

Guest Editorial

CHRONIC HAZARDS AND RISK PERCEPTION – AN OVERVIEW

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Risk assessment and risk management are risky businesses in which to be engaged – a risk caused, at least in part, by the large and significant uncertainties in many of the key estimates needed in these businesses. Consequently, it is little wonder that the perception of risk by the general public is frequently confused and contradictory. Much has been written recently on these subjects in the scientific and engineering literature, including several articles and Special Issues of this Journal.

Nevertheless, the Co-Editors of this Special Issue think the revisitation of this topic as shown in the following papers contributes positively to the literature. They : (a) summarize useful concepts from epidemiology and statistics that are used in risk assessment (RA) and risk management (RM); (b) illustrate the advantages and limitations of RA/RM as they currently are applied by United States regulatory agencies to certain chronic hazards; and (c) discuss how public perceptions of risk affects, and effects changes in regulatory outcomes and public policy. The first paper by Robinson and Yodaiken reviews chronic hazards of the workplace, from scrotal cancer in chimney sweeps in the Eighteenth Century, to metals and organic chemicals found in present workplace environments. From an historical perspective, they follow the development of epidemiological and statistical tools needed to understand and evaluate human and animal studies, one of the main foundations of the RA process. Such tools frequently have shown a linkage between suspected agent and observed effect, prior to a full understanding or acceptance of the etiology: the relationship between cholera and water supply was established prior to the identification of the offending organisms; the relationship between lung cancer and cigarette smoking was explored in the British literature well before the Surgeon General's warnings in the United States. Although the elucidation of acute toxicity effects was the driving force in these scientific and statistical developments, the authors point out that these tools now are being applied to investigate subtle, chronic, and even sub-chronic effects in the present industrial environment, by using computers and a multi-disciplinary team.

Robins et al. use data from 13 studies examined in a 1986 National Academy of Sciences report to study one of today's most publicized chronic hazards – the relationship between the number of cigarettes one smokes, and resulting risk of lung cancer. These recent epidemiologic studies provide evidence that

even those who do not smoke directly, but are exposed indirectly or passively to cigarette smoke, are also at risk. Such persons are said to be exposed to "environmental tobacco smoke" (ETS). The authors derive from these studies a "summary rate ratio" (SRR), based on lung cancer mortality rate among persons exposed to ETS, and those not so exposed. The authors then try to determine whether or not the SSR is consistent with: (a) existing epidemiological data for active smokers, and (b) dosimetric measurements on mainstream smoke and ETS. If the authors' SRR is causally related to differences in exposure to ETS and not due to bias, then the estimated number of lung cancer deaths attributable to ETS exposure occurring in U.S. non-smokers in 1985 lies in the range 2300–5000. Their article illustrates the degree of understanding one must have with respect to biochemical processes, carcinogenesis, and mathematical modeling to contribute to this field.

Next, Rodricks and Taylor examine RA and RM, as practiced at three different United States regulatory agencies: the Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the Occupational Safety and Health Administration (OSHA). Here, presumably, are what risk assessment and risk management are all about: protection of worker health, public health, or the environment. Their paper uses vinyl chloride to illustrate that, even with the same data base, each agency can promulgate, and has promulgated, widely differing standards for exposure. This comes about because: (a) there is no single definition of "safety" or "safe level" in use among the laws or agencies, and (b) most of the enabling laws differ in the degree of protection to be provided, or in their considerations of the cost of the regulations.

At the time of actual decision-making, considerations beyond those enumerated in the statutes are apt to be influential. In a democracy, public perception of risk (and consequent persuasion applied to the political decisionmaker) can effect outcomes that may not correspond with those implied in the risk assessment stage. This is illustrated in the following articles by Cohen and Sharlin.

Cohen's paper examines the public's misperception of risks from nuclear power plants in the United States, and the adverse consequences that may be attributed to this misperception. He cites the wide disparity between: (a) nuclear power risks as perceived by the public, and (b) actual or estimated risks. Cohen concludes that this disparity is due to journalism's failure to communicate the basic information that would lead the public to conclude that nuclear power is acceptably safe – in fact, safer than several other alternatives. In response to the public's perception of nuclear power risks, decisionmakers in the United States have largely foreclosed the nuclear power alternative. Cohen points out that this foreclosure results in: (a) increased early deaths resulting from use of alternative energy sources (burning of fossil fuels), and (b) higher energy costs and the concomitant higher processing and manufacturing costs, for the same level of energy consumption.

Sharlin's historical perspective on the concept and use of risk analysis illustrates that in our current discussions and decisions regarding RA, RM, and risk perception, we may be using anachronistic notions or definitions of important terms, and that such use may have important consequences. Reminding us that the concept of risk began in the insurance industry, he summarizes the evolution of "risk", and concludes that:

- Risk in insurance terms indicates a hazard beyond human control, and insurance was designed to ease economic loss suffered through loss of property or early death. Today, risk more usually means something that can be controlled and ought to be reduced.
- As used in discussion today, risk assessment and risk perception are terms connected with regulation. Risk assessment is used in a macro sense in setting regulatory standards. Risk perception is the public's means of evaluating regulatory action.