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Recognizing Risks and Paying for Risk Reduction

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Introduction

During our lifetime, we live in a perpetual state of risk management, continually accepting and rejecting risks. Reviewing my daily activities, I find many examples of conscious or subconscious risk management decisions. I decide that it is better to accept the risk of electrocution (less than 3.7×10^{-4})[1] by turning on the hallway light in the morning than to face the risk of tripping and falling (6.2×10^{-5})[2] on my way to the bathroom (falls collectively pose a 7.7×10^{-3} risk).[3] I decide the risk from a cup of morning coffee (1.6×10^{-4} from known carcinogens), is far outweighed by the risk of driving my car (as high as 7.1×10^{-3})[4] before I fully wake up. Driving to work, I fasten my seat belt, because it almost doubles[5] chances of surviving an accident.

This assessment and management of risks continues through my day. As I go to bed, I wonder, "Did I lock the door?" In my town, the risk of being killed by an intruder is extremely small (certainly less than

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1 OFFICE OF MANAGEMENT AND BUDGET, REFORMING REGULATION AND MANAGING RISK-REDUCTION SENSIBLY, 1992 Budget Document Sent to Congress January 1991, IX.C. Part Two, at 367-76.

2 R. WILSON & E. CROUCH, RISK BENEFIT ANALYSIS (1982).

3 OFFICE OF MANAGEMENT AND BUDGET, *supra* note 1.

4 *Id.*

5 *Id.*

the national homicide rate of 1.1×10^{-3} for 15–24 year old white males),[6] but....

As a matter of curiosity (certainly not paranoia or a morbid sense of humor), I wonder how I am doing in managing the risks in my life. Knowing that the ultimate probability of dying sometime during my life is 100%, I wonder what the odds are of each activity or situation being the cause of my untimely demise.

I search my desk and find a surprising amount of information,[7] providing estimates for several potential causes of death over the course of my lifetime. They include my being a single male (increased risks, 27%), cancer (20%), SCUBA diving (3%), working for a utility company (3%), motor vehicle accident (2%), accident in the home (0.8%), boating (0.4%), and skiing (0.14%). Assuming no synergistic effects between activities (e.g., being a single male does not increase my odds of getting into an auto accident), I still cannot account for over 43% of the possible combinations for hitting the "death risk lotto." Technically, I know that I've identified in this list, the most likely cause of my death. Yet, emotionally, I'm convinced that it's hiding in the 43% I know nothing about.

The life expectancy in the U.S. rose from 54.1 years in 1920 to 74.7 years in 1985[8]. Thus, total risks have decreased. The increased interest in risk assessment and management in conjunction with a longer life span, means that we worry more and more about lower risks. As we define the risks in our society in more detail, we become more fascinated by smaller, less significant risks. We fear the unknown and are confident that only what we don't know can hurt us.

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6 *Id.*

7 *Id.*; WILSON & CROUCH, *supra* note 2; Allman, *Staying Alive in the 20th Century*, Science 85, October 1985, at 30-41.

8 U.S. ENVIRONMENTAL PROTECTION AGENCY, EXPOSURE FACTORS HANDBOOK (1989).

Why We Bother

It doesn't take long to reach the point of diminishing returns when looking at risks in the range of 10^{-6} — the routine cutoff point for regulatory action. Comparing daily risks with those posed by a Superfund hazardous waste site close to my vacation home in Vermont, I see that the former are about 10^{-2}, while the latter is 10^{-6} or 0.01% as high.

Assessing risks at 10^{-6} or lower is useful to compare relative risks between a variety of locations or situations not to determine absolute risk levels. This is discussed in a report to the Environmental Protection Agency (EPA)[9] that proposes prioritizing EPA activities based on the relative risk (on a national scale) for each area of EPA interest. If this were done, we could cost-effectively make great strides in reducing risks and extending and improving our quality of life. The following language from the report should, in my opinion, be hanging on the wall of every corporate and government office:[10]

> There are heavy costs involved if society fails to set environmental priorities based on risk. If finite resources are expended on lower-priority problems at the expense of higher-priority risks, then society will face needlessly high risks. If priorities are established based on the greatest opportunities to reduce risk, total risk will be reduced in a more efficient way, lessening threats to both public health and local and global ecosystems.

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9 SCIENCE ADVISORY BOARD, RELATIVE RISK REDUCTION STRATEGIES COMMITTEE, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION, report to William K. Reilly, Administrator, U.S. Environmental Protection Agency (Sept. 1990).

10 *Id.*, at 2.

What We Don't Know

Although I'm at much greater risk from familiar, accepted activities; I still refuse to accept even seemingly insignificant risks forced upon me or risks I don't fully understand. I'm not alone; this universal attitude has led to requiring formal risk assessments for most "environmental" risks.

Every day, industry and government personnel weigh the impact of their activities on your increased risk of death or illness. Yet, as ominous as this sounds, you probably have little need to worry. With notable exceptions, e.g., Times Beach or Love Canal, the vast majority of risks from industrial discharges or emissions are far outweighed by the risk of getting out of bed and going to work or school. Although voluntary and involuntary risks aren't directly comparable, developing a healthy society nevertheless depends on understanding and properly managing *all* risks.

Reviewing a number of quantitative risk analyses[11] I conducted for the utility industry between 1988 and 1991, I found the mean expected increase in risk to people living, working, playing, or fishing within approximately a half mile of the site to be 1.5×10^{-7}, ranging from 1×10^{-6} to less than 1×10^{-10}. In reviewing the risk to workers on site (excluding site cleanup), I found a mean expected increase to be 9×10^{-8}, ranging from 2.5×10^{-7} to less than 1×10^{-10}.

It's difficult to justify spending hundreds of thousands of dollars to prevent, statistically, only a fraction of a single case of cancer. In fact, in three analyses, I estimated the costs of remedial alternatives to avoid one additional case of cancer to be $88 billion, $115 billion and $1.9 trillion! Even the most risk-averse should balk at this kind of expense.

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[11] In each case, the risk was for contracting cancer from exposure to a variety of organic chemicals.

Drawing the Line

How much *should* we spend? This question haunts regulators and decision makers who try to avoid "putting a price on human life." We can nevertheless determine implicit values by examining the cost-effectiveness of various regulations. Consider a few that were promulgated between 1967 and 1991.[12]

Eighteen EPA regulations (not including listing wood preserving chemicals as hazardous waste) reveal a mean value of $6.9 billion per premature death averted. Costs range from $200,000 for initiating the trihalomethane drinking water standards to $92 billion for the atrazine/alachlor drinking water standard. Adding wood preserving chemical regulations (which in themselves imply a value for averting a premature death of $5.7 trillion) raises the mean to $323 billion!

Eight Occupational Safety and Health Administration (OSHA) standards imply a mean value for averting one premature worker death of $9.8 million with costs ranging from $100,000 for underground construction standards to $70.9 million for lockout/tagout procedures.

The National Highway Traffic Safety Administration (NHTSA) has maintained perhaps the highest cost/benefit ratio. Eight NHTSA regulations reveal a mean cost of $1 million to avert one premature death. The passive restraint/seat belt and steering column protection standards each cost $100,000, and even the least cost-effective (rear lap/shoulder belts) cost $3.2 million dollars per averted death.

The Value of Environment

This review is not entirely fair to the EPA. Cost-effectiveness is generally higher in those programs intended to prevent death by injury than in those programs aimed at reducing risk of cancer through environmental, and even occupational, causes. Also, EPA regulations

12 OFFICE OF MANAGEMENT AND BUDGET, *supra* note 1; all values in 1990 dollars.

are intended to protect the environment as well as human health; therefore one cannot evaluate their regulations based solely on human lives saved.

Still, it is becoming readily apparent that some method of evaluating human and environmental well-being is necessary. Resources must be allocated to high priority risks whether they are to human health or the environment. To achieve this, wider acceptance and standardization of quantitative methods for analyzing a wide range of risks is required.

Until the problems involved with comparing environmental and human health risks are resolved, discrepancies in cost-benefit analyses will continue. Meanwhile, we must be careful not to undervalue environmental health. Since the environment is the life support system for the entire human race, it may warrant more expense than would appear at first glance.

Conclusion: Equal Rights for all Risks

To begin to equalize efforts to reduce environmental and human health risks, the following recommendations from the earlier mentioned report to the EPA should be given top priority, there as well as elsewhere:[13]

> 1. EPA should target environmental protection efforts on the basis of opportunities for the greatest risk reduction. ...
> 2. ... attach as much importance to reducing ecological risk as to reducing human health risk. ...
> 3. ... improve data and analytical methodologies that support the assessment, comparison, and reduction of different environmental risks. ...
> 4. ... reflect risk-based priorities in the strategic planning process. ...
> 5. ... reflect risk-based priorities in the budget process. ...
> 6. ... make greater use of all the tools available to reduce risk. ...

13 *Supra* note 9, at 6.

> 7. ... emphasize pollution prevention as the preferred option for reducing risk. ...
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> 8. ... increase efforts to integrate environmental considerations into broader aspects of public policy in as fundamental a manner as are economic concerns. ...
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> 9. ... work to improve public understanding of environmental risks and train a professional work force to help reduce them. ...
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> 10. ... develop improved analytical methods to value natural resources and to account for long-term environmental effects in all economic analyses. ...

Also, we can apply these principles in our daily lives. What we *do* know is more likely to kill us than what we don't.