economic Research Working Paper 8574, November 2001.

[22] John D. Leeth and John Ruser, "Compensating Wage Differentials for Fatal and Nonfatal Injury Risk by Gender and Race," Bentley College Department of Economics, January 2002 (corresponding author JLeeth@Bentley.edu). Dollar figures from this study are in 1998 dollars.

[23] This is our calculation, using the rates of occupational fatalities in dangerous occupations (as in Table 2) and the average risk premium for blue-collar and service workers, by gender, from Leeth and Ruser (note 21).

[24] Alan Krupnick, Anna Alberini, Maureen Cropper, Nathalie Simon, Bernie O'Brien, Ron Goeree, and Martin Heintzelman, "Age, Health, and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Survey of Ontario Residents," Resources for the Future Discussion Paper 00-37 (2000), http://www.rff.org.

[25]Matthew D. Adler and Eric A. Posner, "Implementing Cost-Benefit Analysis When Preferences are Distorted," *Journal of Legal Studies* 29 no. 2, part 2 (June 2000).

[26] His three major surveys are W. Kip Viscusi, *Fatal Tradeoffs: Public and Private Responsibilities for Risk* (New York: Oxford University Press, 1992); "The Value of Risks to Life and Health," *Journal of Economic Literature* 31 no. 4 (December 1993), 1912-1946; *Rational Risk Policy* (Oxford: Clarendon Press-Oxford University Press, 1998).

[27] The original calculation can be found in EPA, *The Benefits and Costs of the Clean Air Act, 1970 to 1990*, 1997, Appendix I. For an example of a subsequent analysis citing the Clean Air Act analysis and adjusting only for inflation, see EPA, *Arsenic in Drinking Water Rule: Economic Analysis*, EPA Document 815-R-00-026, December 2000, p. 5-23.

[28] Viscusi's figures are normally expressed in 1990 dollars; these are equivalents in 2001 dollars.

[29] Viscusi, *Rational Risk Policy* (his latest survey), 54-57.

[30] For Viscusi's own argument that the value of risk should be proportional to income, see W. Kip Viscusi and W. Evans, "Utility Functions that Depend on Health Status: Estimates and Economic Implications," *American Economic Review* 80 no.3 (June 1990), 353-374. A recent literature review, Ted R. Miller, "Variations between Countries in Values of Statistical Life," *Journal of Transport Economics and Policy* 34 part 2, May 2000, 169-188, estimates an income elasticity of close to 1.0, implying that the value of a statistical life is proportional to income. Research on valuation of risk in Taiwan, during a period of rapid growth, suggests that the value of a life may rise much faster than income: James K. Hammitt, Jin-Tan Liu, and Jin-Long Liu, "Survival is a Luxury Good: The Increasing Value of a Statistical Life," NBER Summer Institute Workshop on Public Policy and the Environment, Cambridge, Massachusetts, August 2000. (Corresponding author: James Hamitt, Harvard School of Public Health, James_Hammitt@Harvard.edu.).

[31] Real personal income per capita rose by 44% between 1976 and 1999. Adjustment for this alone, adding 44% to $6.1 million, yields $8.8 million. The variation is based on the observation that the average U.S. value in Viscusi's latest survey (*Rational Risk Policy*; see note 26) was $6.2 million in 1990 dollars, higher than usually reported. The inappropriate inclusion of a few foreign estimates depresses the usual averages drawn from Viscusi's data. Adjusting $6.2 million both for inflation through 1999, and for 44% real personal income growth, yields $11.1 million.

In a preliminary version of our work on this subject, we used GDP per capita rather than personal income per capita for income adjustment; that approach yields even higher numbers, reaching $13.8 million in place of the $11.1 million reported here for 1999.

[32] For recent literature reviews, see Janusz R. Mrozek and Laura O. Taylor, "What Determines the Value of Life? A Meta-Analysis," Georgia State University Department of Economics, August 2001 (corresponding author Taylor@gsu.edu), and Ted R. Miller, "Variations between Countries in Values of Statistical Life," *Journal of Transport Economics and Policy* 34 part 2, May 2000, 169-188.

[33] Office of Management and Budget, Office of Information and Regulatory Affairs, Report to Congress on the Costs and Benefits of Federal Regulations, at 32 n. 21 (1998).

[34] Calculated from National Safety Council data. NSC has the only continuous data series on occupational fatalities extending back to the 1970s; its data are not strictly comparable to government data cited elsewhere in this paper.

[35] For a review of some of the extensive literature on this subject see Frank Ackerman, Neva R. Goodwin, Laurie Dougherty, and Kevin Gallagher, editors, *The Changing Nature of Work* (Island Press, 1998).

[36] Michael H. Belzer, *Sweatshops on Wheels: Winners and Losers in Trucking Deregulation* (Oxford University Press, 2000), 21.

[37] Douglas Birsch, "Product Safety, Cost-Benefit Analysis, and the Ford Pinto Case," in Douglas Birsch and John H. Fielder, editors, *The Ford Pinto Case: A Study in Applied Ethics, Business, and Technology* (Albany NY: SUNY Press, 1994).

[38] The original Ford memo is E.S. Grush and C.S. Saunby, "Fatalities Associated with Crash-Induced Fuel Leakages and Fires," reprinted in Birsch and Fielder, *The Ford Pinto Case*.

[39] Lisa Heinzerling and Frank Ackerman, "The Humbugs of the Anti-Regulatory Movement," *Cornell Law Review* 87 number 2, January 2002, 648-670; Lisa Heinzerling, "Regulatory Costs of Mythic Proportions," *Yale Law Journal* 107 number 7, May 1998, 1981-2069.

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