

SCIENTIFIC METHODS & POLICY CHOICES IN RISK ANALYSIS:

THE REGULATION OF AIR TOXICS IN RHODE ISLAND

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ABSTRACT

Controversies over pollution sources often focus on the uncertainty associated with the scientific information and methods that are used to evaluate the potential for adverse human health risks. Uncertainty arises along each step of the risk assessment process - from the interpretation of results from animal bioassays to dose conversions across species and extrapolations from high level experimental exposures.

Critics from academia as well as from industry claim that the assessments used by regulators usually overstate risks by orders of magnitude and that it is inappropriate to base regulatory decisions upon those analyses. Meanwhile, citizen advocates argue that the methods used by regulators to evaluate risk sources are too narrow; risks are not characterized fully, and therefore the assessments are not sufficiently protective of health and the environment. Critics from both camps attempt to discredit particular regulatory decisions by citing scientific evidence for the adoption of alternative decision rules, suggesting that varying assumptions or methods might provide vastly different risk estimates.

My investigation of a Rhode Island regulatory case study contradicts these critics. I conclude that debates over which assumptions are the most "scientifically correct" to use for regulatory purposes are misdirected, and that the basis for such debates actually lies within unresolved, and undiscussed, policy choices. I examined how scientific uncertainty was dealt with in the development and application of the "acceptable ambient levels" (AALs) for carcinogens listed in the Rhode Island Air Toxics Regulation. In Rhode Island, the AALs are used to screen applications for operating permits and to guide the establishment of air pollution emissions limits. The AALs, however, are based only upon exposures to toxics via inhalation with no consideration of how risks might be compounded by multiple chemicals from the same source, by other nearby sources, or through additional routes of exposure.

I identified plausible alternatives to the "scientific" decision rules that were employed in developing the Regulation, and performed sensitivity analyses to measure how the AALs might have been altered by the use of different rules. I calculated and compared, for example, cancer potencies from different dose-response

models using the same animal data sets. Further, I examined how characterizing risks more broadly might have influenced assessments of specific air toxics sources, particularly solid waste incinerators. Cancer risks associated with inhalation exposures to emissions were calculated independently and contrasted with analyses that include risks associated with multiple chemicals, sources, and pathways.

I found that the variation in risk estimates associated with changing most decision rules for the Air Toxics case is insignificant, from a public policy perspective, and that even factors that do introduce large variations are not necessarily dealt with risk averse. In most cases the use of different decision rules would have altered risk estimates by factors too small to affect most permitting decisions. And while other rules could have a greater effect, these are not necessarily, nor consistently, risk averse. Decision rules that may be much more significant in shaping the "acceptability" of risk sources, from a regulatory point of view, are explicit policy choices that rarely are contested.

I found that resource and institutional constraints limit regulators in characterizing risks more broadly for management purposes, and political and legal influences require risk estimates to serve multiple and conflicting policy goals. Such factors prohibit regulators from directly refuting technical criticism and enforce the misdirection of risk controversies. I also identified several factors that inhibit public discussion about how regulators ought to deal with the policy choices inherent in risk assessment. These involve the way in which the AALs are perceived as absolute and inflexible cutoffs for "safe" concentrations of toxics and the special legitimacy that our society affords numerical arguments.

Technical debates over what are the "right" risk numbers cannot be resolved with our current understanding of the health effects associated with many environmental assaults and they often result in stalling the entire regulatory process. However, directing public debates away from the technical details of risk assessment and clarifying basic policy choices in such analyses may help to resolve, or at least expedite, risk controversies. Developing standards that are more flexible and reflect public concerns, for example, would address technical arguments before they are raised in specific siting controversies. Minor institutional reorganization and the formation of working groups consisting of regulators from different programs within agencies could enable certain decisions to be made consistently and cross-media issues to be evaluated. Similarly, risk controversies might be avoided by establishing firm siting guidelines that provide opportunities

for public participation at appropriate points in the permitting process and balance policy goals early and explicitly.

