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# Implementing Ethics in the Professions: Toward Ecological Integrity

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## ABSTRACT

Ethics guidelines for professionals in the risk sciences are relatively recent. The need for accountability is recognized by many professionals, and has led to the development of ethics guidelines, anchored in organization-specific mission statements or sets of core values. Almost none of the professions' existing codes reflect on broader social consequences such as concern for ecological integrity. The importance of this consideration was recently noted in The Toronto Resolution where ensuring ecological integrity was directly linked to professional conduct. Guidelines are useful and necessary for professional development and day-to-day functioning, but alone they are insufficient to ensure that professionals learn about ethics and how to apply the guidelines while simultaneously recognizing the broader social consequences of their professional pursuits. In the interests both of professional accountability, as well as concern for the seamless web upon which all life-support systems depend, each profession needs an ethics infrastructure. This paper provides a comprehensive organizational in-

frastructure, comprising a seven-step program—focusing more on process than on content—for the integration of ethics into professional life. A framework for action is developed, integrating several operationalizable process steps. Difficulties in raising professional awareness and introducing an ethics infrastructure are discussed in the context of epidemiology. Professional organization and consensus on core values are seen as laying the foundation for an ethics program. To implement a program, codifying professional conduct in the form of ethics guidelines, establishing consistent procedures and review processes, and establishing ethics education and training, are essential. Furthermore, introducing incentives to encourage ethical conduct, an ethics consultation service, and ongoing oversight and commitment, are critical components for success. Its process goals would include ongoing review, education, dissemination, and adherence to the professions' core values, into which concern for issues beyond the narrow confines of professional pursuits would be integrated.

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## THE PROFESSIONAL CONTEXT

In North America, members of the more traditional professions (e.g., law, dentistry, and medicine), in order to practice, must be licensed by legally defined professional bodies. The term "profession," however, has become ubiquitous today, often being used to describe any reasonably specialized occupational group. Self-described professionals

range from sales clerks to musicians, and from editors to epidemiologists. Most self-described professionals rarely think about what it means to be "professional."

One distinguishing characteristic of a profession, as compared to an occupation, is an autonomous system of self-regulation (Sohl & Bassford 1986) governed by a code of ethics. However, the autonomy of these systems is an ideal that is not completely achieved because governments and other entities can and often do influence professional conduct. Despite these external influences, the professions do tend to self-regulate. Most

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commonly, this is effected through the process of peer review, and increasingly through professional organization. The mechanism by which peer review operates is by setting standards for research and publication. Professional organization works via a more subtle mechanism, namely that group expectations tend to modify and regulate individual behaviors.

A second distinguishing characteristic of a profession is that its goals are oriented more toward public service than personal self-interest. An important component of a public service orientation, recently recognized in The Toronto Resolution (TTR), is a commitment to ecological integrity. Ecological integrity, for the purposes of this paper, is defined as the state of the environment in which all necessary parts are present and functioning to promote and sustain biodiversity (Westra 1994, p. 24). Unfortunately, because of the relatively recent "mainstreaming" of environmental awareness, most professions have not yet integrated sections into their ethics guidelines concerning a commitment to ecological integrity. Pressure for attention to these matters has arisen since issues of environmental destruction, with consequent health and social disruption, have gained public attention.

TTR recommends 12 elements for consideration by all professional groups for inclusion in their codes and guidelines (Fawcett 1993). These elements were identified after it was acknowledged that professional groups tend, in their codes of practice and ethics guidelines, to focus almost exclusively on matters of direct relevance to their specialized role. Often ignored is consideration of broader social consequences associated with the pursuit of any one profession's mission. Indeed, Summers *et al.* (1995) demonstrated this by reviewing the codes of 21 Ontario-based scholarly and scientific organizations. They showed that guidelines on specific social issues such as ecological integrity or conflict resolution are scarcely mentioned at all. Altruism is being recognized as an imperative not only for individuals, but also for professional groups.

Because the authors are familiar with the field of epidemiology (i.e., the study of the distribution, determinants, and dynamics of disease and health in defined populations), this paper draws on the experience of this public health-based profession for generating examples. We believe that epidemiology and the other risk sciences share similar challenges with regard to integrating ethics into their professional pursuits, and

hence we move freely between epidemiology and the other risk sciences in our discussion.

In considering the introduction of ethics into any profession, organizations need to consider the extent to which, if at all, they can be deemed self-regulating. Drawing on our experience in the field of epidemiology, the logical question is: "Can epidemiologists be considered self-regulating professionals?" Unlike the more traditional professions, noted earlier, and like many other risk sciences, the freedom and responsibility of epidemiologists to regulate themselves is not recognized formally in law. Also, much of the work of epidemiologists is regulated by non-epidemiological outside bodies such as institutional review boards (IRBs) or university ethics committees, as well as by government and private funding agencies. Epidemiologists and other risk scientists do, however, have internal systems of regulation in the traditional fashion of science. Like all other sciences, peer review operates to maintain scientific standards and to detect scientific misconduct. These standards are then enforced by peer pressure.

## RECOGNIZED NEED FOR ETHICS TRAINING AMONG RISK SCIENTISTS

All scientists are trained to detect threats to good science. To this end, the traditional safeguards of science—peer review and peer pressure—help to maintain and enhance scientific excellence. The high level of scientific education of peer reviewers makes this system of self-regulation possible. However, while training in the scientific aspects of risk forms the core of graduate education, little if any training in the ethical underpinnings of risk is available and almost never required of graduate students. Nor has there been any systematic training in the ethics of collegial and other human dimensions in the conduct of science.

For example, Coughlin and Etheredge (1995) have commented on the lack of ethics training for epidemiologists in the United States. They found that only 8% of graduate students in public health at Tulane University had ever read any of the proposed ethics guidelines for epidemiologists. In Rossignol and Goodmonson's (1995) more extensive survey of 24 U.S. schools of public health, 88% of surveyed faculty agreed or strongly agreed that ethical issues in epidemiologic re-

search should be addressed in graduate epidemiology curricula. Interestingly, only about half this number (43%) actually had held at least one seminar in the last two years on the topic of ethical issues in epidemiology. They also found that only one faculty member (approximately 1%) of those surveyed had ever taken a course in ethics.

These studies demonstrate that not only is there a dearth of competence in professional ethics, but also overwhelming support for ethics training. If risk scientists are not educated in ethics, it would seem that a peer review system of self-regulation, while helpful for ensuring good science, is not adequate for ensuring good professional conduct. This leaves these professions with two routes for improving their ability to monitor their non-scientific elements. First, the professions could implement stricter enforcement procedures, such as licensure; and second, they could educate their members about the ethical issues encountered in their work, and in the various ways of responding to them effectively. Anecdotal evidence indicates that stricter enforcement procedures are not the preferred route for epidemiologists, and this is also likely true for other risk scientists. Therefore, in order that the preferred system of enforcement—that is, peer review and peer pressure—remain viable and effective, the second route—education—remains as the only viable option.

In addition to members of the professions being concerned with their own professional conduct, public concern also has been evident. The ethical standards of risk scientists are likely to become increasingly important given the interest of the media and the courts in risk-based evidence. If the risk sciences are to retain their current degree of autonomy, they must take on the mantle of responsibility for themselves. The foundation for self-regulation in any profession is its codification of ethical conduct. It forms the basis for determining normative standards of behavior by members of the profession, as well as the grounds for censure of members who choose not to comply with these standards. Soskolne (1985; 1989) and Soskolne *et al.* (1994) drew attention to this fact and called for the development of ethics guidelines and self-regulation for epidemiologists. Guidelines have been forthcoming, with several sub-specialty professional associations each drafting their own set of guidelines intended to apply to their members (IEA Workshop on Ethics, Health Policy, and Epidemiology 1990; Beauchamp *et al.* 1991; Council for International Orga-

nizations of Medical Sciences 1993; Soskolne and Light 1996). The American College of Epidemiology (ACE), in cooperation with the various subspecialty organizations, now is attempting to bring these separate initiatives together into a “universal set” of ethics guidelines for North American epidemiologists (Anonymous 1997).

With the acceptance, refinement, and consolidation of ethics guidelines well underway, the dissemination and integration of ethics information into the daily lives of epidemiologists remains at issue. The remainder of this paper provides a framework for going beyond ethics guidelines, and implementing comprehensive ethics infrastructures for the professions. Clearly, the issue of moving the ethics agenda beyond the stage of an academic exercise and into the lives of working risk scientists needs not only to be considered, but acted upon.

## FRAMEWORK FOR ACTION

Hall (1993) provides a general framework for the implementation of an ethics program for the business community. We have adapted this framework for use in the risk sciences and combined it with a paper presented by one of the authors (Soskolne) at the Centers for Disease Control and Prevention (CDC) in Atlanta, GA, April 10–11, 1997 (see Acknowledgments). This approach is intended to provide risk scientists with a comprehensive ethics infrastructure. It should serve not only as a substantive basis for self-regulation, but also as a basis for the effective implementation of ethics in the risk professions. Discussion of the content of organization-specific guidelines is avoided, because these particulars will vary from organization to organization. The intent of this section is to provide a general framework for the implementation of ethics; however, each organization, having a unique context and dynamics, would have to insert its own specifics. The proposed program to implement ethics in the risk professions is organized into seven major areas.

### Foundations

- Professional organization

- Statement of core values appropriate to each professional specialty area

### Implementation

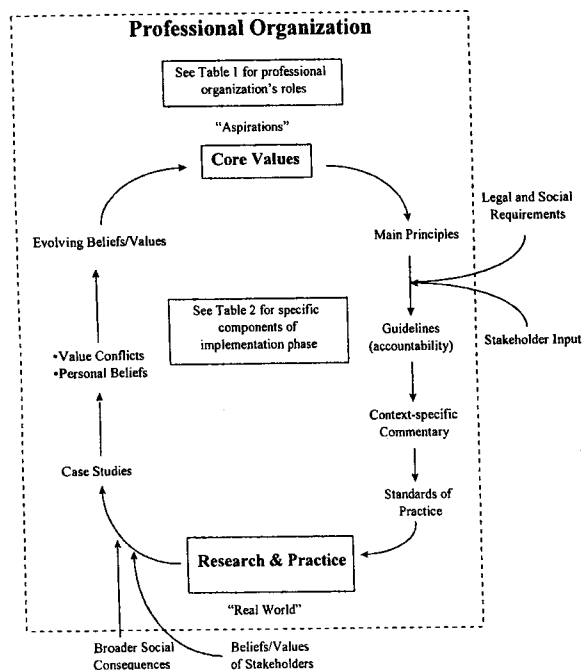
- Ethics guidelines

- Organizational infrastructure and established procedures

Ethics education and training  
Ethics consultation service  
Ongoing oversight and commitment

The first two areas, professional organization and a statement of values, formalize the foundations of the professions. Areas three through seven comprise the actual ethics program. Because ethics guidelines are not an end in themselves, there is a distinction between content per se and the process by which they are implemented. Figure 1 embodies the dynamic nature of the inherent connection between process and content at each step of the proposed generic ethics program. It provides a blueprint showing structural relationships among the various components of an ethics program. It would be up to each profession to adapt this model to its own context.

Figure 1 shows the primacy of core values as a starting place for affecting both research and practice. The right-hand side of the diagram shows how core values (aspirational in nature) affect research and practice (the "real" world). The left-hand side of the figure shows how research and practice provide feedback to shape the core values. From these core values, the main principles are derived. This occurs within the purview



**FIGURE 1.** The relationships between the professional organization, professional core values, and research and practice.

of the professional organization (the dashed box and Table 1). In drafting guidelines from these main principles, we must take into account external influences such as legal and social expectations, input from stakeholders, and broader social and environmental consequences.

Continuing with Figure 1, we see that once guidelines are agreed upon, they will affect both research and practice. In turn, members of each respective professional organization will voice their concerns, contribute ideas, and engage in dialogue that will articulate their personal values and beliefs, and the value conflicts that they encounter in their professional lives. Along with input from stakeholders and consideration of broader social consequences, including ecological integrity, these inputs will form the evolving beliefs and values of each professional organization. In turn, this will redefine the core values of each profession in an iterative cyclical fashion. Central to this continuing interaction of core values and practice, or the interaction between who we are and who we aspire to be, are the forces that perpetuate the circle. They include established procedures, education and training, and a consultation service (see Table 2).

## PROFESSIONAL ORGANIZATION

Most of the risk science professions have professional organizations. Epidemiology has several sub-specialty organizations as well as a college, called the American College of Epidemiology (ACE). At its inception, the ACE established itself as the body that would license epidemiologists. It sought to become the central agency responsible for licensure and standards of practice. However, it was largely ignored within the practicing community. This resulted in the ACE revising its mandate away from licensure, thereby demonstrating its responsiveness to the concerns of its members. The implementation of guidelines thus would have to lean heavily on the ability of the ACE to educate its members about professional ethics.

If epidemiologists and other risk scientists want to be perceived as legitimate professionals, they need professional associations. Legitimation is associated with virtuous behavior and ethics guidelines embody these virtues. Thus, the guidelines of each organization are the standard against which individuals as well as the profession itself can be deemed legitimate and be held accountable.

TABLE 1

## Professional organization's roles

A focus for the profession and a "collective identity."

A voice for the profession:

Public education on the role of the profession;

An advocate for public health and the interests of the profession.

Professional education about the ethical and philosophical basis for the profession.

Interaction with other professions to better maintain public relevance and protect against adverse consequences.

Mediation service.

Ongoing oversight and commitment to ethics program: Centers of Excellence in Ethics.

Act as a clearinghouse for epidemiologic information to the media and the public.

Accountability to both the public and stakeholders.

Professional organizations, serving as the voice of each respective profession, could have as their primary function to focus on members' concerns and aspirations. Hence, the organization would function as the professions' collective identity and as a focus for professional accountability. Further, it could be the professions' spokesperson to the public whose interests they serve and whose support they require. Professional bodies also provide: dispute resolution services among members, between members of the specific professional community and other professions, and between study participants and researchers; articulation of official positions derived from grassroots input on key issues or events; provision of collective bargaining, if required; acting as a rallying point to advocate on any initiatives in the public interest; and taking responsibility for maintaining and updating the ethics guidelines, policies, and procedures of the association.

The absence of a voice for the profession has left epidemiology in an awkward position. Every

epidemiologist has experienced the frustration of opening a newspaper or magazine and reading the "Health" section only to find snippets of what look to be rather sketchy claims presumably derived from epidemiological research. Taubes (1995) in his controversial article "Epidemiology Faces Its Limits," points out that because of the interest that the public has in health, epidemiological research has received and will continue to receive a great deal of attention from the media. The media is well known for misinterpreting the findings of epidemiology and other risk sciences, not surprisingly because journalists are trained in journalism, and not usually in the risk sciences (Taubes 1995). In the absence of a central voice for each profession, reporters are forced to go to individual scientists (who are not representative of their profession as a whole) or to scientific literature that they have only a small chance of correctly interpreting. Therefore, the public easily misinterprets epidemiological research, and unwarranted mistrust can arise. Mistrust of public health re-

TABLE 2

## Components of the implementation phase of the ethics program

Organizational infrastructure and established procedures that resonate with ethics and philosophy involvements.

Ongoing evaluation in relation to medium- and long-term ethics goals.

Agreements of understanding to minimize risk of allegations of unethical behavior.

Ethics education and training through ethics sessions at association meetings and columns in its scientific and more general literature.

Develop model ethics curricula.

Incentives (e.g., student prizes for ethics papers).

Ethics consultation service.

search could lead to reduced research funding and compliance with public health recommendations, with consequent negative impacts on the health status of the population.

The American Association for the Advancement of Science (AAAS) views the education of journalists about the practices and standards of science as a part of its mission across all scientific disciplines (M. Frankel, pers. comm.). Perhaps each professional organization could take up this same mission with regard to educating journalists about risk science. Furthermore, professional organizations could act somewhat like clearing-houses for specialty-specific information, thereby facilitating communication with the public. Perhaps each profession could elect a board to review all findings to date related to a so-called "issue of the week," solicit commentary from appropriate experts, apply the Bradford-Hill or other relevant criteria for causation, and give a balanced, well-considered opinion about the current state of knowledge for that particular issue. In this way, the barrage of misinformation to which the public is currently subjected may be reduced and even abated, and the credibility of the risk sciences might thereby be enhanced.

## STATEMENT OF CORE VALUES APPROPRIATE TO EACH PROFESSIONAL SPECIALTY AREA

A list of core values and principles is needed that have ethical and moral underpinnings (Gellermann *et al.* 1990) and are therefore central to each profession in terms of relationships with colleagues, society, study participants, and science. Practitioners of the risk sciences come from a wide variety of social, cultural, ethnic, religious, and philosophical backgrounds. They are employed in universities, governments, industry, and private practice. As such, the ethics guidelines should be derived from the normative practices of a broad segment of each professional community.

A global survey of the normative ethical standards of epidemiologists was conducted through the International Society for Environmental Epidemiology (ISEE), the Italian Epidemiological Association, and the Global Environmental Epidemiology Network (GEENET) in 1994 (Soskolne *et al.* 1996). This led to the development of a statement of the core values and ethics guidelines for

environmental epidemiologists. These values, updated regularly (by survey, through discussion within the organization's designated ethics committee, and at annual conferences) as new issues and challenges confront the profession, could form the basis of a statement of values for all epidemiologists.

The U.S. Public Health Service defines research as work done with the intent to generalize (Office for the Protection from Research Risks, National Institutes of Health 1991); all else falls into the realm of professional practice. Such a definition will have a bearing on both values and guideline development with consequences for all aspects of the ethics program proposed in this paper. As the topic of ethics gains greater institutional recognition, we recommend that the language employed to describe ethics for those engaged in the risk sciences (as a component of public health) shift away from that used for describing physician-patient ethics under the biomedical model, and move boldly into public health ethics. For example, the use of the phrase "research subject" from the biomedical model has little, if any, applicability in public health and rather should be referred to as "research participant." Furthermore, the inherent reductionist approach under the biomedical model needs to be subsumed by the more structural/holistic approach of public health.

Changes in terminology will have an effect on administrative and regulatory law because such law is based on definitions that, if altered, would require changes in related laws. Furthermore, changes in the conceptual approach from reductionist to holistic will have consequences for both the content of public health ethics and for the process by which it is administered. For example and consistent with these prognostications, Mann (1997) recently has suggested the distinct link of public health ethics to that of human rights. Indeed, paradigm shifts are inevitable.

## ETHICS GUIDELINES

In return for the freedom to self-regulate, the public, which finances most risk science, expects accountability. Accountability is made possible by the existence of ethics guidelines to which each profession and its individual members subscribe. For example, the profession of epidemiology, as the science that is basic to public health research and practice, has at its foundation the maintenance,

enhancement, and promotion of health in communities. To this end, epidemiologists can be employed in government, in university research and teaching, in private consulting and, more frequently, now in the role of expert witnesses in legal actions. Guidelines for epidemiology thus are broad-based and focus both on the ethics of epidemiology in research as well as in public health practice. The analog is true for other risk sciences.

It is the role of the professional organization to maintain what are deemed acceptable standards. Guidelines will need to be updated as values change. For example, TTR has recommended that when any professional group revisits its guidelines, they be updated to address concerns about, among other things, ecological integrity. The latter is a more recent global concern the recognition of which represents a significant enough departure from traditional values to justify changes in professional ethics guidelines (Fawcett 1993; Earth Charter Commission 1997; Lubchenco 1998).

Peer pressure has been deemed adequate in the past to ensure adherence to normative standards of professional conduct. Licensure has been suggested as a stronger mechanism for ensuring compliance with guidelines, but whether or not a voluntary organization could manage such a policing function is beyond the scope of this paper. Suffice it to say that as long as peer pressure and voluntary compliance are seen to be effective, the likelihood of government intervention requiring licensure remains only a remote possibility.

A key factor in creating public confidence and for ensuring that new members of a profession emulate ethics guidelines is described by Hall (1993) as the "tone at the top." Hall is referring here to the conduct of leaders in the field who should provide an example to newcomers as well as to the public. While all members ought to follow the standards of conduct of their profession, the highest standards of conduct should be applied, and be seen to be applied, by leaders of the field.

## ORGANIZATIONAL INFRASTRUCTURE AND ESTABLISHED PROCEDURES

Any organization, professional or otherwise, must have a set of established procedures to promote consistency, fairness, transparency, and confidence. The most basic of established procedures would

be standards of practice. Standards of practice are derived from ethics guidelines and their associated commentary (see Figure 1), but are even more context-specific. They specify normative requirements of conduct for individuals at a more detailed level than what ethics guidelines address. For instance, an epidemiologist might be confronted with the challenge of conducting a randomized controlled trial of a new cardiac drug. He or she would be able to consult a standards of practice document, written by leading experts in randomized controlled trials of cardiac drugs, providing a list of requirements that need to be followed to conduct a good study in this area. Standards of practice also provide a set of expectations, a social contract between the scientist and the sponsor or employer, the study participants, colleagues and students, and other scientists. They outline what constitutes professionalism in that particular area, what he or she should and should not do, and the level of excellence that can be expected in the pursuit of scientific truth.

Perhaps standard contracts detailing the rights of both scientist and sponsor or employer could be developed. Further, since students are generally trained as apprentices under professors, this idea could be extended to include standard agreements of understanding between students and their supervisors.

A process for dealing with grievances among members of the profession and between members of one profession with members of another profession should be implemented; in this regard, a mediation service might be considered.

Finally, no process would be complete without a review procedure for evaluating its own policies both in terms of its members and in terms of the broader social good. All aspects of the ethics program should be evaluated on a regular basis in terms of its medium- and long-range goals.

## ETHICS EDUCATION AND TRAINING

Just as students must become aware of the major methodological issues in their chosen field, so must they be sensitized to important ethical and professional issues of the period. For example, in teaching epidemiological methods, sensitization to the pitfalls of chance, bias, and confounding, is only paralyzing if the student is not taught how to deal with these potential obstacles. Similarly, eth-

ics education is damaging if it does not include methods for examining and addressing ethical dilemmas. As such, in addition to ethical theory, the education and training program must include practical instruction and experiences designed to simulate real-life conditions.

Soskolne (1989) and, more recently, Coughlin and Etheredge (1995) have called for the development of ethics curricula for training epidemiologists. Goodman and Prineas (1996) have drawn upon the substantial body of epidemiological and biomedical ethics literature to develop a model curriculum for epidemiology. They go so far as to suggest the possibility of an entire degree program in epidemiological ethics (Goodman & Prineas 1996, p. 299). We believe that this may amount to over-specialization and that the profession likely would be better served by a more general degree in public health or scientific ethics within which epidemiologic ethics might be an area of interest. Regardless, Goodman and Prineas's (1996) curriculum is quite complete, extending itself beyond the usual confines of the bioethics literature. It includes as subject areas issues of duties, responsibilities, and practice standards; valid consent and refusal; privacy and confidentiality; risks, harms, and wrongs; sponsorship and conflicting interests; communication, publication, intellectual property, and education; and advocacy and intercultural conflict.

Rossignol and Goodmonson (1995) have raised the concern that there is a lack of instructional material in epidemiological ethics. It is true that books specifically devoted to instruction in the subject are rare. *Ethics and Epidemiology* (Coughlin & Beauchamp 1996) is a recent collection of articles devoted to exploring issues in epidemiological ethics. It is a useful reference text containing articles by many of the key people in the area, but it is not an instructional text. Also, Coughlin (1995) has edited a set of annotated readings intended as an anthology of the ethics of epidemiology and clinical research. It is useful in that it provides many of the important previously published works in a single volume. *Case Studies in Public Health Ethics* (Coughlin *et al.* 1997) is designed specifically as an instructional text, the first of its kind for public health and for epidemiology in particular. In line with main currents in education, it combines theory with a case-based approach to learning ethical analysis. This book is designed as the main text for a graduate-level course in public health ethics. Additional resource material is available in the form of draft

ethics guidelines (IEA Workshop on Ethics, Health Policy, and Epidemiology 1990; Beauchamp *et al.* 1991; Council for International Organizations of Medical Sciences 1993; Soskolne and Light 1996), biomedical ethics texts (Beauchamp & Childress 1994), and a list of ethics resources on the Internet (Coughlin 1996).

In addition to courses, both students and practicing risk scientists should be encouraged to think about and discuss ethics through the offering of student prizes for ethics papers or abstracts submitted to conferences. Additional opportunities for discussion of ethics could come during conferences, workshops, symposia, and journal sections devoted to the discussion of interesting case studies. An example of the innovative incorporation of ethics discussion at scientific meetings occurred at the 1996 meeting of the ISEE. At this meeting, several time slots were set aside at the end of about half of the contributed paper sessions. In these time slots, ethical issues related to the papers just presented were discussed. It is through efforts such as these that students and professionals come to see the value the profession places on ethical conduct. In this way, ethics and the role of risk science in society will be considered alongside the more traditional methodological topics discussed at conferences.

While it is critically important that students be initiated into the analysis of professional ethics, it is equally important that practicing scientists who are the teachers of these students have a good understanding of these issues. Rossignol and Goodmonson (1995) report that, in their survey, only 1% of teachers of epidemiology had taken a course in ethical issues as part of their graduate training. Thus, as part of a comprehensive ethics program for the profession, epidemiologists should be encouraged to attend courses on ethical issues. This is already recognized as important by virtue of the fact that in 1997, the New England Epidemiology Summer Program and the University of Michigan School of Public Health Graduate Summer Program in Epidemiology have offered summer courses in epidemiological ethics.

## ETHICS CONSULTATION SERVICE

Not everyone can be an expert in ethics and many people will, from time to time, require assistance in deciding on the most ethical course of action. Thoughtful people will, from time to time, need counsel on morally tenuous situations. For this



reason, each profession may consider the implementation of an ethics consultation service, staffed by applied ethicists to aid members to resolve potential or actual conflicts, tensions, and dilemmas. Such services could help to prevent circumstances that otherwise could result in resource-consuming and attention-focusing investigations and exposés.

## ONGOING OVERSIGHT AND COMMITMENT

A comprehensive ethics program for any profession would include, within the governing body of the profession, an ethics section. It could comprise scientists working in close collaboration with members of other related professions such as ethics, moral philosophy, and organizations concerned with scientific ethics such as the AAAS. This section would advise the executive or counselors of the profession on matters of emerging concern by remaining sensitive to the social movements and influences that could impact government policy. A recent example is the European Proposed Data Protection Directive (Directive of the European Parliament and Council of Europe 1995) that nearly ended the ability of epidemiologists to conduct linkage studies using health data in Europe. It was only a last minute letter-writing campaign by some concerned epidemiology organizations that resulted in the inclusion of an exemption permitting access to data for health and social research (Soskolne 1996). The ethics section of any profession could embark on educational campaigns, including letter-writing efforts, where the voice of the profession could be registered on any relevant matter.

That part of each profession's organizational structure devoted to professional ethics could integrate all aspects of ethics in that profession and provide services such as the consultation service mentioned above, dispute resolution, an interface with other professional organizations and the media, and an on-line compendium of ethically-analyzed case studies. They could encourage the wider dissemination of examples of good ethical conduct among professionals by issuing awards for innovative, exemplary conduct to serve as examples to others, especially examples of ethical conduct among leaders of the profession. Further, the pursuit of scholarly thought in the field of applied ethics would be advanced through the

publication of work in ethics and philosophy in the existing literature. In addition, workshops, symposia, and forums addressing ethics and philosophy should be included at every sub-specialty professional gathering.

## CONCLUSIONS

A fledgling literature exists addressing ethics in the risk sciences. Professionals increasingly recognize the need for ethics scholarship and education. We believe that if the risk sciences are to remain autonomous and self-regulating, as well as address concerns for the broader social consequences of their activities, they must implement comprehensive ethics infrastructures. We have presented a seven-part model for the implementation of a program that would provide the infrastructure needed to attain these ends.

While many of the risk science professions have ethics guidelines, few, if any, have developed mechanisms for their implementation, and almost none have addressed the broader social consequences of their professional activity. We address the need for each profession to adopt an ethics infrastructure to ensure the full integration of ethics into professional life. Professional organizations must begin to consider the broader social consequences of their professional pursuits. Only then will the professions exemplify concern for the environmental impacts of their activities and thereby make the attainment of ecological integrity more of a reality.

Efforts to consolidate ethics guidelines need to be supported and a commitment to professional ethics promoted within the professions. By implementing an ethics program, risk scientists will be more likely to gain enduring professional identities, fulfill their social contract with the public, enhance their science, and contribute to the greater environmental good.

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