

Editorial: Toward a Holistic Approach to Public Health Surveillance

Surveillance is an essential public health function,^{1,2} and the paper by Thacker and colleagues in this issue of the *Journal*³ represents an important advance in the application of surveillance to environmental public health. Their clear thinking and straightforward approach should contribute substantially to the development and improvement of surveillance systems. Issues raised by this paper concern scope, methodology, dissemination and use of data, and a holistic approach to surveillance.

Scope

The authors appropriately define the field of environmental public health in a broad manner. "Hazards" in this field include those related to air pollution (both outdoor and indoor), water pollution (by microorganisms and chemicals), food contamination, consumer products, and a variety of others involving health and safety hazards in the environment. Arguably, safety on the road, in the home, and at work could be considered parts of environmental public health. "Exposures" in this broad field cover a wide spectrum of chemical, physical, biological, and, not to be forgotten, psychosocial hazards. "Health outcomes," likewise, cover an extremely wide spectrum, including not only illnesses—from acute infectious diseases to cancer and other chronic conditions—but also injuries, both acute and cumulative trauma.

For some categories of hazards such as food contamination, some exposures such as lead, and some health outcomes such as certain infectious diseases and cancer, public health surveillance is already well developed. For other hazards such as indoor air pollution, other exposures such as nonionizing radiation, and other health outcomes such as neurological disorders, it is not.

Methodology

The authors' hazard-exposure-health outcome framework is a helpful way to approach surveillance in environmental public health. As they state, a great deal can be learned from the experience in recent years in occupational health surveillance, especially from the Sentinel Event Notification System for Occupational Risks (SENSOR), which operates in

many states and is coordinated by the National Institute for Occupational Safety and Health (NIOSH).⁴⁻¹⁶ Some of the successful elements in occupational health surveillance have been the following:

- State-based programs that reflect state-based problems and needs and consider resources and opportunities that exist in the state

- Identification of sentinel health events to give priority to the surveillance of the most important health outcomes. (The SHE[O]—sentinel health event [occupational]—list developed for occupational health problems could serve as a useful basis for developing an analogous list for priority problems caused by environmental toxicants¹⁷)

- Use of sentinel reporters or sentinel sources of surveillance information, such as respiratory medicine specialists for reporting cases of work-related asthma, laboratories for lead poisoning, and hospital discharge records for silicosis

One should not forget that there are many situations in the United States and other countries—especially developing nations, the nations of Central and Eastern Europe, and the republics of the former Soviet Union—where surveillance programs do not have access to reliable data, or where reliable data do not exist, on the presence or levels of hazards in the environment, specific exposures, or health outcomes. In such situations, in which relevant quantitative data are sparse or nonexistent, public health practitioners may have to rely on qualitative information about the use of certain materials and the presence of certain hazards. In ascertaining such qualitative information, anthropologists, sociologists, and other specialists can play an important public health role by interviewing key informants in government, business, labor, and the nongovernmental organization sector as well as those exposed to environmental exposures, including those adversely affected by these exposures.^{18,19}

Dissemination and Use of Data

It is important to emphasize that, as the authors state, analyzed surveillance data and their interpretation need to be disseminated in a timely manner to those who need it for public health purposes, including those who submitted the data. Surveillance data should guide short-term

and long-term interventions. These data can also serve as a basis for educating the public and policymakers about (a) the nature and magnitude of a problem, (b) what needs to be done to control it, and (c) what resources will be needed to control it. At a time when the public needs to be reeducated about the importance of public health, surveillance can play an even more important role than before.

In the United States, as government cuts funds and reverses major policies in environmental and occupational health,^{20,21} environmental hazards, exposures, and adverse health outcomes are likely to increase. Surveillance can play an important role in documenting these impacts.

A Holistic Approach to Surveillance

Surveillance of environmental toxicants is important; however, it should be approached as part of a broader whole. There is a pressing need for a comprehensive national surveillance system, for which a strong foundation already exists. Surveillance of environmental toxicants—hazards, exposures, and health outcomes—should be integrated into such a comprehensive system.

Such a comprehensive system could integrate surveillance for many different types of hazards, exposures, and health outcomes. In so doing, it could help delineate relationships among problems of public health importance. For example, it could help delineate relationships among pesticide exposure of agricultural workers (occupational health surveillance), pesticide pollution of soil and water in farming regions (environmental health surveillance), and pesticide contamination of fruits and vegetables on sale in markets (food surveillance).

Such a comprehensive system could include "denominator" data, such as the characteristics of the exposed (or at-risk) population for certain hazards so that additional analyses of surveillance data could be performed. These additional analyses could, for example, document instances of environmental injustice by correlating ethnic, racial, or income char-

Editor's Note. See related annotation by Morabia (p 625), article by Thacker et al. (p 633), and comment by Hertz-Picciotto (p 638) in this issue.

acteristics of populations with their exposures to pesticides at work, in the ambient environment, and in food consumed.

Such a comprehensive system could facilitate coordinated approaches to prevention and control of specific problems among public health, environmental, and other agencies and organizations. For example, it could facilitate an integrated approach to addressing pesticide exposure at work, in the ambient environment, and in food by state departments of public health, labor, agriculture, and environmental protection, as well as other organizations in the public and private sector working together.

A holistic approach to public health surveillance could hold the key to a much needed holistic approach to public health practice. □

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Annotation: From Disease Surveillance to the Surveillance of Risk Factors

Classical surveillance systems focus on monitoring mortality and, to a lesser extent, morbidity. These systems are adequate for assessing the effectiveness of public health intervention when the elimination of the cause has immediate impact on incidence or mortality rates. However, they are insufficient when decades separate exposure to preventable factors from the clinical manifestations of a chronic disease. In this context, monitoring distributions of risk factors in populations provides short-term indicators to identify preventive strategies, assess their effectiveness, and predict emerging epidemics. Surveillance of risk factors has been progressively instituted since the early 1970s. Some methodological issues still need to be addressed to fully integrate it in public health policies.

Surveillance of Disease

In its classic definition, disease surveillance means monitoring distributions and trends of morbidity and mortality data.¹ Its functions are to anticipate immediate health problems, to observe their evolution, and to guide decisions for their control. It has been successfully applied to major communicable diseases (e.g., polio, smallpox, malaria, influenza, tuberculosis) but also to noninfectious diseases.²

The epidemic of paralytic poliomyelitis shortly after World War II exemplifies the potential articulation between surveillance of disease and public health intervention. Improved living standards in the United States¹ and several European countries^{3,4} had delayed the age at first

exposure and produced an unexpected outbreak of poliomyelitis associated with severe neurologic complications among young adults. Average incidence rates had notably increased in the early 1940s and reached a peak in the early 1950s.⁵ The impact of prevention was demonstrated by the sharp decline of rates that followed the introduction of the poliovaccine programs.^{1,3,4}

More generally, epidemiology and public health have benefited from the efforts of monitoring causes of death or from instituting disease registries. Major emerging (e.g., coronary heart disease, lung cancer) or declining (e.g., gastric cancer) epidemics were identified. How-

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