

2007

## Risk Comparisons

Baruch Fischhoff

*Carnegie Mellon University*, [baruch@cmu.edu](mailto:baruch@cmu.edu)

Follow this and additional works at: <http://repository.cmu.edu/sds>

---

This Book Chapter is brought to you for free and open access by the Dietrich College of Humanities and Social Sciences at Research Showcase @ CMU. It has been accepted for inclusion in Department of Social and Decision Sciences by an authorized administrator of Research Showcase @ CMU. For more information, please contact [research-showcase@andrew.cmu.edu](mailto:research-showcase@andrew.cmu.edu).

**Scientific Review of the Proposed  
Risk Assessment Bulletin from the  
Office of Management and Budget**

Committee to Review the OMB Risk Assessment Bulletin  
Board on Environmental Studies and Toxicology  
Division on Earth and Life Studies

February 2007

National Research Council  
of the National Academies

The National Academies Press  
Washington, DC  
[www.npu.edu/catalog/11811.html](http://www.npu.edu/catalog/11811.html)

Excerpt on Risk Comparisons (pp. 37-38)

## RISK COMPARISONS

There are two conceivable legitimate purposes for risk comparisons. Readers who consult the risk communication literature will find that serving either purpose requires both formal analysis to ensure that defensible comparisons are being made and dedicated empirical research to ensure that the result is understood as intended. Readers of that literature will also find that poorly done risk comparisons can confuse, mislead, and antagonize recipients. Unless done in a scientifically sound way, risk comparisons are unlikely to be useful and relevant and hence should be avoided.

One conceivable legitimate purpose is giving recipients an intuitive feeling for just how large a risk is by comparing it with another, otherwise similar, risk that recipients understand. For example, roughly one American in a million dies from lightning in an average year (NOAA 1995). “As likely as being hit by lightning” would be a relevant and useful comparison for someone who has an accurate intuitive feeling for the probability of being hit by lightning, faces roughly that “average” risk, and considers the comparison risk to be like death by lightning in all important respects. It is not hard to imagine each of these conditions failing, rendering the comparisons irrelevant or harmful:

(a) Lightning deaths are so vivid and newsworthy that they might be overestimated relative to other, equally probable events. But “being struck by lightning” is an iconic very-low-probability risk, meaning that it might be underestimated. Where either occurs, the comparison will mislead (Lichtenstein et al. 1978; NRC 1989).

(b) Individual Americans face different risks from lightning. For example, they are, on the average, much higher for golfers than for nursing-home residents. A blanket statement would mislead readers who did not think about this variability and what their risk is relative to that of the average American (Slovic 2000; Tversky and Kahneman 1974).

(c) Death by lightning has distinctive properties. It is sometimes immediate, sometimes preceded by painful suffering. It can leave victims and their survivors unprepared. It offers some possibility of risk reduction, which people may understand to some degree. It poses an acute threat at some very limited times but typically no threat at all. Each of those properties may lead people to judge them differently— and undermine the relevance of comparisons with risks having different properties (Fischhoff et al. 1978; Lowrance 1976).

(d) It is often assumed that the risks being used for comparison are widely considered acceptable at their present levels. The risks may be accepted in the trivial sense that people are, in fact, living with them. But that does not make them acceptable in the sense that people believe that they are as low as they should or could be. It would be wrong to make comparisons with risks that responsible organizations are working diligently to reduce. For example, the National Lightning Safety Institute (NLSI) and the United States Golf Association do not consider contemporary risks of injury and death

from lightning strikes to be acceptable: “A strong case can be made for reducing lightning’s human and economic costs through the adoption of proactive defensive guidelines” (Kithil 1995).

The second conceivable use of risk comparisons is to facilitate making consistent decisions regarding different risks. Other things being equal, one would want similar risks from different sources to be treated the same. However, many things might need to be held equal, including the various properties of risks (discussed above) that might make people want to treat them differently despite similarity in one dimension (for example, annual fatality rate among Americans) (HM Treasury 2005; Wittenberg et al. 2003).

The same risk may be acceptable in one setting but not another if the associated benefits are different (for example, being struck by lightning while golfing or working on a road crew). Even when making voluntary decisions, people do not accept risks in isolation but in the context of the associated benefits. As a result, *acceptable risk* is a misnomer except as shorthand for a voluntarily assumed risk accompanied by acceptable benefits (Fischhoff et al. 1981).

The bulletin does not convey how difficult it is to produce useful and relevant risk comparisons. Unless such comparisons are developed in a scientifically sound and empirically evaluated way that addresses the values and circumstances of all recipients, risk comparisons should not be made.

## REFERENCES

- Fischhoff, B., P. Slovic, S. Lichtenstein, S. Read, and B. Combs. 1978. How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sci.* 9(2): 127-152.
- Fischhoff, B., S. Lichtenstein, P. Slovic, S.L. Derby, and R.L. Keeney. 1981. *Acceptable Risk*. New York: Cambridge University Press.
- HM Treasury (Her Majesty's Treasury). 2005. *Managing Risks to the Public: Appraisal Guidance*. London: HM Treasury. June 2005: [http://www.hmtreasury.gov.uk/media/8AB/54/Managing\\_risks\\_to\\_the\\_public.pdf](http://www.hmtreasury.gov.uk/media/8AB/54/Managing_risks_to_the_public.pdf)
- Kithil, R. 1995. *Lightning's Social and Economic Costs*. Presentation at International Aerospace and Ground Conference on Lightning and Static Electricity, September 26-28, 1995, Williamsburg, VA [online]. Available: [http://www.lightningsafety.com/nlsi\\_lls/sec.html](http://www.lightningsafety.com/nlsi_lls/sec.html)
- Lichtenstein, S., P. Slovic, B. Fischhoff, M. Layman, and B. Combs. 1978. Judged frequency of lethal events. *J. Exp. Psychol. Learn.* 4:551-578.
- Lowrance, W.W. 1976. *Of Acceptable Risk: Science and the Determination of Safety*. Los Altos, CA: W. Kaufmann.
- NOAA (National Oceanic and Atmospheric Administration). 1995. *Natural Hazard Fatalities for the United States, 1994*. National Oceanic and Atmospheric Administration, Washington, DC.
- NRC (National Research Council). 1989. *Improving Risk Communication*. Washington DC: National Academy Press.
- Slovic, P. 2000. *The Perception of Risk*. London: Earthscan.
- Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185(4157):1124-1131.
- Wittenberg, E., S.J. Goldie, B. Fischhoff, and J.D. Graham. 2003. Rationing decisions and individual responsibility in illness: Are all lives equal? *Med. Decis. Making* 23(3):194-221.