



Ethics Guidelines for Environmental Epidemiologists

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EXECUTIVE SUMMARY

Environmental epidemiology is the subspecialty of epidemiology that uses epidemiological principles, reasoning, and methods to study and control the health effects on populations of physical, chemical, and biological processes and agents external to the human body (e.g., climate change, air pollution, dietary pollutants, urbanization, energy production, and combustion). Along with the environment and all it sustains, environmental epidemiologists value human life and human dignity. We acknowledge that the natural environment, (including nature, ecosystems, and biodiversity) has intrinsic value, in addition to any instrumental value. Our ethical responsibility is not only to engage in objective scientific inquiry, but also to recommend measures to prevent negative health outcomes and to promote measures to protect the environment and public health locally, regionally, nationally, and globally.

In 1996, recognizing the importance to environmental epidemiology of ethical and philosophical deliberation led to the establishment of ethics guidelines for the profession. A deliberative process of stakeholder and member engagement resulted, in 1999, in their adoption by the International Society for Environmental Epidemiology (ISEE).

The guidelines, which comprise normative standards of professional conduct, apply to all those engaged in environmental epidemiology, including individual researchers, governmental and non-governmental agencies, private institutions, and corporate sponsors. They are structured into four subsections: 1) obligations to individuals and communities participating in research; 2) obligations to society; 3) obligations regarding funders/sponsors and employers; and 4) obligations to colleagues.

Through these guidelines, ISEE seeks to ensure the highest possible standards of transparency and accountability for the ethical conduct of its members, for those environmental epidemiologists engaged in research, and for those engaged in public health practice. Updated guidelines will be produced periodically (about every 10–15 years) to ensure their ongoing relevance in response to scientific advances, legislative, technical, and other contextually-relevant societal changes.

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1. INTRODUCTION

1.1 Definition of Environmental Epidemiology

Environmental epidemiology is the subspecialty of epidemiology that uses epidemiological principles, reasoning, and methods to study and control the health effects on populations of physical, chemical, and biological processes and agents external to the human body (e.g., climate change; air pollution, dietary pollutants, urbanization, energy production, and combustion).¹ A more comprehensive definition is “the study of the distributions of health-related states or events in specified populations in relation to determinants/hazards in the living environment of these populations, and the application of the study outcome to the control of such risk factors.”² The mission of epidemiologists is to promote the investigation, detection, and prevention of hazards in the environment. Our research recognizes the importance of the environment, as well as of communities that depend on it.

1.2 Moral and Ethical Norms

Although the initial version of these guidelines³ and their first revision⁴ were primarily informed by North American and European norms for thinking about what environmental epidemiologists “ought to do” when serving the public good, the current revision has benefited in its formulation from greater levels of input from epidemiologists from Middle Eastern, African, and Latin American countries. The term “morality” is often used when discussing what individuals “ought to do” to other sentient beings and even ecological systems, as well as what they “ought to do” regarding purely intrapersonal issues. The term “Ethics,” on the other hand (and in the context of applied professional ethics), is often used to convey how we ought to behave as professionals.⁵

1.3 Salient Ethical Issues in Environmental Epidemiology

Because environmental epidemiologists focus on health and the environment, they deal not only with representative samples of diseased and healthy individuals, but sometimes with geographically defined communities composed of stakeholders with different ethical world views and different economic interests. Often, those impacted by hazards represent a minority of these communities, but could sometimes represent a majority. Regardless, they are groups who are disadvantaged in other and unfair ways. In many cases, the community itself argues as to what constitutes “the public good.” Each step of the research process is thus fraught with ethical issues. Powerful economic and/or ideological stakeholders sometimes fund environmental epidemiological research; the epidemiologist needs to deal with pressure from these funders who might want to influence various research steps with the aim of distorting the research process and its conclusions to either protect or advance their self-interest. Hence, these Guidelines deal with the obligations that environmental epidemiologists have to communities, society, sponsors, and colleagues.

These guidelines relate specifically to the epidemiology subspecialty discipline of environmental epidemiology. Every subspecialty of epidemiology has, or ought to have, its own specific guidelines (e.g., clinical, pediatric, pharmaco-, and occupational epidemiology). Because the environment embraces the occupational setting, environmental epidemiologists who also work in the field of occupational epidemiology will need to respect the set of guidelines to which they prefer to be more professionally aligned.

1.4 Statement of Core Values

We value human life, human dignity, the environment, and all that it sustains. We acknowledge that the natural environment (including nature, ecosystems, and biodiversity) has intrinsic value, in addition to any instrumental value.

A core value of science in general, and environmental epidemiology in particular, is to strive towards being objective about its subject matter. However, this process is not straightforward, and may be influenced by myriad personal, cultural, and sociopolitical factors. Both in describing the distribution of exposure and the distribution and occurrence of environmentally-induced disease, as well as in analyzing causal relations, there are ideological and economic stakeholders who have preferences for what such facts should be and how they are presented. The epidemiologist is tasked with resisting those pressures. Epidemiologists must strive to conduct the highest quality, unbiased research and to recognize influences that may impair objectivity.

Another core value is to assist environmental health practitioners and policymakers in advancing the health and welfare of the general public and of groups of unusually-exposed, susceptible, or traditionally-marginalized subgroups,⁶ particularly when they are disadvantaged in other ways as well. These include vulnerable life stages such as the fetus and young child. They have little voice and no vote, and it is important to consider the long-term implications of today's policy decisions on their future health.

Our duty as scientists is to do the best science possible with a view to reducing uncertainties. However, the presence of uncertainty is no justification for inaction in the face of environmental harms.⁷

1.5 Scope of the Ethics Guidelines

The importance of ethical deliberation and public health values to the science of environmental epidemiology has led to the establishment of ethics guidelines by consensus of the ISEE Ethics and Philosophy Committee. The ISEE Ethics Guidelines are structured into four sections:

- a) Obligations to Individuals and Communities Who Participate in Research (see [section 2 below](#))
- b) Obligations to Society (see [section 3 below](#))
- c) Obligations Regarding Funders/Sponsors and Employers (see [section 4 below](#))
- d) Obligations to Colleagues (see [section 5 below](#))

Through these Guidelines, ISEE seeks to ensure the highest possible standard of transparent and accountable ethical practice, not only for those environmental epidemiologists in research, but also for those in public health practice. Therefore, we consider these recommendations consistent with and extending the original ISEE ethics guidelines³ and the 2012 revision⁴ as well as the extant ethics guidelines of the overarching discipline of epidemiology⁸ with respect to the study of environmental exposures.

2. OBLIGATIONS TO INDIVIDUALS AND COMMUNITIES WHO PARTICIPATE IN RESEARCH

2.1 Research Should Avoid Harm to the Individuals and Communities Studied. Knowledge Gained Should Be Disseminated Widely, and Benefits Gleaned Should Be Accessible to the Community Studied

- 2.1.1 **Beneficence:** The primary goal of environmental epidemiology research and practice is beneficence, i.e., improving the health and welfare of the population by identifying and assessing the magnitude of environmental exposures that are suspected of being harmful to health, and by identifying and evaluating the factors or interventions that enhance health and well-being.
- 2.1.2 **Accessible Language:** Environmental epidemiologists should present their results in accessible language, identifying the strengths of the study, its limitations, and the authors' recommendations to allow stakeholders to understand the report and, where appropriate, to act to promote environmental health, even in the face of uncertainty⁹ (see also [subsection 3.5, "Communication and Action Plan"](#) and [subsection 5.2, "Reporting Methods and Results"](#)).
- 2.1.3 **Precautionary Principle:** The Precautionary Principle is defined as follows: "When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm."¹⁰

Prudence and care, the principles underlying preventive medicine, require that we err on the side of caution. We apply this principle when balancing harms and benefits under the *status quo* while being transparent about who is being subjected to harm and who is deriving benefit under the *status quo*. In environmental epidemiology, both research and practice are driven by respect for life and human dignity as attainable through health and well-being. Principles underlying both preventive medicine and environmental epidemiology are guided by the Precautionary Principle,¹¹ placing an emphasis on actions and standards in favor of safeguarding public health, particularly in the presence of uncertainty.

Researchers have the duty to clarify the degree of uncertainty by pointing out the risks or uncertainty factors associated with the research findings.¹⁰ Specifically, application of the Precautionary Principle results in lines of enquiry that serve to narrow scientific uncertainties. The absence of certainty does not justify inaction.⁷ Unrecognized risks may lead to unacceptable consequences for health, society, or the environment. Whenever there is scientific uncertainty, researchers must observe the Precautionary Principle.

- 2.1.4 **Nonmaleficence:** Research and practice in environmental epidemiology should be designed to minimize risk, disruption and harm to both study participants and their source populations (upholding the biomedical ethical principle of nonmaleficence; i.e., do no harm). Investigators should consider special protections when working with vulnerable groups or communities (see [subsection 2.4.3, "Consideration of Vulnerable Groups"](#)).¹²

- 2.1.5 **Respect for Autonomy:** The design and conduct of environmental epidemiology research should demonstrate respect for study participants and communities, their lifestyle(s), their sociopolitical environment(s), and their cultural values compatible with respect for life, human dignity, health, and well-being. Based on the notion of respect for human dignity, the investigator(s) should respect the individual and not place research participants at any excess risk for the sake of society or science. Only in exceptional circumstances, where the public health authorities decide that the interests of the community as a whole are so important that infringing upon the interests of individuals is unavoidable, would respect for human dignity be compromised.¹³
- 2.1.6 **Community Input:** In community-based research settings, early consultation and input should be sought from members and/or (elected) representatives of affected populations (see [subsection 3.4.2, “Community Partnerships”](#)). Investigators are encouraged to identify whether they are proposing community-engaged research (driven by academic concerns), or citizen science (driven by community concerns), and to adhere to the best practices associated with a given strategy for community engagement.
- 2.1.7 **Full Disclosure:** Research protocols shall clearly identify the benefits, the risks or negative consequences to any individual or group; concerns articulated by stakeholders; potential for positive public health impact, and/or barriers to the research; and the potential for implementation of its findings in public health practice.
- 2.1.8 **Prompt Disclosure:** If, in a research study, information is discovered about the health and safety of particular individuals or populations, this information should not be withheld. Guidelines on the harms and benefits possibly revealed by early reporting of results to individuals or groups should be developed in advance of ethics approval and certainly before the study or practice intervention is initiated. Moreover, investigators may discover private information that is not being collected as part of the study when they enter a home or workplace. In this situation, investigators should use good judgment when deciding how best to approach this issue and the possibility of sharing the data. The investigator(s) should refer the matter to the Institutional Review Board (IRB) or Research Ethics Board (REB) before contacting, if warranted, any appropriate authority.¹⁴

2.2 Informed Consent in Environmental Epidemiology Research: Before Research is Initiated

- 2.2.1 **Informed Consent:** If environmental epidemiology research involves the active participation of, or contribution of biospecimens from (individual) people (i.e., human subjects), explicit prior, documented, informed consent (electronic, written or oral) should be obtained. Resources for guidance on the need for and securing of informed consent in research involving human subjects in the broad category of biomedical research¹⁵⁻¹⁸ and specifically epidemiological research⁸ are readily available. These resources should be accessed on a regular basis to ensure that the most current guidelines/practices are implemented. If children are participating in research, informed consent should be sought from the parent(s) or guardian(s). The minor should also express a willingness to participate, i.e., s/he must give their assent when age appropriate. Consultation with one’s host

institution is needed to ensure that one is in compliance with local standards for obtaining consent. The distinction between linked and unlinked data for research as opposed to public health surveillance must be recognized, because surveillance work is often governed by legislation. In research that has no more than minimal risk, investigators can ask the IRB/REB for a waiver of consent. Types of waivers include waiving the requirement to obtain informed consent or altering some or all the elements of informed consent, or waiving the requirement to document informed consent.¹⁸

- 2.2.2 **Individual Rights:** There should be clearly communicated disclosure of the aims; methods; anticipated benefits, risks, inconvenience, and discomfort associated with the research; the right to refuse participation at any time; the right to withdraw from the research without retribution of any kind; and confidentiality safeguards. Research participants shall have the right to request data pertaining to themselves through the entire time period of data storage and for which clinical interpretation has been established. There shall be no implicit or explicit pressure from any party placed directly or indirectly on a person to participate in a research project.
- 2.2.3 **Public Communication:** The public/affected populations should be informed by appropriate mechanisms (e.g., mayor, chief, newspapers, townhall meetings) about potential benefits, risks, or other known impacts of the environmental epidemiology research project, both at the individual and group level.
- 2.2.4 **Consent for Biospecimens:** If biospecimens are to be collected from study participants, the benefits, risks, and discomfort associated with biospecimen collection should be fully explained. Details should be provided as to the procedures that will be performed in order to collect, analyze, and store the specimens. The purpose for collecting biospecimens must be disclosed, stating the specific tests and/or diseases that are to be investigated. The ultimate fate of the biospecimens, after study completion, should be disclosed, including potential future use in follow-up or other studies. Future use of biospecimens proposed for purposes other than those foreseen at the time of sample collection would be subject to renewed Informed Consent, whenever possible, and Institutional Review Board (IRB)/Research Ethics Board (REB) approval (see [subsection 2.4.1, "IRB/REB Roles and Responsibilities"](#)). Guidelines from the European Union on these issues were published in 2010.¹⁹
- 2.2.5 **Cultural Sensitivity of Consent:** Culturally-appropriate, additional means of communication and special precautions may be necessary in order to ensure that study participants fully understand the disclosures. This tenet is based upon the universal ethical principle of respect for autonomy (i.e., a person's right to self-determination).
- 2.2.6 **Financial Disclosure:** There should be full disclosure to study participants and to an Institutional Review Board/Research Ethics Board (or an equivalent oversight committee) of all sources of financial support, sponsorships, or financial relationships of study directors and other research personnel that may be related to the research or analysis of research outcomes. Disclosure should be provided not only at the application stage to the IRB/REB and the sponsoring entity, but also in all forums in which the project is discussed and presented.

- 2.2.7 **Financial Conflict Verification:** An IRB/REB or an equivalent oversight committee (when an IRB/REB does not exist) should take special steps to verify that full and voluntary prior, documented, informed consent; participant safety; study design and methods; and any communication plan have not been compromised when financial sponsorship of study personnel may favor a particular outcome.
- 2.2.8 **Confidentiality of Public Data/Records:** Research based upon records or data contained in special databases is of critical importance in environmental epidemiology research and does not always require prior informed consent. This type of research does, however, require review by an appropriate IRB/REB or an equivalent oversight committee, and a plan for the protection of the confidentiality of the data and privacy of both the people and their records.
- 2.2.9 **Data Available on the Internet:** The conduct of environmental epidemiological research using data publicly available through the internet should follow the same ethical obligation to communities and individuals as when data are collected in situ. The investigators should engage with the population involved (e.g., by including local researchers in the study team and submitting the study protocol to the IRB/REB in the local institutions of the population under study for approval) to better ensure that the necessary sociocultural contexts are reflected in the study. Investigators should work to ensure the dissemination of research findings to this population and the local implementation of its findings in public health practice.
- 2.2.10 **Types of Informed Consent:** Informed consent may have different forms (e.g., open consent, broad consent, dynamic consent). Investigators should choose the one that best suits the study goal and the participants' engagement, which may vary from vague and limiting to engaging and empowering.²⁰

2.3 Confidentiality

- 2.3.1 **Essential Need for Information:** Obtaining and analyzing potentially confidential information about individuals is essential to environmental epidemiology research.
- 2.3.2 **Assuring Confidentiality:** In all types of environmental epidemiology research, there should be a comprehensive and detailed plan to assure confidentiality of data and privacy of individual study participants. Any information obtained about research participants prior to or during a research project is subject to this confidentiality requirement, regardless of whether confidentiality has been explicitly pledged.
- 2.3.3 **Data Security:** Important elements of the confidentiality plan include security of data to be collected; control of access to data; chain of custody of data, including biospecimens; strict control or removal of individually identifiable data; and follow-back or follow-up intentions (and protocol).
- 2.3.4 **Avoiding Identification of Participants:** Results or data identifiable at the individual level should not be published. Investigators should avoid locating or tracking participants without specific permission or authorization. Results should be published in tabular or graphical form, as grouped data. The groups should be large enough to prevent any individual from being identified.

- 2.3.5 **Sharing Confidential Information:** Sharing of confidential information between investigators should follow the guidelines of the confidentiality plan and conform to procedures approved by an IRB/REB or an equivalent oversight committee.
- 2.3.6 **Allowed Breach of Confidentiality:** Infringement of privacy or breach of confidentiality should occur only in extraordinary circumstances (e.g., health emergency; threat to public health and safety; child abuse; illegal activities), and be subject to prior review by an IRB/REB or an equivalent oversight committee.
- 2.3.7 **Data Storage:** In the research design process, investigators should plan the management and storage, use, or reuse of data collected from research participants. These procedures should be explicitly noted in the informed consent document.
- 2.3.8 **Using Social Media for Research:** If using social media for research, investigators should collect only necessary data related to their research questions. Investigators should communicate with the research participants all information related to how privacy is maintained, and confidentiality secured. Investigators should protect the research participants by keeping all data collected de-identifiable to avoid exposing or putting the participant in a vulnerable position.²¹

2.4 Review of Research Protocols by Institutional Review Boards (IRBs)/Research Ethics Boards (REBs)

- 2.4.1 **IRB/REB Roles and Responsibilities:** It should be acknowledged by researchers that research involving people should include institutional oversight. Thus, research that is planned needs to be reviewed by a properly constituted review panel for both scientific design and ethical adequacy. This review is expected to operate pursuant to transparent, authoritative regulations that establish the composition of review panels and the principles for such review, including ethical issues and requirements. In certain circumstances, the IRB/REB may cause needless obstruction or delay for timely and important research and therefore there should be an institutional oversight mechanism to adequately handle such exceptional situations. In parts of the world where an IRB/REB does not exist, an *ad hoc* committee of community members/representatives, researchers and officials should be formed as an oversight committee to the investigative team (see [subsection 2.4.5, “The Principal Investigator Has the Ultimate Ethical Responsibility”](#)).
- 2.4.2 **Ethics are Local:** The IRB/REB should represent and reflect local values and cultural norms that apply to the populations under study, but in accordance with core ethical values of public health. This role may be delegated to a more central IRB/REB when multicenter studies are being proposed. In this case, the strategy for multi-country studies should pay special attention to vulnerable and traditionally marginalized communities and populations. If a community-based ethics review board and/or tribal IRB exists in the community where the research is being conducted, that local review board should be consulted with and potentially play a role in providing oversight for the study.
- 2.4.3 **Consideration of Vulnerable Groups:** Researchers should be mindful of vulnerable groups who may be disproportionately impacted by environmental

hazards. These include children, pregnant women, and marginalized communities. Researchers should take steps to ensure that these populations are not further marginalized by the research, and that their voices are heard. Researchers should take steps to ensure that the benefits of their research are distributed fairly. They should also consider the potential for unintended consequences and take steps to mitigate any negative impacts.

- 2.4.4 **Ethical Study Design:** Environmental epidemiology research plans and protocols should include a section on ethical considerations, and should demonstrate that the study design has the critical elements (e.g., inclusion of appropriate study populations, power, sufficient length of follow-up, latency) which will enable it to address the research question(s) and draw meaningful conclusions, noting both the strengths and limitations of the study's findings, whether positive, negative or of no effect.
- 2.4.5 **The Principal Investigator Has the Ultimate Ethical Responsibility:** The IRB/REB or an equivalent oversight committee should work closely with study investigators to improve the ethical quality/rigor of the research. However, ultimate responsibility for evaluating and ensuring ethical standards rests with the principal investigator.
- 2.4.6 **Conflicting Interests of Reviewers:** IRB/REB members should disclose any financial support or relationship that could create a conflict of interest in the review process, and recuse themselves if conflicting interests may influence decision-making.

3. OBLIGATIONS TO SOCIETY

3.1 Avoiding Partiality

- 3.1.1 **Partiality:** Partiality is said to occur when there is a value-directed departure from accuracy, objectivity and balance.
- 3.1.2 **Unconscious Partiality:** Unconscious partiality is a human tendency that environmental epidemiologists should avoid because they have a dual commitment and a moral duty towards the profession and society to seek diverse perspectives and a range of advice, even from those who often disagree with them.²² Moreover, there are historical examples and sociological evidence demonstrating that scientific practices, scientific theories, and many phases of the scientific process can and have been influenced by personal and group values and worldviews as well as ideologies such as political, race, sexism, and other forms of group-based discrimination.²³ Although it is true that environmental epidemiologists are subject to the limitations of their own experiences, their identities and social attributes, including their appearance, ethnicity, religious, cultural, and political beliefs, sexual orientation and gender identity and expression should not be used against them to undermine their impartiality. To avoid this unconscious partiality—or the semblance of partiality—environmental epidemiologists should argue for diversity in their research teams since it offers a plurality of perspectives that can broaden knowledge, expose biases, and lead to an overall more objective account of the phenomena under study.²⁴

- 3.1.3 **Choice of Methods and Practices:** Under no circumstance should environmental epidemiologists engage in selecting methods or practices that are designed to produce misleading results, nor should they misrepresent findings. They should resist institutional pressures to do these things.
- 3.1.4 **Interference:** It is acknowledged that sponsoring institutions and funders have a positive and crucial oversight role in the research process. However, they should avoid inappropriate interference with the initiation, conduct and publication of research, unless unethical or scientifically-unacceptable practices are being proposed or pursued by the researcher(s). They should help resist stakeholder pressure designed or intended to corrupt research to serve their own financial or other interests.
- 3.1.5 **Avoidance of Bias in Original Research:** Environmental epidemiologists, reviewers, and journal editors should not engage in practices that may lead to biases in study design, data analysis, or publication of results, such as *post hoc* analysis or revisions aimed at supporting a sponsor’s point of view or financial interests; cherry-picking results for publication that do not represent the full spectrum of actual results generated in the analysis of the research; avoidance of publication of “null” results; and rejection of research results that do not support a point of view.
- 3.1.6 **Avoidance of Bias in Review Articles:** Systematic reviews and meta-analyses provide many advantages, such as assessing the consistency and generalization of results among populations and groups, offering more comprehensive and precise information than individual studies, and ultimately guiding clinicians and policymakers in their decisions.^{25,26} They are susceptible to different types of biases, however, including publication bias and reporting bias. Publication bias occurs when the outcome of a study affects the decision and the time required to publish it while reporting bias can influence the choice of the selected outcomes or included studies in the review. To overcome publication bias, environmental epidemiologists can review clinical trial registries, regulatory agency websites, and conference abstracts to identify unpublished studies or any outcomes that may have been selectively omitted. Unfortunately, this can be difficult and time-consuming, which highlights the importance of avoidance of bias in original research. Systematic reviews and meta-analyses are only as good as, and as free from bias as, the primary data sources that they use. To avoid reporting bias, environmental epidemiologists need to perform their systematic reviews in accordance with a protocol written before the start of the review, defining the research question, the population of interest, the intervention or exposure, the outcomes of interests, etc. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocol (PRISMA-P) statement can be a valuable resource to define the main components of the review, such as the adopted search strategies and data sources, eligibility criteria, method of study screening and selection, primary and secondary outcomes, data extraction, and any planned analyses.²⁷
- 3.1.7 **Predatory Journals:** The academic publishing world has witnessed an exponential growth in the number of predatory journals in recent years. Predatory journals pose a serious threat to the integrity, credibility, and trustworthiness of the scholarly communications system²⁸. Environmental epidemiologists are expected to exercise due diligence before submitting their research to journals

that are considered predatory, as well as before agreeing to become reviewers or guest editors on special issues in such journals. This includes cross-checking journals against empirical lists of predatory journal characteristics,²⁹ verifying whether the entities to which they are submitting are members of the Committee on Publication Ethics (COPE) and, if open access, whether they are listed in the Directory of Open Access Journals (DOAJ), and to stay up to date with and increase their awareness of predatory journal practices.³⁰ It is the ethical duty of environmental epidemiologists to ensure that their work is published in reputable and trustworthy professional journals to prevent potential harm to society and public health.

- 3.1.8 **Journal Requests for Retraction of Published Manuscripts Showing “Inconvenient” Findings:** Journal editors may be pressured by organizations that make or distribute toxic substances to retract published papers that demonstrate health harms associated with these substances. Environmental epidemiologists should resist these journal editors’ requests for retraction and engage transparently with any critiques through published letters to the editor.

3.2 Avoiding Conflicting Interests

- 3.2.1 **Conflict of Interest:** A conflict of interest occurs whenever a political, bureaucratic, career, or economic incentive, real or perceived, has the potential for producing partiality or compromising objectivity. Conflicting interests are important to environmental epidemiologists because they alter our assessment of exposure and risk and the relationship between the two. Every environmental epidemiologist has the potential for a conflict of interest. A conflict exists whenever an epidemiologist’s role, obligation, or personal interest in accommodating an institution, sponsor, job/financial security, or personal goals compromises obligations to others who have a right to expect objectivity and fairness. Such circumstances are to be scrupulously avoided in conducting environmental epidemiology investigations because the attendant negative health consequences in environmental epidemiology research can be great.
- 3.2.2 **Full Disclosure:** Environmental epidemiology researchers, IRB/REB members, journal reviewers and editors, research grant reviewers, and other professionals who have a decision-making or primary role in the funding, conduct, or publication of research should provide full disclosure of financial and/or other advisory relationships that could influence their decision-making. Such disclosure should occur in all scenarios in which the research is presented, including oral presentations; written communications and publications; decision-making about research funding, methods, or approval; and research oversight. Individuals in a position of authority over research funding, publication, or data access should recuse themselves in circumstances where financial, personal, or other relationships may interfere with objective evaluation.
- 3.2.3 **Guidelines Governing Disclosure:** Institutions, funding agencies, regulatory agencies, journals, and other organizations that control the conduct, publication, or implementation of environmental epidemiology research should support the goal of transparency by establishing guidelines governing disclosure of relationships that may underlie all types of conflicting interests.

3.3 Epidemiological Conduct that Facilitates Good and Just Environmental Health Policy and Practice

- 3.3.1 **Recognizing Different Ethical Worldviews and Interests:** Environmental health policy and practice is usually the result of a societal negotiation between stakeholders with different ethical worldviews and economic interests. The environmental epidemiologist should present any descriptions and causal analyses in such a way as to facilitate informed, evidence-based discussion among these stakeholders. For example, stakeholders concerned with duties and rights will be interested in epidemiological information about “unfair” distributions of exposure or the existence of subpopulations with special vulnerabilities. Those who argue from a cost-benefit perspective will have other informational needs.
- 3.3.2 **Causal Inference:** Stakeholders and political jurisdictions may implement environmental health policy using the Precautionary Principle, adopting an approach that specifies that where there is evidence of risk attributable to a certain agent, the presence of uncertainty shall not be used as a reason for postponing measures to prevent or minimize such exposure. When an epidemiologist is asked to summarize or comment on epidemiological and biological evidence with the purpose of providing professional judgment as to causality, the epidemiologist should present the nature and extent of available evidence in a clear and objective manner, and in such a way as to avoid interfering with or obstructing a precautionary approach. In expressing opinions about causality, the epidemiologist should make explicit the assumptions and general rules of inference that form the basis for his/her opinions and that underlie the linkage of research evidence to conclusions relating to causality.
- 3.3.3 **Contextualization:** The environmental epidemiologist should exercise caution when describing the quality, the amount of evidence and the degree of possible added risk conveyed by an environmental agent. For example, citing only the rate ratio for a rare disease may cause alarm, while citing only the lifetime probability of not contracting a rare disease among the exposed may falsely reassure. Putting a possible risk in context requires the citing of both. Moreover, given the rising threat of climate change and diverse effects on health and societal wellbeing, environmental epidemiologists should develop new methods of study and new interdisciplinary collaborations.⁸ Multidisciplinary and interdisciplinary approaches, including collaboration by environmental epidemiologists with ecologists, social and behavioral scientists, and human rights and law experts, are instrumental in recognizing, preventing, and mitigating these effects on societies and communities around the world.⁶
- 3.3.4 **Re-analysis:** If an epidemiologist participates in a re-analysis of existing data by someone other than the original author, they should follow the ISEE Guidelines for such re-analysis.³¹
- 3.3.5 **Advocacy Role:** Environmental epidemiologists may choose to become advocates for abating some environmental risk or rebutting what they believe to be a false incrimination of some environmental factor. In either situation, they have a duty to avoid partiality in the conduct and interpretation of their research or in the interpretation of others’ research.

- 3.3.6 ***Distributive Justice:*** Historically, investments in health research have neglected vast portions of the population, both locally and globally, to rather focus on the needs of the more affluent. The principle of distributive justice calls for equity, and hence the need to reduce disparities in health outcomes resulting from this imbalance; locally, nationally, and globally. As such, environmental epidemiologists ought to focus more on traditionally underserved populations that tend also to be least protected from environmental harms.⁶ Prioritarianism is a principle of distributive justice which states that in the distribution of advantages, priority should be given to those who are worse off;³² this stands in contrast to the utilitarianism that favors acts or interventions that achieve the greater good simply for the largest number of people. Environmental epidemiologists should advocate for the application of prioritarian principles because they provide an ethical framework to fulfill the Sustainable Development Goal commitment of leaving no one behind.
- 3.3.7 ***Research Priorities:*** Funding priorities for public health research should be reflective of public health burden; e.g., morbidity, mortality, disability, potential years of life lost, and cost to the individual and society of the risk factor(s) and/or health outcome(s). In addition, research resource allocation should take account of lifetime risks (e.g., risks to fetuses and children), and the need to consider especially susceptible populations. It is also important to acknowledge that scientific research into global challenges, including climate change, are dominated by the Global North, and this North-South divide is driven partly by uneven distribution of funding and failure to address historic and structural inequities that contribute to this imbalance.³³ Environmental epidemiologists in the Global North can increase collaboration with peers in the Global South, sharing resources, expertise, knowledge, and funding opportunities. By working together, they can understand how global challenges affect different regions, both differently and disproportionately, and develop more effective strategies to improve public health on a global scale.
- 3.3.8 ***Data Sharing in the Public Interest:*** Environmental epidemiologists have a moral duty to disseminate their research findings for the greater good of society and public health. This includes data sharing because it advances knowledge and promotes more transparency in research. However, environmental epidemiologists need to be mindful of the potential risks associated with data sharing, including the possibility of re-identifying participants and the misuse of sensitive information.
- 3.3.9 ***Data Protection in the Public Interest:*** Data protection advocates hold that the individual's right to privacy trumps the benefits of data access for research purposes, particularly for record linkage studies. In today's digital age, environmental epidemiologists face new challenges in relation to balancing the individual's right to privacy and generating important findings from research that is dependent upon the linkage of administrative datasets. It is thus important for environmental epidemiologists to engage with data protectionists, as well as with entities that control data access, to work together to address mutual concerns. The benefits to be gained from such research ought to be clearly articulated with acknowledgement of the true custodians of the data, as they are critical to the pursuit of knowledge about environmental health risk factors, and thus to the protection of the health of the public.

- 3.3.10 **Respect for the Natural Environment:** Environmental epidemiologists should recognize the importance of the natural environment (nature, nonhuman species and ecosystems), as well as the communities that depend on these ecosystems. As such, environmental epidemiologists should approach the natural environment with respect and recognize its intrinsic value. This means that the research should not harm nonhuman species and ecosystems; the environmental epidemiologist should strive to minimize any negative impacts of their research on ecosystems and take steps to promote positive outcomes. Epidemiological research should actively aim to reduce greenhouse gas emissions so as not to contribute to climate change.
- 3.3.11 **Long-term Impacts:** Environmental epidemiologists should consider the potential long-term impacts of their research on the integrity of ecosystems and the communities that depend on them. This may involve conducting follow-up studies to assess the long-term effects of environmental exposures or engaging with community members to identify potential risks and develop strategies to mitigate them.
- 3.3.12 **Choice of Methods and Practice:** Environmental epidemiologists should use scientifically rigorous methods in their research that recognize and respect the complexity of environmental systems. They should also consider alternative methods that may reduce potential harms or promote more positive outcomes.
- 3.3.13 **Outcome Measures:** Environmental epidemiologists should include outcome measures that are relevant to the well-being of the environment and the communities that depend on it. These measures should capture both short-term and long-term impacts of environmental exposures.

3.4 Community Involvement

- 3.4.1 **Engagement of Stakeholders:** Depending upon the primary study's aims and settings, and whenever feasible, environmental epidemiologists should budget for and meaningfully engage community stakeholders, public health agencies, industry, and others with an interest in the design, conduct, analysis, and dissemination of research. Their roles should be agreed upon ahead of time.
- 3.4.2 **Community Partnerships:** Research involving a community or any other defined group ought to include at all stages of research, from formal design stage through completion of the study, representatives of those groups who are (a) knowledgeable about the health, science, social, political, and economic issues under investigation (e.g., union and health representatives) and (b) are affected by the issue being investigated (e.g., community stakeholders including, but not limited to, those traditionally marginalized/disenfranchised). The IRB/REB or its equivalent likely will include lay community representatives. Whatever the situation, the environmental epidemiologist's task is to ensure, whenever feasible, that community input throughout the research process is included in a partnership capacity with the principal investigator. This goal could be accomplished by including representatives of stakeholders on a project steering committee.

- 3.4.3 **Understanding Information of Uncertain Biological Significance:** It is important to ensure that members of the community understand that there may be uncertainty associated with the implications or interpretation of the measures being evaluated through the research process, including results of genetic monitoring, markers of exposure, and physiological changes of uncertain biological significance. In communications with community research participants, the environmental epidemiology research team should be clear that research is an ongoing and cumulative process. Further, results from individual studies contribute to a greater understanding of the significance of that which has been measured.

3.5 Communication and Action Plan

- 3.5.1 **Social Responsibility:** Environmental epidemiologists should consider the broader societal implications of their research and take steps to ensure that their findings are used for the public good and for improving environmental conditions. This may involve engaging with policymakers and stakeholders to promote evidence-based decision-making.
- 3.5.2 **Reporting:** All research findings and information vital to public health should be communicated to stakeholders in a timely, clear, comprehensive, understandable, and responsible manner, in a format and language appropriate and accessible to, and understandable by the specific audiences.
- 3.5.3 **Media Communications:** Studies in progress should not report results to the media without prior authorization by a properly constituted IRB/REB or an equivalent oversight committee.
- 3.5.4 **Transparency:** Environmental epidemiologists must be transparent about the assumptions underlying their studies and share uncertainties with relevant stakeholders; any communication plan should acknowledge not only the strengths, but also the limits and uncertainties of the study. Furthermore, they should explain and acknowledge proper interpretation of statistical analytical results; e.g., that the absence of data or failure to attain statistical significance does not prove the absence of risk, and that statistical significance does not establish clinical or biological significance^{1,34}. By researchers making their data and findings transparent and accessible to the public, broader understanding and discussion of the research will be facilitated, thereby helping to build trust with the community.
- 3.5.5 **Communications and Action Plan:** Environmental epidemiologists should include in their proposals/grant applications a section identifying their “communications and action plan.” This should describe (a) the strategy for the prior-to-publication presentation of methods and results at any scientific gathering of peers (if media are in attendance, they must be specifically reminded to

¹ Statistical significance refers to the degree to which a research outcome cannot reasonably be attributed to the operation of chance or random factors. Clinical significance refers to the importance or meaning of a study’s result to the care of participants in clinical research (i.e., patients), including diagnosis and treatment. Biological significance (or biological relevance) refers to an effect considered by expert judgement as important and meaningful for human, animal, plant or environmental health.

recognize the interim/preliminary nature of the results); (b) how the methods and results are to be subjected to peer-review for publication (see [subsection 5.2, “Reporting Methods and Results”](#) below); (c) the degree of care that will be exercised to ensure clarity when communicating results to nonscientific groups (e.g., the community and/or other professions); and (d) the types of actions or interventions that might be contemplated or recommended, based upon the outcome of the research.

- 3.5.6 **Avoid Misrepresentation and Improper Interference:** Environmental epidemiologists should work to promote and preserve public confidence and not misrepresent (for example, by understating or overstating) the methods, results, limitations or public health significance of environmental epidemiology inquiry. In stakeholder-funded research, contractual language should rule out the possibility of sponsors writing the reports without attribution or pre-empting the conclusions. Any influence from stakeholders to change an *a priori* hypothesis or research design in response to being privy to preliminary results is unacceptable. Obligations should rule out *post hoc* changes in protocols and analyses (i.e., after study results are generated, analyzed, or submitted for publication), and the specification of peer reviewers or editors with known conflicting interests.
- 3.5.7 **Mental Health Impact:** With psychological stress recognized as a significant determinant of morbidity, the consequences of risk information about the adverse health impacts of environmental factors should balance the obligation to disclose results with the potential mental health and/or economic impact that such information could have on the affected community. The concern and respect for autonomy should not be invoked as a pretext for withholding information from appropriate stakeholders. Project steering committees comprising community representatives provide one mechanism for addressing such concerns (see [subsection 3.4, “Community involvement”](#) above).

4. OBLIGATIONS REGARDING FUNDERS/SPONSORS AND EMPLOYERS

4.1 Specifying Obligations

- 4.1.1 **Protecting the Public Interest:** Environmental epidemiology research topics and designs are shaped by public and private institutions, as well as advocacy groups. Some institutions may benefit financially from practices that are less concerned with hazardous environmental exposures than with competitive and financial interests. Likewise, advocacy groups may apply pressure to decision-makers or funding sources to focus on research topics that they believe have an etiologic role in particular health outcomes. Similar to other applied and basic scientists, environmental epidemiologists have a duty to critically evaluate the interests and motivations of stakeholders, employers, and funders. Indeed, environmental epidemiologists have a duty to advocate for research topics and designs that place the health of exposed or at-risk populations ahead of concern for the reputation and financial well-being of any institution or organization. They work to protect the public interest over any other interest.

- 4.1.2 **Communicating Obligations:** Environmental epidemiologists should inform employers and funders/sponsors, preferably in contractual form, about how research is to be conducted, and how research results will be communicated to stakeholders, the public, the scientific community, and to governmental agencies, in accordance with these guidelines. The moral and legal responsibilities of all parties should be acknowledged in this process. The obligations of employer, funder/sponsor and environmental epidemiologist should be clearly specified in documents such as program manuals, protocols and/or professional contracts. The employer or funder/sponsor should be referred to the relevant part of these guidelines and other professional codes to which environmental epidemiologists subscribe.
- 4.1.3 **Avoid Funding Influence:** Environmental epidemiologists should not accept funding from sponsors, accept contractual obligations, or engage in research that is contingent upon reaching particular conclusions from a proposed environmental epidemiology inquiry. Likewise, they should not accept funding if conditions are placed on their right and, indeed, on the obligation to publish the research findings. It is acknowledged, however, that there are certain work settings (e.g., within the context of litigation) where confidentiality is normally required and publication of analyses is/may not be permitted, and also whenever professional opinions that extend beyond a specific project are discussed and presented.
- 4.1.4 **Undue Influence:** Environmental epidemiologists who develop research plans, protocols, or administer funding on behalf of a sponsor or employer should not attempt to influence study personnel, protocols, analyses, or publications in such a way as to favor a particular *a priori* conclusion or interpretation of results.
- 4.1.5 **Funder Review of Findings:** Funders/sponsors may wish to review study findings and manuscripts prior to submission for publication. Such review should not include the right to refuse publication.
- 4.1.6 **Government Clearance:** Environmental epidemiologists who work for governmental agencies may be required to submit all manuscripts reporting results of their studies through a clearance process. Occasionally, government agencies may use the clearance process to delay or deny publication. Environmental epidemiologists have a duty to make a timely release of the results of their studies to protect the health of exposed or at-risk populations. If the government, after review, does not allow the publication of research results, researchers may consider publishing in their personal capacity.

4.2 Protecting Privileged Information

- 4.2.1 **Privileged Information:** Environmental epidemiologists may use privileged information furnished by a funder/sponsor or employer provided that permission was granted to use the privileged information, and that confidentiality restrictions are respected/maintained. The privileged information may include intellectual property, including trade secrets.

5. OBLIGATIONS TO COLLEAGUES

5.1 Specifying Obligations

- 5.1.1 **Intellectual Property:** There should be respect for, and acknowledgement of ownership of intellectual property, research ideas, ongoing research activities, leadership roles, research funding/resources, and research attribution at all professional levels, including those of students.
- 5.1.2 **Avoid Conflicting Interests and Misappropriation:** Environmental epidemiologists who fund research protocols or influence the publication of results should avoid partiality and any conflict of interest in funding or publication decisions. They should avoid using their special access to the new ideas of others to appropriate these research ideas as if they were their own.
- 5.1.3 **Maintaining Confidentiality:** Environmental epidemiologists have an obligation to respect the confidentiality of their colleagues' personal and professional information, unless disclosure is necessary to prevent harm or is required by law.³⁵
- 5.1.4 **Scientific Integrity:** Environmental epidemiologists should maintain scientific integrity at all times and this should also be evidenced wherever possible via the conduct of research work adopting the open science philosophy and principles. This includes transparency in research methods, accurate data collection and analysis, as well as reporting. Researchers should be aware of power relations and epistemic injustice inherent in traditional structures.
- 5.1.5 **Knowledge Translation:** To rapidly advance the knowledge base in the field of environment and health, it is imperative that environmental epidemiologists collaborate with colleagues to leverage individual and regional strengths. This shall be evidenced from research outputs representing wider geographical regions and or international comparative studies, and such outputs should be profiled and acknowledged at annual societal events as well as through member institutional media/communication channels.
- 5.1.6 **Providing Support and Mentoring:** Environmental epidemiologists should offer support and mentoring to their colleagues, especially those who are new to the field or facing difficult challenges. This can include sharing knowledge and expertise, providing feedback, and offering guidance on ethical issues.³⁵ Mentorship should be viewed in both ways as well, where there are instances for a mentor to equally learn from a mentee to better appreciate their needs and aspirations in a fast-changing world.
- 5.1.7 **Avoiding Conflict of interest:** Environmental epidemiologists should avoid conflicting interests that could compromise their objectivity or professional judgment. This includes refraining from engaging in activities that could benefit themselves or their personal interests at the expense of their colleagues or their organization.

- 5.1.8 **Respecting Diversity and Inclusivity:** Environmental epidemiologists have an obligation to respect and value the diversity of their colleagues, including differences in appearance, ethnicity, gender, religion, sexual orientation, and culture. This requires creating a welcoming and inclusive workplace culture that values, respects, and embraces diversity and human rights.
- 5.1.9 **Promoting Professional Development:** Environmental epidemiologists should actively promote the professional development of their colleagues, including providing opportunities for training, education, mentoring, and career advancement.
- 5.1.10 **Respecting New or Controversial Ideas:** Environmental epidemiologists should respect novel or controversial ideas. They should respect the epidemiologist's right to investigate any hypothesis that may enhance the health and well-being of people, no matter how unpopular. Those who feel threatened should be encouraged to follow the ISEE procedure for dealing with scientists who feel threatened and/or whistleblowers.³⁶

5.2 Reporting Methods and Results

- 5.2.1 **Assessment and Replication:** Upon completion of their studies, environmental epidemiologists should provide in their final reports/publications adequate information in order to permit the methods, procedures, techniques and findings of their research to be critically assessed and replicated.
- 5.2.2 **Independence and Neutrality:** There is a tension among the timely conduct of studies, reporting of scientific findings, and the need for thorough analysis and peer review. Environmental epidemiologists should have the freedom to pursue a study to conclusion with due diligence and in a timely fashion, especially in anticipation of interim findings that may not be pleasing to a sponsoring organization. Researchers should be protected from any attempts to interfere with the orderly completion and analysis of a study, demonstrating analytical rigor throughout. Neutrality/impartiality in science is an ethical imperative.
- 5.2.3 **Peer Review:** Environmental epidemiologists should submit their methods and findings (whether “positive,” “negative,” or “no effect”) to peer review (e.g., editorial review for publication). If a research report does not withstand objective peer review on scientific grounds, the work should, in all likelihood, not be communicated to the public (see [subsection 3.5, “Communication and Action Plan”](#)). Selecting peer reviewers with an appropriate range of expertise and points of view on a given issue is one way to avoid inadvertent bias. Where findings have some urgency, mechanisms for accelerating the peer-review process ought to exist. Journal editors are obligated to consider “positive,” “no effect,” and “negative” studies with equal favor in their decision to publish.
- 5.2.4 **Objectivity of Reviewers:** Environmental epidemiologists who are asked to suggest reviewers should avoid selecting those whom they know would be likely to accept their submitted research article based upon the conclusions drawn rather than on the appropriateness of the methods employed.

- 5.2.5 **Reporting Accurately and Honestly:** Environmental epidemiologists have an ethical obligation to report their research findings accurately and honestly, without manipulating or distorting the data to fit their hypotheses or biases.³⁷
- 5.2.6 **Reporting All Relevant Information:** Environmental epidemiologists have an ethical obligation to report all relevant information, including both positive and negative findings, and to provide a clear and transparent account of their research methodology.
- 5.2.7 **Avoiding Plagiarism and Self-plagiarism:** Environmental epidemiologists have an ethical obligation to give proper credit to the work of others and to avoid self-plagiarism by not submitting the same work to multiple journals or conferences. Because artificial intelligence has no moral compass, epidemiologists who use a chatbot (such as ChatGPT) should be transparent about its usage and should take full responsibility for the content produced by the chatbot.³⁸⁻⁴⁰ Any use of a chatbot must be included in the Acknowledgements section of the manuscript.
- 5.2.8 **Protecting the Confidentiality of Participants:** Environmental epidemiologists have an ethical obligation to protect the confidentiality and privacy of research participants, and to obtain informed consent before collecting or using their data.⁴¹
- 5.2.9 **Engaging in Responsible Data Sharing:** Environmental epidemiologists have an ethical obligation to share their data and research findings with others in a responsible and ethical manner, including following appropriate data sharing protocols and ensuring that their data are accurate and properly annotated.⁴²

5.3 Confronting Unacceptable Behavior

- 5.3.1 **Confronting Improper Practices:** Environmental epidemiologists are at times faced with practices that may result in misrepresentation, fraud, unethical behavior, illegal behavior, or incompetence. When such behavior is encountered in colleagues or in other associates, the environmental epidemiologist should attempt to confront the problem by discreetly, but directly, communicating the concern to the colleague and to encourage the repudiation of improper activities. In some cases, there may be an obligation to take specific action to correct inappropriate behavior.
- 5.3.2 **International Review Panels:** It is particularly difficult to challenge the actions of senior-level investigators or “thought leaders” within research teams, within institutions, and at various levels of hierarchy within the professional community. There is widespread aversion to openly challenging colleagues. Therefore, an independent review panel consisting of representatives from many countries should be created within major environmental epidemiology organizations for the purpose of considering cases of alleged misconduct or ethics violations, and for issuing recommendations. It is important to note, however, that scientific difference of opinion does not necessarily equate to unacceptable conduct.
- 5.3.3 **Protecting Whistleblowers:** Environmental epidemiologists ought to consider supporting colleagues who are subjected to pressures and who might even be fired from employment when they are diligent in upholding these Guidelines. Such

individuals are commonly labeled as “whistleblowers.” Support might take many forms, the least of which is the provision of moral support. Ideally, institutional protections should exist that guard against the practice of victimizing the whistleblower. The profession should protect and defend from harassment environmental epidemiologists who uphold these guidelines.

- 5.3.4 ***Speaking up Against Unacceptable Behavior:*** Environmental epidemiologists have an ethical obligation to speak up against unacceptable behavior, such as harassment, discrimination, or bullying, even if it may be difficult or uncomfortable to do so.⁴³
- 5.3.5 ***Reporting Incidents to Management:*** Environmental epidemiologists have an ethical obligation to report incidents of unacceptable behavior to management, who have a responsibility to address and resolve the issue.⁴⁴
- 5.3.6 ***Providing Support to Colleagues:*** Environmental epidemiologists have an ethical obligation to provide support to colleagues who have been victims of unacceptable behavior, including offering emotional support, advocating on their behalf, and providing resources and referrals.
- 5.3.7 ***Promoting a Culture of Respect and Inclusion:*** Environmental epidemiologists have an ethical obligation to promote a culture of respect and inclusion in the workplace, which includes valuing diversity, treating others with dignity and respect, and creating a safe and welcoming environment for all environmental epidemiologists.⁴⁵
- 5.3.8 ***Developing Moral Courage:*** Environmental epidemiologists have an ethical obligation to develop moral courage, which involves having the courage to speak up and take action in the face of ethical dilemmas or unacceptable behavior.⁴⁶

5.4 Communicating Ethical Requirements

- 5.4.1 ***Duty to Communicate Ethical Requirements:*** In circumstances of collaborative inquiry, as well as in the usual practice of environmental epidemiology, environmental epidemiologists have a responsibility to ensure that their colleagues understand the ethical requirements applicable to the research. Collaborators, staff, assistants, student workers, and other involved parties should likewise be informed of said requirements in the practice field of environmental epidemiology.
- 5.4.2 ***Educating Colleagues on Ethical Requirements:*** Environmental epidemiologists have an ethical obligation to educate their colleagues on the ethical requirements for conducting research, including obtaining informed consent, protecting participant privacy and confidentiality, and ensuring that the research is conducted in an ethical and responsible manner.⁴⁷
- 5.4.3 ***Ensuring Compliance with Ethical Requirements:*** Environmental epidemiologists have an ethical obligation to ensure that their colleagues are complying with ethical requirements, and to report any ethical violations to the appropriate authorities.⁴⁸

- 5.4.4 **Providing Resources and Support:** Environmental epidemiologists have an ethical obligation to provide their colleagues with the resources and support they need to conduct research in an ethical and responsible manner, including providing training on ethical requirements and offering guidance and support throughout the research process.⁴⁹
- 5.4.5 **Encouraging Ethical Behavior:** Environmental epidemiologists have an ethical obligation to encourage ethical behavior among their colleagues, including promoting a culture of ethical conduct and modeling ethical behavior themselves.⁵⁰

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