Improved Decision-Making *in Environmental and Occupational Health

Traffic congestion in urban centers, polluted rivers and streams, toxic waste sites, hazardous working conditions, unsafe home environments for infants—remediation of any one of these conditions presents a challenge for risk managers and other officials. It will also consume tremendous financial resources. Considering that these problems usually coexist in communities, a method is needed for setting priorities among the problems so that the allocation of resources will provide the most benefit for a community. Of course, the benefit may be perceived from the point of view of health consequences, economics, or other angles. In allocating resources, a society might decide to weigh factors such as the age or gender of susceptible individuals, health services costs associated with the environmental problem, mortality vs morbidity vs disability burdens, or numerous other indicators. Even when the choices are distinctive, the decisions remain complicated. How would one choose between strategies to reduce the burden of infant diarrhea and the burden of respiratory diseases in the elderly? How would the choice between reducing fatal injuries in a factory and increasing immunization levels be made? Without some standardized approaches for estimating population health burdens, and the projected impacts of interventions, the complexity of such a decision analysis could be overwhelming.

Competent methods for health impact assessment can also be used for related purposes, including targeting health interventions, establishing health service priorities and research priorities, and providing a basis for evaluating the effectiveness of programs aimed at reducing population disease burdens. If we exclude political and other nonscientific bases for determining which environmental conditions deserve to be made priorities, we are faced with some interesting tools to choose from. The best methods provide a standardized measure of health impact that is clearly understood and reproducible and incorporate societal values or allows them to be superimposed at some point in the estimation process. This special section of *Epidemiology* presents a series of articles that address these measurements from a conceptual and methodologic vantage point and provides some applied examples. Together, they create a valuable body of information that can introduce willing epidemiologists and other health scientists to these issues. The relative strengths and weaknesses of these decision tools have rarely received attention.

In July of 1997, the World Health Organization and the International Labor Organization convened a meeting entitled "Methods for Health Impact Assessment in Environmental and Occupational Health" to review the various methods that have been proposed for objectively evaluating how environmental and occupational exposures impact a the health status of a population. An international group of scientists was assembled to summarize and evaluate the available strategies and to propose refinements aimed at improving the methods where possible. A main objective of the meeting was to discuss ways of helping local and national health officials to determine priority areas affecting their populations so that research or environmental remediation could be pursued, or disease prevention or control activities could be initiated. The papers submitted for this special section were outgrowths of the presentations and follow-up discussions held in small working groups or plenary sessions at the meeting.

The issue begins with an article by Smith et al. that attempts to explain the reasons why historical estimates of the proportion of population disease burdens attributable to environmental factors have varied so greatly. They argue that semantic factors have been to blame, at least in part, and they propose some standard definitions. Using these definitions, they estimate that more than one quarter of global illness may be environmentally determined. Nurminen et al. proceed to remind us that the uncertainties and assumptions inherent to data sources must be reflected in the estimates of precision of environmental disease burdens. They remind us that the level of precision, alongside the estimate of population burden, should be a component of any decision making. Next, Murray and Lopez' elaborate on their important Global Burden of Disease study by presenting several alternative population-risk levels of some environmental factor (theoretical minimum risk, plausible minimum risk, feasible minimum risk, and cost-effective minimum risk) to weigh the consequences of an intended action. Not surprisingly, the predicted consequences are shown to depend on the preferred exposure level. Another methodologic approach is offered by de Hollander et al. who propose a model that integrates measurements of life expectancy, quality of life, and number of people affected by one or more environmental factors. Using this model, they estimate that, in the Netherlands, the most prominent environmental health issues are particulate...
air pollution, noise, indoor air pollution, lead in drinking water, and food contamination. They estimate that these factors, combined, contribute approximately 5% of the annual burden of disease in The Netherlands. Moving into a prospective framework, Fehr describes a ten-step model for predicting the health consequences of enlarging a waste-disposal site in Lower Saxony and constructing a highway in Krefeld, Germany. Numerous assumptions required by the model are discussed. The next three articles (Leigh et al., Loewenson, and Takala) discuss the intricacies of estimating the burden of population illness consequential to occupational illnesses and fatal occupational injuries at the global and regional levels (Africa). Next, Schwela uses air pollution as an example of the way in which a comprehensive monitoring and information system can contribute reliable data to be used as the basis for health impact assessment and for cost-benefit analyses of proposed remedial interventions. In the concluding article, Corvalan et al. seek to connect the driving forces that lead to environmental degradation with the health consequences at the far end of the causal chain of events. The series therefore concludes, as it started, with a discussion of definitions, concepts, and approaches to improving the practice of environmental health impact assessment.

"Science-based policy" is a phrase used frequently these days, but it is also used loosely. The series of papers published in this issue can help focus attention on how community resources may be allocated prudently and according to an accepted set of values. As a group they are better at raising our consciousness than at solving our problems; nevertheless, they serve as a clear and thoughtful beginning. Assuming that health consequences of environmental problems will continue to require attention and that financial resources will continue to be finite, methods for environmental health impact assessment will certainly attract increasing attention. They surely deserve the attention of interested epidemiologists and other health scientists.

References

5. de Hollander AEM, Melse JM, Lebret E, Kraemer PG. An aggregate public health indicator to represent the impact of multiple environmental exposures. Epidemiology 1999;10:606-617.