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Environmental Health in Public Health

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THOMSON
DELMAR LEARNING

Principles of Public Health Practice

2nd edition



F. Douglas Scutchfield
C. William Keck

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FOREWORD



Public health has never received the recognition it deserves. The late nineteenth and early twentieth centuries have been referred to as the "Age of Modern Medical Miracles," yet it was not "miracles" of high technology that brought this nation to the health status it now enjoys. Instead, it was public health advances that accomplished that: clean water, proper housing, immunization, eradication of smallpox, increased life expectancy and the understanding of preventive medicine as exemplified by healthy lifestyle choices.

In the past decade, we have seen two separate movements in the national and global worlds of public health. In the United States we have seen the erosion of the infrastructure of public health not because the practitioners of public health or its teachers were negligent, but because both the Congress and the Administrative Branch, with their minds on other things, contributed to the present sorry state of affairs. The Republican Party presented the nation with a *Contract with the American People*, which unlike most contracts was signed only by the government. The Administrative Branch conceived the idea of "re-inventing" government. Public health was caught in a pincers movement, both sides of which could have more honestly labeled their efforts as "downsizing" that euphemism, which frequently undermined institutions and then infrastructures, as well as reducing them in size.

The terrorist effort, mailing anthrax bacilli to prominent individuals, demonstrated our woeful inadequacy of institutions and infrastructure, which we trusted to forge the necessary alliances between health surveillance, health management and agencies of the law necessary to respond to a bio-terrorist attempt at mass destruction. Even the communication was confusing with multiple voices telling different stories. No one seemed to be in charge, in spite of the fact that the threat of bio-terrorism cannot honestly be called new.

The other great movement that affects global as well as national public health augers well, if properly harnessed, for not only the health of America but also the health of the world. Public health has been provided with a number of new tools, such as the unbelievable explosion of informatics, particularly e-mail and the Internet. This has come in a time to transmit knowledge of the tremendous growth of science, including the scientific basis of public health. The mapping of the genome and advances in genetic engineering have provided public health and medicine with knowledge hitherto almost unimaginable. And the development of new vaccines, always a welcomed advancement, comes at the very time when we need all of the expertise we can muster in this field if we are to respond adequately to bio-terrorism.

The word "globalization" has become one of our current buzzwords and although most of the popular writing on the subject has to do with the economics of globalization, it is inextricably tied up with the health of those nations to be globalized. We have truly globalized only two things and we have done them well: we have globalized the spread

of infectious disease and we have seen the exportation of the cigarette into every nook and cranny of the planet. These things being true, and both being the fruits, if you will, of the industrialized world, it stands to reason that we have the obligation to globalize health. The benefits of economic globalization aside, economic globalization cannot take place if the health of developing nations is not tremendously improved. These nations are too sick to contribute to economic globalization; only the globalization of good health can change that situation.

I do not view the health status of the world with discouragement, but rather see it as an unprecedented challenge for public health, which comes at a time when we have tools recently undreamed of that can aid us in our quest. In earlier years, I worried how we could ever bring health to the developing world because it lacked a health infrastructure. But science leapfrogged over that issue, and with the cell-phone and the Internet, all it takes now is organization.

Just a few years ago representatives of the almost 150 schools of medicine and osteopathic medicine in the United States, who turn out practitioners to treat injury and illness and return people to a previous state of health without making much effort to take them beyond that, met in dialogue on several occasions with representatives of the field of public health. The early enthusiasm of both sides has faded to a lackluster substitute of what we started out to do. That situation has to be reversed. I can't think of a professional challenge presented to two interrelated but distinct groups simultaneously that carries such promise with proper guidance.

It is obvious, therefore, that there is an important role for a book that synthesizes state-of-the-art information about the problems and challenges of public health for the benefit of both students and current practitioners. I believe that Drs. Scutchfield and Keck have provided such a book. They have brought together the wisdom of many of the most knowledgeable health professionals in North America to provide the best information possible about current public health organizations and practice. For the new student, the book provides an introduction to the field of public health practice. For the current practitioner, it is a unique and vital reference. Those who make public health policy should not do so without understanding the content of this book. Only when there are enough knowledgeable and committed individuals will deplorable human suffering and unaffordable economic costs be prevented. This book is a step in that direction.

C. Everett Koop, M.D., Sc.D.

PREFACE



An interesting dichotomy has developed in the field of public health over the past several years. On one hand, the contributions made by public health measures to the improvement of health status in the United States have been documented and increasingly appreciated, and the potential for future improvement has been recognized. On the other hand, those contributions have largely been taken for granted, and public health expenditures have been slashed as part of the effort to control governmental spending at the local, state, and federal levels. This has resulted in the growing awareness in the potential improvements that can still be made to the public's health, while, at the same time the capacity of the "delivery system" in state and local health department has been diminished.

Today's public health practitioner faces a changing and somewhat ambiguous environment. There are challenging and exciting possibilities, but resources are limited. The government's role is paramount but there is public mistrust of government. Health reform is on the public's mind but the focus is on illness care rather than health promotion and disease prevention. New public health crises call for effective responses but the public is divided on priorities for action.

Successful management of health departments and other community health agencies will require enlightened and strong leadership. Public health leaders will need to understand the contributions that can be made by the application of public health principles to community health problems, to work with communities to involve them in understanding and addressing the problems that threaten them and to engineer constructive evolution of their agencies to effectively perform in a changing and uncertain environment.

There are about 500,000 individuals employed as public health workers at all levels of government in the United States. Very few of these professionals have formal public health training or even share a common academic base. There are wide variations in the capacity of local health departments across the country, and there is uncertainty about the future place of public health departments in society. Nonetheless, improvement of the public's health will require that the core functions of public health be competently executed. A cadre of public health leaders must emerge, therefore, with a clear vision of public health's place in maintaining and improving health and with the skills required to make that vision a reality. This combination of problems and opportunity suggest to us the need for *Principles of Public Health Practice, 2nd Edition*.

The second edition of this book is designed to appeal principally to two audiences. The first is the public health professional who has come to work in the public health environment without having a formal exposure to course work in public health practice, or who wishes to have on hand a review of recent developments in the field. The second audience for this text is students of the public health professions who would benefit from access to a broad text describing the organization, administration, and practice of public health.

ORGANIZATION

This new edition is organized into five major parts. The first describes the current public health environment by introducing the basic concepts and development of public health practice, determinants of health status, and the legal aspects on which public health practice is based. It also includes a new chapter on reviewing the last decade of public health information and issues.

Part two addresses the contributions made to public health at the federal, state, and local levels. Part three contains chapters that describe and discuss available tools to effectively manage a typical health department. A new chapter has been added to this section describing performance measurement and management.

Part four of this new edition describes public health practice in a number of substantive environments, including a new chapter on health promotion and disease prevention effectiveness that examines the use of new analytical tools for use in the public health arena. Part five focuses on the role of the public health department in an evolving health system, and suggests a vision of the ideal health department of the future.

ALSO NEW TO THIS EDITION

Three new appendices have been added to this new edition. They include major public health professional associations, health leadership training institutes, and core competency requirements for public health professionals.

Additionally, an instructor's guide has been created to accompany this text. It provides the instructor with discussion topics for each chapter that can be incorporated into course lectures and student writing assignments, and that can serve as study guides.

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CHAPTER

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Environmental Health in Public Health

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A most intriguing question, and one that leads to many debates both inside and outside of the environmental health field, is a definition of *environmental health*. The answer given is often tempered by one's political slant (i.e., liberal, moderate, or conservative) and by one's professional training (e.g., public health sanitation, chemistry, nursing, ecology, planning, public administration, etc.). Although agreement is needed to effectively address the challenges in the field, disagreement often centers on what constitutes environmental health and even on the name or nickname that should be applied to individuals whose primary focus is on one or many aspects of environmental health. Unfortunately, this disagreement has caused confusion and splintering in the field itself. It is important to accurately define and understand what comprises environmental health, and to answer the question, "Is environmental health a profession or

a discipline, or is it merely a loosely joined group of activities with an eclectic army of individuals working in it?" The reader should be able to understand environmental health's role in the public health arena; more important, the reader should not be confused with the many evolving terms and "satellite" professions that are part of the greater field of environmental health.

This chapter will define environmental health and introduce or clarify how environmental health fits into public health. It will discuss, historically, what areas environmental health programs typically have addressed, new areas that are additions to the greater arena, and how this fits within the traditional public health field. Finally, it will discuss who the professionals are that perform these environmental health duties, where and how they are trained, and future challenges for environmental health in the public and private sectors.

THE DEFINITION DEBATE

It is often easier to begin defining a subject by what it is not rather than what it is. Over the past 35 years it has become trendy to add the term *environmental* or *environment* to almost every conceivable job. Accompanying this trend has been the elevation of the terms *ecology* and *ecosystem*. Additionally, terms such as *environmental science* and *environmental protection* have crept into the realm of environmental health, with the danger that the latter is being supplanted by the former in definition and in the focus of the general public, as well as public health organizations. These fields of study are important, often overlap, and are arguably partially included in environmental health, but are not the same as environmental health. This confusion of terms and roles can lead to a dichotomy of direction, as now seen in the work of the Environmental Protection Agency (EPA) where the agency's name does not describe the focus of its activity.

To understand environmental health it is necessary to differentiate it from those terms described above and similar terms. Miller¹ defines *environment* as "all external conditions and factors that affect living organisms." It comes as no surprise that humans are living organisms. He also addresses the term *ecology* and defines it as "the study of the relationships between living organisms and their environment." This is a step closer, but does not reflect a true definition of environmental health. Another important and even more misleading term is *environmental science*. Environmental science is defined as "the interdisciplinary study of humanity's relationship with other organisms and the non-living physical environment."² Finally, in this menagerie of associated terms, the introduction of the term *environmental protection* has added to the confusion. According to the *American Heritage Dictionary*,³ "environmental protection" relates to the keeping from harm, attack, or injury the combination of external or extrinsic conditions, which affect the life growth, development, and survival of an organism or group of organisms. Plainly stated, these are activities that are essentially corrective measures or belated preventive measures addressing issues ranging from air and water quality to legislation, rules and regulations, and enforcement of standards.

SCOPE OF PROFESSIONAL RESPONSIBILITY

The scope of environmental health has expanded and become more complex. It currently encompasses environmental protection. Regrettably, as stated earlier in this chapter, environmental health and environmental protection have become linked and are used to denote different programs based on organizational settings rather than on logical or definable differences in programs, missions, or goals. This distinction is artificial and has led to inappropriate organizational separation of activities that share the common goals of protecting the public's health and enhancing environmental quality. In some cases, the separate terminology has created organizational barriers rather than essential bridges among the organizations involved in the struggle for environmental quality. The umbrella of environmental health is adequate without the additional terms *environmental protection*.

The programmatic scope of environmental health and protection, as described later in this chapter, is quite broad. In addition, global environmental health and environmental protection issues, such as habitat destruction, species extinction, possible global warming and stratospheric ozone depletion, planetary toxification, desertification, deforestation, and overpopulation are interrelated. Indeed, excessive population growth contributes to all of the foregoing problems as well as to famine, war, disease, social disruption, illegal immigration, economic failures, and resource and energy shortages.

The primary difference between the terms *environmental health* and the other related or similar sounding terms is that the focus of environmental health is on those activities that directly impact *human health*. People, not ecosystems, are the primary focus of environmental health, ranging from education, program development, policies, regulation, investment in preventive measures, or using the bully pulpit to motivate all health professionals. Environmental health seems as relevant as it ever has been, though many of the fruits of its labors are events that simply do not occur because they have been properly avoided.

How does environmental health fit into the current public health arena? An examination of the Centers for Disease Control and Prevention's (CDC) "Ten

Great Public Health Achievements—United States, 1900–1999”⁴ reveals that 5 of these 10 achievements are the result of direct involvement by environmental health professionals. These achievements are listed below with those related to environmental health highlighted in bold.

- Vaccination
- **Motor-vehicle safety**
- **Safer work places**
- **Control of infectious diseases**
- Decline in deaths from coronary heart disease and stroke
- **Safer and healthier foods**
- Healthier mothers and babies
- Family planning
- **Fluoridation of drinking water**
- Recognition of tobacco use as a health hazard

In conclusion, the term *environmental health* is a broad umbrella term for all environmentally related activities that are focused on health effects in the human population. Although elements of the terminology and concepts of science may be shared by environmental health with other related professions, it is the critical focus on health of the individual, communities, and the general public that separates peripheral areas of study from environmental health. It should also be apparent that getting the environmental science and technical matters “right” is essential to making fair, efficient, wise, and stable decisions affecting the health of individuals.

HISTORY

The history of environmental health science could easily be linked to practices that took place in Imhotep’s Egypt or in ancient Greece and Rome. However, since most, if not all, of the personal and environmental health practices that were gained by the ancients were lost for various reasons in the Middle Ages, the “civilized world” of the West was basically a filthy place both in personal hygiene and from an environmental point of view.

Many believe that environmental health received its “rekindling” on April 22, 1970, with the birth of

the first Earth Day. However, Earth Day was really a revitalization of the environmental movement that found its roots at the turn of the twentieth century in visionary leaders such as John Muir, Henry David Thoreau, Theodore Roosevelt, Gifford Pinchot, Aldo Leopold, Rachel Carson, and Garrett Hardin. In the 1960s and 1970s, Senator Gaylord Nelson from Wisconsin, Senator Henry M. “Scoop” Jackson from Washington, and other legislative leaders such as Senator Edmund Muskie from Maine sought a way to translate the public’s increasing concern with the quality of the environment and human health issues into the political agenda and the implementation of the nation’s laws. The Nixon presidency not only opened up diplomacy with China, but it also had unprecedented health, safety, and environmental accomplishments. Table 23.1 illustrates selected environmental laws and a few selected environmental law cases in the time line from 1842 to the present.

According to Yassi et al,⁵ recently there have been three waves or periods of environmental attention. The initial wave occurred in Europe in the nineteenth century; it was linked to serious public health problems involving water contamination and food adulteration. In 1848 the British Parliament passed the first broad-based public health laws. It also was the “call to arms” of the first modern “sanitarian,” Edwin Chadwick, with his theme the “sanitary idea.”⁶ Chadwick’s role in authoring the *Report on the Sanitary Condition of the Labouring Population* allowed him to propose well-founded ideas regarding the provision of habitable living conditions, adequate disposal of waste, and potable water available to the working class. Chadwick also voiced concern about and held factory management responsible for accidental injuries and deaths of workers from faulty machinery or faulty construction practices. In addition, Chadwick became troubled over the sanitary conditions suffered by British soldiers in the 1853–1856 Crimean War. His concern resulted in the posting of sanitary inspectors during that war. All of these proposals by Chadwick were environmental health issues. Each demonstrates that what is known currently as occupational health and safety and hospital sanitation found its roots with Chadwick’s “sanitary idea.” Even given today’s vastly improved conditions in

Table 23.1. Selected Environmental Laws and Environmental Case Time Line

 Legal Progression Reflecting the Efforts of the Environmental and Public Health Movements

- 1842—*Martin v. Waddell*, one of the nation's first environmental cases, goes to the U.S. Supreme Court. A New Jersey riparian landowner, Waddell, claimed that he had exclusive rights to take oysters from the Raritan River. Case involves riparian and property rights.
- 1914—Search for better health quality standards leads to first U.S. drinking water regulations.
- 1946—Administrative Procedures Act (APA) signed into law; it is used to establish due process and protocols for government agencies. Key to understanding procedural requirements for agency actions.
- 1947—Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) signed into law, requiring pesticides to be registered with the Food and Drug Administration (FDA).
- 1948—Federal Water Pollution Act (FWPA) signed into law. Authorizes the Surgeon General of the Public Health Service to prepare comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries and improving the sanitary conditions of surface and underground waters.
- 1961—Wetlands Protection Act (WPA) signed. Its main purpose is to assign responsibility to protect precious migratory bird homes and mating grounds, and to reduce the increased draining of wetlands and associated loss of habitat.
- 1962—Rachel Carson's *Silent Spring* is published. Her book led to a widespread public outcry for environmental legislation. Marks the beginning of the modern environmental movement in the view of some historians.
- 1964—Wilderness Protection Act signed into law. Law meant to preserve and protect lands in their natural and wild state. Later Congress would add areas, such as the Ansel Adams Wilderness Area (and Mt. Ansel Adams) to the lands set aside for wilderness under this Act.
- 1965—Solid Waste Disposal Act (SWDA) signed into law. This is the first law governing the disposal of solid waste (later becomes the Resource Conservation and Recovery Act [RCRA]).
- 1966—Freedom of Information Act (FOIA) signed into law. This provides citizens with access to government documents and encourages full disclosure. Current dispute over executive privilege and access to energy policy formulation by the General Accounting Office (GAO) will be interesting to follow, especially given the collapse of Enron corporation.
- 1969—Endangered Species Conservation Act (ESCA) signed into law. For the first time, allows secretary of the interior to list wildlife that is threatened with worldwide extinction. Calls for an international meeting on endangered species.
- 1969—January 28: Union Oil Company's Platform A, in Santa Barbara, California, begins disgorging oil; 235,000 gallons of oil spilled in 11 days; thousands of wildlife are killed. Public starts demanding stiffer regulations as well as large civil and criminal penalties for polluters.
- 1969—June: Cuyahoga River in Ohio catches fire. Nixon administration feels pressure of public hysteria over high-profile environmental failures like this one.
- 1970—January 1, 1970: President Richard Nixon signs the National Environmental Policy Act (NEPA). NEPA creates a Council on Environmental Quality, as well as states lofty goals on the national policy to encourage productive and enjoyable harmony between people and their environment. NEPA is referred to as the mother of all environmental laws. NEPA, Public Law 91-190, also requires Environmental Assessments to determine whether or not proposed federal actions have significant environmental impacts—thereby requiring an Environmental Impact Statement (EIS). The Environmental Protection Agency (EPA) is created by Executive Order later that year, on December 2, 1970. The Occupational Safety and Health Administration (OSHA) was also created at this time, through the Occupational Safety and Health Act (OSH Act), Public Law 91-596, December 29, 1970.
- 1970—Clean Air Act (CAA) signed into law. This law sets standards for air quality and controls hazardous air pollutants.
- 1970—April 22: First Earth Day is celebrated, helping usher in the environmental decade of the 1970s. Long hair, rock music, hippie movement, counterculture flourish.

- 1971—*Calvert Cliffs Coordinating Committee, Inc. v. United States Atomic Energy Commission (AEC)* case is decided. 449 F.2d 1109 (1971). The Court of Appeals, D.C. Circuit, J. Skelly Wright, Circuit Judge presiding, finds that the AEC's rules precluding review of key matters—including nonradiological environmental issues (unless specifically raised earlier), prohibiting reviews by other agencies and between issuance of construction and operation permits—does not comply with NEPA. Assessment of cumulative impacts are also found to be lacking. In short, AEC is charged with acting improperly and not taking into account the environmental ramifications of siting a nuclear plant being built along Chesapeake Bay. The Court ordered AEC to revise its rules.
- 1972—Coastal Zone Management Act (CZMA) signed into law. Meant to preserve, protect, develop, restore, or enhance resources of the national coast.
Consumer Product Safety Commission created as part of Public Law 92-573, enacted October 27, 1972.
- 1972—Noise Control Act (NCA) signed into law. First law governing noise pollution.
- 1973—Endangered Species Act (ESA) signed into law. Its purpose is to “Provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species. . . .”
- 1974—Safe Drinking Water Act (SDWA) signed into law. Sets standards for drinking water.
- 1975—Hazardous Materials Transportation Act (HMTA) signed into law. Regulates commerce of hazardous materials.
- 1976—Resource Conservation and Recovery Act (RCRA) signed into law. This act amends 1965 SWDA. Noted for its cradle-to-grave system of resource management.
- 1976—Toxic Substance Control Act (TSCA) signed into law. Main purpose is making sure manufacturers test products being marketed. Gives the EPA “broad authority” to control chemical risks that could not be dealt with under other environmental statutes.
- 1977—Clean Water Act Amendments (CWAA). Requires fishable and swimmable water bodies by 1985.
- 1978—Love Canal, New York, declared state of emergency due to chemical ponds adjacent to schools and houses. This environmental disaster (& Woburn) lead to passage of the Superfund law, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510.
- 1980—Alaska National Interest Lands Conservation Act (Public Law 96-487). Passed nine years after the Alaska Native Claims Settlement Act (ANCSA), ANILCA provided for designation of over 100 million acres of federal lands into conservation units, such as national parks, wild and scenic rivers, national forests, wildlife refuges, and national monuments. Quite a legacy to “Seward’s Folly,” the 1867 purchase of Alaska from Russia under the American diplomat and secretary of state William Henry Seward (1861–1869).
- 1980—Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Public Law 96-510, passed. Also known as Superfund, this law provides a framework for cleaning up abandoned, orphan, and contaminated sites and allocating costs and liability to potentially responsible parties (PRP).
- 1986—Superfund Amendments and Reauthorization Act (SARA) passed, Public Law 99-499, which reauthorizes the Superfund law (CERCLA). Congress provides extensive guidance and milestones for enforcing the timely cleanup of Superfund sites and species criteria for developing cleanup standards. Funding for Superfund is increased to \$9 billion. By this time the Superfund National Priority List has grown from the original 400 sites to approximately 900.
- Note:* There currently are more than 1,200 sites on the NPL; the Bush administration has proposed changing the “polluter pays” principle underlying cleanups.
- 1989—March 1989: *Exxon Valdez* spills hundreds of thousands of gallons of oil into Alaska’s Prince William Sound. This leads to the passing of the OPA.
- 1990—Oil Pollution Act (OPA) provides framework for rules, regulations, research, prevention, and compensation for possible damages to the environment from the release of oil during recovery, loading, and transportation in navigable waters.

(continued)

Table 23.1. Selected Environmental Laws and Environmental Case Time Line—continued

Legal Progression Reflecting the Efforts of the Environmental and Public Health Movements

- 1992—United Nations Conference on the Environment and Development (UNCED) meets. Discusses global environmental policy.
- 1992–1999
Clinton administration promotes new executive orders, regulations, and programs, ranging from designating national monuments to making oil drilling off limits in the Arctic National Wildlife Refuge (ANWR), to listing more toxic chemicals for regulation under laws such as SDWA and the TSCA. Administration is seen as very progressive by many environmental groups, but less concerned about costs to business for compliance. DOE, EPA, OSHA, DOT, DOA, and other federal agencies increase their budgets and initiatives. Environmental health science continues to grow.
- 2000—Closest presidential election in U.S. history. George W. Bush elected president. Role of the environment and government role in environmental health appear to have played a relatively minor part in the election; 2004 promises more interest in these issues. Earth Day initiative in 2002 touts ability to reduce mercury, acid rain, and nitrogen oxides in the Adirondack Mountains in New York state.
- 2001—September 11, 2001: Terrorist attack on the World Trade Centers and the Pentagon starts a new era of concern regarding bioterrorism, food safety, and the need to have preventive as well as infrastructure investments to have prophylactic/response capabilities in place.
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Research Note: We would like to acknowledge Ms. Dori Thompson for her research assistance with this table. The authors remain solely responsible for its content.

much of civilization, Chadwick fashioned the groundwork for what was to become environmental health.

The second wave or crisis occurred in the mid to late twentieth century. This wave consisted of two movements, environmental conservation and toxics, that eventually merged into what is known as the environmental or ecology movement.⁵ These two movements joined with a common concern regarding the effect of toxins on both humans and the environment. The legacy of the environmental movement can be seen in its evolving structure of leaders, policies, new technologies, and approaches to regulations. Although many of these activities were cloaked in the environmental movement and owe much of their success to the grassroots structure of these groups, it can be argued that their acceptance by the public was due primarily to their positive impact upon human health, rather than their impact upon the general environment.

Yassi and colleagues' third wave of concern occurred in the late 1980s and 1990s.⁵ The focus of this movement was environmental planning and economic development, tilting toward "sustainable development"—the biological idea of a society living within the carrying capacity of the ecosystem. But

once again, the underlying theme of human health is not lost in the maze of resource management, pollution, and social development issues. This is illustrated by the continuing concern over chemical exposures and the enduring and growing problems of worldwide infectious diseases, malaria, dengue, and yellow fever, and the emergence of such frightening agents as the Marburg and Ebola viruses. The search for a more sustainable society has been characterized in terms such as "industrial ecology" and "design-for-environment." What each of these shares with environmental health is the recognition that it is much wiser to invest in the front end to avoid altogether or mitigate, whether by design or process modifications, the adverse effects of exposing populations to toxins or conditions that injure or kill them.

Environmental health and protection are vital parts of public health, regardless of where they are administratively located, whether it is located at the top of the organizational chart or organizationally situated within the official public health agency. As with most fields where integration of diverse concepts is required for effectiveness, environmental health efforts must cross political boundaries and jurisdictional hur-

dles put up by agencies who wish to protect their mission and territory. Improving public health outcomes and environmental quality requires the ability to do risk assessment and to communicate those risks. It requires people with skill, competencies, and support services if efforts to protect human health and the environment are to be successful. Environment health must remain high on the public health agenda.

ENVIRONMENTAL HEALTH AT THE LOCAL HEALTH DEPARTMENT

Local health departments have the fundamental responsibility of protecting the life, health, and welfare of the people.⁷ These responsibilities are reflected to a great extent in the environmental health programs that are housed within the health department.

Essentially all city and county health departments administer an environmental health program. It is the duty of the environmental health division to protect the public health through control of environmental factors. Professionals frequently called Registered Sanitarians ensure proper compliance with public health environmental laws and sanitary codes, which are designed and implemented to "protect the public health through regular inspections, issuance of permits and investigation and follow-up of complaints."⁸ Environmental health programs are designed to reduce the risk of environmental hazards through education, surveillance, monitoring, and enforcement.

The programmatic scope of environmental health and protection includes, but is not limited to:

- ambient air quality
- water pollution control
- safe drinking water
- indoor air quality
- noise pollution control
- radiation protection
- food protection
- occupational health and safety
- meat inspection
- disaster response
- cross-connection elimination
- shellfish sanitation
- institutional sanitation
- pure food control

- housing conditions
- recreational area sanitation
- poultry inspection
- solid waste management
- hazardous waste management
- vector control
- pesticide control
- land use
- milk sanitation
- toxic chemical control
- unintentional injuries
- prevention of ecological dysfunction⁹

However, many of these programs are no longer or never have been under local health department jurisdiction. There are many reasons why these programs are not under the auspices of a local health department. In many cases it is due to the fact that "many local governments have assigned certain environmental health and protection activities to other agencies, such as public works, housing, planning, councils of government, solid waste management, special purpose districts, and regional authorities."¹⁰ This has often occurred for a number of political rather than scientific or programmatic reasons.

Depending on particular needs and funding, the diversity and extent of environmental health programs in modern-day local health departments vary widely from county to county. A vast majority of local health departments receive funding solely from the state; thus, they fulfill a usually restricted number of program mandates. These program categories most often include the following:

- **General Sanitation.** The sanitarian or environmental health specialist is responsible for enforcing local or state health and sanitation codes. Among these codes are improper storage and disposal of garbage and trash, enforcing rodent and pest control regulations, illegal dumping, and trailer court and campground inspections. Activities are often generated by complaints filed by the public. Complaints are usually assigned to an inspector who conducts an investigation, most often within 24 hours of receiving the complaint, and takes action to abate the nuisance when warranted. If the responsible party does not correct the condition(s), then fines may be

levied for each day the condition remains a public nuisance.

- **Public Facilities.** The environmental health specialist conducts environmental health and safety inspections of public swimming pools, hotels and motels, day cares, schools, correctional facilities, and tattoo/body piercing parlors. Surveyors also respond to complaints regarding these establishments to ensure compliance with appropriate codes and protection of the public's health.
- **Food Hygiene.** Most food programs include the permitting and inspection of food service facilities (delicatessen, fast-food, full-service, specialty shops, cafeterias, and all retail food stores on a routine basis (generally a minimum of two inspections annually). Nearly all health departments use the

Model Food and Drug Administration (FDA) 44-item, 100-point inspection form as a surveillance tool. Compliance is most often maintained through issuance of 10-day notices to correct, suspension of permits, permit revocations, informal hearing proceedings, and quarantining suspect foods. Consumer complaints, which frequently are numerous, are investigated within 24 hours. Due to the continued increase in the number of food service facilities, this has become the largest environmental health program at many county health departments and typically receives the most funding. A better understanding of what a typical environmental health program entails can be found in Table 23.2, which is a typical program plan submitted annually as part of the budgeting and planning process.

Table 23.2. Food Protection Program 605 (Food Service Establishments)

Program Status: There are currently 1000 food-service facilities in the county that possess state permits to operate. Approximately 35% of them are categorized as full-service, 50% are fast food type establishments, and the remaining 15% are specialty establishments or small delis. These establishments are routinely inspected a minimum of two times per year or as needed to maintain sanitary conditions. All consumer complaints and food-borne illness outbreaks are investigated within 24 hours. The state survey of food service facilities in _____ County rated an overall inspection average of 86% which is among the highest in the state. The program is staffed with five registered sanitarians, all of which have completed the FDA Inspection Standardization Program.

Goal: Strive to assure safety of food served from all facilities to consumers and assure the highest level of sanitation in such facilities in accordance with the state food code. These goals shall be attained through routine surveillance by way of inspections, consumer complaint investigations, field visits, food manager training certification programs, legal notices and permit suspension/revocation when necessary.

Objectives: During Fiscal-Year 2002-2003

1. Conduct 2500 routine inspections.
2. Issue 500 notices to correct violations found during routine inspections.
3. Conduct 550 follow-up inspections as a result of the notices to correct violations.
4. Conduct 800 investigations as a result of consumer complaints or personal observances.
5. Perform 400 field visits to offer consultation or to follow up on facilities with ongoing problems.
6. Plan review on 40 food service blueprint design submittals for approval to construct or remodel to assure compliance with regulations.
7. Issue 50 Notices of Intent to Suspend Food Service Permits.
8. Adjudicate 50 administrative hearings as a result of Notices of Intent to Suspend Permit actions.
9. Revoke two permits to operate as a result of hearing actions.
10. Offer eight food managers certification courses.
11. Quarantine and/or voluntarily destroy 1600 pounds of food found to be adulterated or contaminated.
12. Inspect, permit and collect permit fees from 650 temporary food establishments operating at special events, celebrations and fund raising events.

- **On-Site Wastewater.** Services provided include design and approval of on-site subsurface wastewater disposal systems, technical consulting, soil evaluations, percolation tests, and oversight of sewage installation to ensure compliance. Nationally, over 30 percent of all new residences are installing subsurface on-site systems; therefore, this has become a major program for county health departments in predominantly rural areas. In fact, many rural area health departments are so overwhelmed by the mass development of home construction, that their on-site wastewater program has become the priority, at the expense of other program mandates.

Many larger city and regional health departments go beyond the scope of programs detailed above and many have funding above and beyond a baseline program budget. This additional funding might be the result of a local health tax assessment or a matter of local government adding to the state budget to offer nonmandated programs considered to be of importance locally or regionally. Therefore, a progressive health department may administer large programs in injury prevention, road safety,¹¹ and wellhead and watershed protection.¹² Some health departments have requested and received responsibility for programs traditionally administered by other agencies. An illustration of this is Nashville, Tennessee, where the state transferred responsibility for the air pollution program from the State Department of Natural Resources to the City Health Department.¹³ A few health departments are going in an opposite direction, attempting to relinquish programs to privatization. A case in point is that recently a city health department attempted to contract out their food inspection program to a private company.

Whenever possible, environmental health services should be delivered by the agency that is closest to the people being served. A local community agency can do a better job of protecting the local environment than can a distant bureaucracy. Visionary environmental health professionals foresee a future where fragmentation of programs among various agencies and private entities comes to an end and the local health department becomes the center for the entire scope of environmental health programs.

ENVIRONMENTAL HEALTH PERSONNEL

“Although the sanitarian is more directly the offspring of the physician health officer, and although the sanitary engineer has his genesis, in part, in the sanitarian, the public health officer’s function has been markedly influenced by the work of the sanitary engineer.”¹⁴ Environmental health professionals are known by many names, and are employed in both the public and private sectors. One would be hard pressed to name any major organization, public or private, not employing persons with either training or education in environmental health to protect their human resources or the public that impact their organizational missions. Arguably, the Louisiana State Department of Public Health employed some of the first persons formally trained in the science of environmental health in the United States in the 1940s. These individuals were primarily patronage employees. However, they were carefully educated on the job by Dr. Ben Freedman, then director of the state health department. This training process was a benchmark in the use of nonphysicians for environmental health activities. The training materials used and in part developed by Dr. Freedman were later published as the *Sanitarians Handbook*, which defined the scope of the profession in public health departments until the early 1970s. This book, while outdated in many content areas, is still a classic and is used in many developing countries.¹⁴

FEDERAL AGENCIES AND THE PRACTICE OF ENVIRONMENTAL HEALTH

The creation of the Environmental Protection Agency, the Occupational Safety and Health Administration, and the Consumer Product Safety Commission by President Nixon during the first years of his administration had major impacts in reducing the scope of environmental health activities at local and state public health levels. In the public sector, this resulted in the placement of many environmental health professionals in agencies other than those charged with public health responsibilities. All cabinet level agencies of the federal government have offices that are responsible for environment, health, and safety (EHS), including all major branches of the military.

The United States Environmental Protection Agency (EPA) was created by executive order on September 9, 1970. The order incorporated water pollution control and certain pesticide research functions from the Department of the Interior; water supply protection, solid waste management, air pollution control, radiation protection, and pesticide research from the Department of Health, Education, and Welfare; pesticide regulation from the Department of Agriculture; and radiation standards from the Atomic Energy Commission and the Interagency Federal Radiation Council. In addition to the EPA, other significant environmental health and protection agencies of the federal government include:

- Public Health Service (including the National Institute of Environmental Health Sciences, the Centers for Disease Control and Prevention, the Indian Health Service, the Food and Drug Administration, the Agency for Toxic Substances and Disease Registry, and the National Institute for Environmental Health and Safety)
- Coast Guard
- Geological Survey
- National Oceanographic and Atmospheric Administration
- Nuclear Regulatory Commission
- Corps of Engineers
- Department of Transportation
- Department of Agriculture
- Department of Housing and Urban Development⁹

Due to the growth of environmental health outside the local and state health department domains, there are now many new titles for these environmental health professionals that do not reflect their public health roots. This blurring further increases the difficulty of educating the environmental health professional about a common knowledge base that defines the profession. The environmental health arena is made up of both environmental health professionals and professionals working in environmental health. The environmental health professional is an individual having a formal education in environmental health sciences drawn from a nationally recognized common core of knowledge. The professional work-

ing in environmental health is the person that does not have the common environmental health core of knowledge, but does have formal education in a specialty area. Some examples of these would be the entomologist, the toxicologist, and the environmental engineer.

EDUCATION OF ENVIRONMENTAL HEALTH PROFESSIONALS

The U.S. military services all have very strict requirements for their preventive medicine officers in terms of formal environmental health educational requirements. To be an officer in environmental health, the officer candidate is typically required to have a bachelor's or master's degree in environmental health sciences, public health, or engineering. The U.S. Public Health Service, a uniformed service under the Department of Health and Human Services, also has the equivalent, if not stricter requirements for educational background. In contrast, most local and state health departments do not require their environmental health workers to be formally educated in environmental health. Typically, they do require a science-related bachelor's degree, however. These public health agencies often attempt to make up for the lack of a formal education with in-service education and experience. Some states also require certification or licensure. It is interesting that the uniformed services are far more concerned with formal environmental health education than most state and local public health agencies. Of course, history is replete with wars lost due to preventable illness in the ranks of the competing armies.

The formal education of an environmental health professional requires the provision of basic tools for the future practitioner. The students should have education in areas that allow them, as professionals, to protect the public from chemical, biological, and physical threats and hazards to their health and well-being. The scope of environmental health requires that the true environmental health professional have knowledge in the following subject domains:

- Biology
- Chemistry

- Physics
- Mathematics
- Statistics
- Anatomy
- Physiology
- Epidemiology
- Toxicology
- Microbiology
- Zoology
- Vectorborne disease control
- Radiological health
- Solid and hazardous waste management
- Food safety
- Housing and institutional control
- Administration
- Public health and environmental law
- Injury control
- Industrial hygiene and safety principles
- Air pollution and ventilation principles

THE NATIONAL ENVIRONMENTAL HEALTH SCIENCE AND PROTECTION ACCREDITATION COUNCIL

The National Environmental Health Science and Protection Accreditation Council (NEHSPAC) is the primary accrediting agency for universities recognized by the U.S. Department of Education for educating environmental health professionals at the undergraduate level. The goal of accreditation of undergraduate environmental health science and protection programs is to enhance the education and training of students who intend to become environmental health science and protection practitioners/professionals. The criteria used in the evaluation of programs have been developed through the joint efforts of environmental health science and protection academicians and practitioners, and reflect the demands of the professions listed above. The Web site for this organization is as follows:

<http://www.ehaoffice.org/UGCriteria.htm>.

COUNCIL ON EDUCATION FOR PUBLIC HEALTH

The Council on Education for Public Health (CEPH) is an independent agency that is also recognized by the U.S. Department of Education for accrediting

universities offering public health education. CEPH is officially recognized to accredit graduate schools of public health and graduate programs in community health education and community health and preventive medicine in the United States. The American Public Health Association and the Association of Schools of Public Health created the Council in 1974 in response to continuing professional and legislative requirements for evaluation and maintenance of quality in graduate education for public health. The purposes of CEPH are to improve the health of the public by establishing and applying high standards in the education of public health professionals; to assist educators in organizing and developing curricula focused on public health and in assessing educational outcomes; to evaluate the content and quality of instruction, research, and service components of education for public health; and to promote high standards in both public health education and public health practice. In addition to accreditation, CEPH provides consultation and review services to public health schools and programs on request and encourages ongoing self-evaluation in all public health education. A core course in environmental health is required of all CEPH-accredited Master of Public Health degrees. The Web site for this organization is: <http://www.ceph.org/>.

FUTURE OF ENVIRONMENTAL HEALTH

The future of environmental health is growth—growth that threatens to further dilute the visibility of the profession because of the shortage of qualified individuals holding professional environmental health education. Currently, based on Internet job searches, there are well over 100,000 jobs open in the private sector for environmental health and safety professionals. The public sector has an estimated 25,000 new positions created each year. This public sector estimate is likely to be considerably low since it was based on a U.S. Health and Human Services, Bureau of Health Manpower study conducted in 1987. The combined output of educated professionals in environmental health from NEHSPAC- and CEPH-accredited schools do not begin to meet current demands, let alone projected demands.

FUTURE CHALLENGES FOR ENVIRONMENTAL HEALTH

Because of the increased possibility of bioterrorism and the realization of the role environmental health plays in disaster management in the new homeland defense, the shortage of trained personnel is likely to grow, particularly in federal agencies. The current diminished role assigned to local health department environmental health professionals in bioterrorism may be, in part, due to these different standards of education. The warming of the U.S. climate, if it continues, will create new demands for old programs in vectorborne disease control as a result of the creeping northward of diseases more common in temperate

climates. The overcrowding of the highway infrastructure is likely to result in traffic injuries becoming an environmental or public health issue requiring additional focus on education of environmental health personnel in injury control. The future will likely require more effective cost-benefit analysis of current programs and the willingness of current professionals to establish baselines of current problems to provide effective data for cost-benefit analysis. The failure of environmental health to embrace a common professional nomenclature and acceptance of the concept of a common educational core will continue to waste public dollars and cost both lives and public confidence.

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