Environmental Public Health Law: Three Pillars

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Most people dread being the subject of interest for doctors, scientists, regulators, and lawyers. While we may joke about the arrogance of the medical profession and the aggressiveness of the legal field, both lie at the core of environmental public health (EPH). They are inseparable, sometimes complementary and other times in tension. The role of medicine and science in EPH is clear, but their relationship with law is often opaque. Yet in no other area of public health, from infectious and chronic disease prevention to providing health care in underserved communities, is law so central as an instrument and partner. In this article we explore the relationship of law and science in the broader context of EPH, beginning with an overview of potential goals and challenges. We then offer three organizing principles that inform and guide the integration of law, science and policy in EPH.

The term EPH is used deliberately, in part to distinguish "environmental health" from "environmental protection." Most people think of environmental protections as the safeguarding of flora and fauna, or clean up of facilities or chemical spills. While these efforts are important and relevant to EPH, they are not its core. The purpose of public health is defined as "fulfilling society's interest in assuring the conditions in which people can be healthy."[1] No sector of public health is more focused on assuring healthy conditions than EPH. During the 20th century, the average American's lifespan increased by approximately 30 years, due mainly to advancements in two major areas: (1) changes to environmental conditions — often enabled by better standards of living; and (2) increased rates of immunization.[2]

Two main conceptual tributaries or foci of EPH are enhancing *quantity of life* (focusing more on traditional public health concepts such as morbidity and mortality) and improving *quality of life* (often intermingled with environmentalism). While practitioners and researchers typically treat the two as conceptually and functionally distinct, they are often inextricably interconnected.

Reductions in fatality rates of individuals with infectious diseases such as tuberculosis preceded the development and use of medical treatments. Many of the most successful public health interventions, such as waste removal and water sanitation, were accomplished without meaningful knowledge of bacteria, viruses, or underlying causes of disease. Improvements in quality of life through reductions in morbidity and mortality were the result of environmental interventions as well. Clean air, water, and food as well as safer workplaces profoundly improved quantity and quality of life. In this capacity, quality and quantity of life conflate. It is instructive to recognize how quality of life efforts often create benefits long before the impacts on quantity of life. For example, early efforts to reduce smog levels in Los Angeles substantially preceded awareness of the negative health effects of many ground level air pollutants.[3]

Concern about the environment, or "environmentalism," is the second tributary flowing into EPH. Public health is undeniably focused upon the protection of human populations rather than plant and animal species, the oceans, and other natural systems. Yet in many cases the same conditions that threaten public health also raise broader ecological concerns. These

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links between public health and environmental protection are deep and sometimes unexpected. For instance, concerns about polluted rivers and fish fatalities led to stricter water quality laws at the national and state levels. While initially intended to protect wildlife, these regulations also generated unforeseen health and economic benefits. Likewise, efforts to address air pollution in Los Angeles led to catalytic convertor requirements for automobiles in California, and then nationwide, necessitating a ban on leaded gasoline, which in combination led to dramatic improvements in human health. Interestingly, environmental activists often turn to health issues when their initiatives need more political support or more effective fiscal arguments. It is unfortunate, given the enormous contribution of EPH to reducing morbidity and mortality, that EPH is so significantly underfunded by elected officials.

In the past, the mutual gains from improvements in quantity of life and quality of life, and the shared benefits from human health interventions and environmental protection efforts, were often fortuitous. As our policy approaches and scientific capabilities grow more sophisticated, EPH can achieve such positive outcomes more systematically and consistently. Developments in toxicology, information technology, computing, and other areas of science advance understanding of the mechanisms of disease, including the role of the natural and man-made environment in disease genesis and prevention. Decision science, psychology, technology assessment and health impact assessment tools provide the means for anticipating more comprehensively the potential outcomes — positive and negative — of our interventions.

Although these and other tools may improve the state of science and policy, draconian reductions in funding, mounting national and international tensions, and the sheer number of formidable social problems present challenges to the future of EPH. For EPH to succeed in an increasingly complex and dynamic world, its practitioners must embrace and operationalize three organizing principles: (1) a strong *ethos of prevention*; (2) a *systems view* of the natural, social, and political environments in which we work; and (3) a profound *commitment to transdisciplinary work*.

The notion of primary prevention — that where feasible we should avoid disease in the first place rather than treating it — is central to public health practice. It should likewise be a core tenet of EPH. One contemporary example of primary prevention in the area of occupational and environmental health is the growing focus on green chemistry. While current occupational health and consumer protection regulations adopt a secondary prevention (or exposure control) approach in practice, green chemistry focuses upon the elimination of hazardous chemicals, or the substitution of safer alternatives so that people are not exposed to harmful substances in the first place.[4] Yet, primary prevention is not limited to green chemistry; rather it applies to all areas touched upon by EPH. Another example is *inherently* safer design; an approach to process safety management in which facilities seek to increase safety and eliminate hazards throughout industrial processes.[5]

There are strong reasons for adopting a primary prevention approach in EPH. The removal of hazards is more effective than controlling exposure. Secondary prevention approaches rely upon engineering controls and work practice standards often prone to mechanical failure and improper implementation. Moreover, primary prevention has often proven to be more fiscally efficient, leading to cost savings and the reduction of regulatory expenditures.[6]

Still, adoption of a primary prevention approach in EPH is challenged by broad and complex threats. This may lead to an increased risk of a "regrettable substitution" — a situation in which the preventive intervention itself gives rise to unanticipated consequences. In California, a prohibition on the use of methylene chloride and tetrachloroethylene-based brake and engine cleaners led automotive repair shops to adopt hexane and acetone mixtures as substitutes. Once absorbed into the mechanics' bodies, the hexane was metabolized into a powerful neurotoxin causing severe numbness, often permanent, of their hands and feet.[7] The danger of regrettable substitution necessitates a systems view in EPH, the second organizing principle.

An effective systems view in EPH would address three dimensions in particular: (1) the natural or physical system; (2) the social, economic, and institutional system in which the affected parties function; and (3) the bureaucratic and political system in which policymakers operate. Turning to the natural system, nearly all EPH challenges — from contaminated food to global warming — result from a network of direct causes and contributing factors, often exhibiting complicated positive and negative feedback effects. For example, asthma is the most prevalent chronic disease among children.[8] Asthma attacks are provoked not only by exposure to ozone and other ambient air pollutants, but also by home heating and ventilation systems, carpeting, medicines, latex or sulfite exposures,[9] personal characteristics like atopy, and a number of other factors.[10]

Moving beyond the natural systems, effective EPH policy must recognize that interventions themselves — and the parties to which they are directed — operate within complex social, institutional, and economic

milieu. Information dissemination and outreach by public health agencies, for example, may be ineffective where recipients rely upon local social networks for guidance. Likewise, providing tax benefits to encourage adoption of safer soil fumigants could be undermined by constraints imposed by lenders or the tax constraints of many small farmers.[11]

Lastly, policymakers must also function within the constraints of the legal system and a society shaped by power relations and monetary incentives. Infectious disease epidemiologists need not worry about the power of a "gonorrhea lobby," but no one who is concerned about chemical body burdens, dangerous workplace processes, injurious products, or poorly designed communities has escaped the opposition of numerous and well-funded critics and public relations firms. Finding that a pesticide harms farm workers, or a surfactant is endocrinologically active, or a specific air pollutant affects heart function invariably marshals a squad of critics, often directly hired by an affected industry or ideologues opposed to all environmental controls or protections. These conflicts not only arise in scientific journals, but also in courtrooms and mass media publications. Success in EPH depends increasingly on a holistic understanding of relevant physical, social, and political systems in which problems and solutions exist and function. This requires the capacity to bring multiple disciplines to bear, which leads to the third organizing principle.

Modern EPH threats are immense and complex. They do not reside within isolated academic disciplines or single governmental agencies. Rather, such issues inevitably cross many disciplines and bureaucratic jurisdictions. The contamination of drinking water with perchlorate not only implicates drinking water quality, but also disinfection, environmental fate, food contamination, military weapons production, endocrinology, child health, and law. A focus on prevention under a systems approach necessitates an integrated understanding of science, economics, sociology, and law. This type of integration contemplates *transdisciplinary* efforts that weave together the relevant strands and methods of those disciplines.

That scientists and lawyers speak different languages is an advantage, as their differing approaches often reflect varying, useful perspectives, and also an obstacle where it prevents meaningful communication and partnership. Transcending the disciplinary boundaries requires cross-training in graduate and professional education, institutionalizing interdisciplinary interaction within government agencies and public and private institutions, and encouraging communication among academic researchers in these disciplines.

Conclusion

EPH is science in action, seeking to improve both the quantity and quality of life through public policy. Law is a central partner in that enterprise. Through committed and consistent application of the core organizing principles of prevention, systems thinking, and an interdisciplinary framework, this partnership will yield substantial public health benefits for the future.

Acknowledgement

The authors recognize the assistance of Tamanna Rahman and Rachel Cushing, UCLA School of Public Health.

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