Public Health's Response to a Changed World: September 11, Biological Terrorism, and the Development of an Environmental Health Tracking Network

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Historically, the importance of public health has often been recognized during or as a result of major tragedy. The attacks that occurred in the United States in 2001 are no exception.

These events have raised awareness of our vulnerability and the need for emergency preparedness, the need for a flexible and sustainable public health infrastructure, and the importance of linkages between environmental exposures and health outcomes.

The authors encourage the public health community, along with policymakers, to develop a national environmental health tracking system that can improve our overall public health capacity and prepare us to investigate the critical issues of the day, whether they be emerging infectious diseases, terrorist attacks, or chronic illnesses.

IN LIGHT OF THE TRAGEDY that occurred in our country on September 11, 2001, and the subsequent bioterrorist attacks in October and November of that year, the public health community has been forced to step back and reassess its priorities. What teachable moment can we glean from the emotional and physical devastation that the country faced? What insights can we as a public health community share with the nation from our unique perspective? The events of 2001 have done more than heighten our individual and community state of awareness; they have raised the importance of public

health and emergency preparedness to a new level.

FROM TRAGEDY TO ACTION

Throughout history, tragedy has increased people's recognition of public health. An example is the case of a chemical spill of historic proportions that occurred at the Union Carbide plant in Bhopal, India, on December 3, 1984, leading to 2000 casualties and more than 100 000 injuries.[1] Current statistics now estimate the resulting death toll at 20 000 people over the last 17 years. In addition, it is predicted that the event will have long-term adverse effects, in terms of ill health and disability, on more than 50 000 people.[2] This disaster was the impetus for passage of the Emergency Planning and Right to Know Act of 1986 (Pub L No. 99-499), legislation that demonstrated the importance of planning for a possible disaster in the United States.

Similarly, a mine explosion and subsequent fires in Farmington, WV, in 1968 resulted in the deaths of 78 miners and led to the establishment of the Federal Coal Mine Health and Safety Act of 1969 (Pub L No. 91-173).[3] This act required that all mines have an annual inspection and that underground coal mines have 4 yearly inspections; in addition, it established mandatory fines for violations and allowed for the closure of mines due to imminent danger. Finally, this legislation led to the adoption of important health standards, including benefits for miners disabled as a result of black lung disease, thus improving safety for all miners.[3]

These and other lessons from the past have resulted in vastly improved US health and safety policies. In the same way, it is important that we use what we have learned from the September 11 disaster and the subsequent anthrax attacks to improve our public health policy, in preparation both for imminent disaster and, most important, for the everyday needs and services that public health must provide.

ENVIRONMENT AND PUBLIC HEALTH INFRASTRUCTURE

Now that we have mapped the human genome and studied individual and social behavior, searching for the solutions to disease and disability, it is becoming clearer that the etiology of many diseases is truly multifactorial, and one of the factors that cannot be ignored is the external environment. For example, tremendous strides have been made in understanding cancer and the factors that increase cancer risk. It is now known that most cancers (as well as a variety of other chronic diseases) are associated with external—or environmental—factors, including tobacco and alcohol use, nutrition, physical activity, and chemical exposures, with minor contributions from inherited genetic mutations.[4,5]

Numerous experimental, laboratory, and epidemiological studies conducted over the past several years have linked high concentrations of known air pollutants to respiratory health problems, and a simple social experiment reinforced this relationship: during the 1996 Olympic Games in Atlanta, efforts to reduce downtown traffic congestion, especially during the morning, were associated with prolonged reductions in ozone pollution and a 41% decrease in rates of childhood asthma events requiring emergency care or hospitalization.[6] This example illustrates that significant improvements can be made over a very short period of time, but it also raises an important question. What kind of damage can be done over a short period of exposure to environmental contaminants such as those that the rescue and cleanup workers faced in the days following the World Trade Center collapse?

The events of September 11 have elevated the connection between environment and health to a new level. In recognition of this important connection, funds have been directed to researchers and communities to conduct studies that will help us better understand overall health outcomes. Congress has appropriated $12 million to study health outcomes among firefighters involved in the rescue efforts at the World Trade Center site. In addition, an array of studies are under way to evaluate health concerns related to being present in lower Manhattan on the day of the attacks, as well as to ascertain health-related effects on the residents of that area. However, these health concerns are not limited to the World Trade Center site; rather, they are relevant to the broader issue of how everyday environmental exposures affect our health.

The anthrax attacks that occurred in October and November of 2001 provided similar wakeup calls. Although emergency response plans were in place in some areas, medical experts had previously misjudged the difficulty that doctors might face in diagnosing inhalation anthrax because each case involved such varied symptoms. The anthrax attacks and other recent threats have strained the abilities and resources of the Centers for Disease Control and Prevention (CDC) and state and local health departments to react effectively. For example, as a nation, we were unable to prepare an effective risk communication strategy after the anthrax events that could alleviate nationwide panic, and we were unprepared for the volume of laboratory samples that had to be processed. What does this mean for our nation's capacity and ability to handle a more widespread attack?

The anthrax attacks exemplify the need for a comprehensive and effective public health infrastructure that has the ability to address any type of emergency. Before the attacks, in a March 2001 congressional hearing, CDC proposed a major national initiative linking partners at the local, state, and federal levels to address critical gaps in health care workforce capacity and competency, information and data systems, and organizational capacities of local and state

health departments and laboratories.[7] Unfortunately, it was not until December of 2001 that Congress allocated significant funding for this initiative. These funds included $1 billion for state and local preparedness, $918 million of which was allocated to CDC for state and local health departments to upgrade their ability to react to bioterrorism and other public health emergencies.[8]

Such plans are not new. Led by senators Kennedy and Frist, Congress passed a bill in October of 2000, the Public Health Threats and Emergencies Act (Pub L No. 106-505), directing the Public Health Service to take appropriate action in responding to or investigating the cause, treatment, or prevention of a disease that might present a public health emergency. In addition, the bill required the secretary of health and human services to establish a working group focused on preparedness and readiness for the medical and public health effects of a bioterrorist attack. Unfortunately, this legislation was not perceived as a national priority until the events of 2001.

While investments such as those just described represent an important start, public health infrastructure needs a long-term commitment well beyond a narrow focus on terrorism. Collaboration and communication at the federal, state, and local levels are cornerstones for enhancing our infrastructure's ability to handle unexpected as well as "traditional" public health emergencies. Although emergency public health has always been a public health activity, it is now a priority, one that must include preparing, planning, tracking, and responding to all public health threats.

It is important to link our pressing public health preparedness needs with the growing national concern regarding rising rates of chronic diseases that may have links to the environments in which we live. For example, Libby, a small town in northwestern Montana, has watched for decades as many of its residents have fallen ill with fatal respiratory diseases. The town gained national attention in the 1990s when it was found that the deaths were due, in part, to illnesses caused by the vermiculite mine that was the town's largest employer from the 1920s to 1990.[9] The mine was also releasing large amounts of tremolite, a natural, highly toxic form of asbestos. Although decades typically pass before asbestos exposure ultimately results in chronic illness, Libby has already seen its fair share of mortality and morbidity, with more than 200 people dead from diseases connected to asbestos-tainted vermiculite and reports indicating that more than 400 additional residents are suffering from asbestos-related diseases such as asbestosis, cancer, and emphysema.[9] Tracking the steadily rising rates of chronic disease in this community would have alerted health officials to the potential problem much earlier and allowed a proactive rather than reactive intervention.

CHRONIC DISEASE AND PUBLIC HEALTH INFRASTRUCTURE

Currently, chronic diseases are the leading cause of death and disability in the United States. In the past, the primary cause of morbidity and mortality was naturally occurring infectious diseases, but scientific advances in immunology and bacteriology, along with improvements in sanitation, have largely deterred these widespread epidemics and increased life expectancy significantly. In 1900, life expectancy was 47 years on average; men can now expect to live to 74 years, and women to 80 years.[10]

Of course, as some problems are solved, others emerge. As people live longer, they are affected by many other factors that may contribute to disease, including lifestyle factors such as dietary choices, exercise frequency, and tobacco use; environmental exposures, including those occurring at workplaces; and the natural aging process. These factors, either alone or in combination, contribute to an array of chronic diseases.

One hundred million Americans live with chronic illness each year. Chronic diseases cause 70% to 80% of deaths annually, and the costs associated with these diseases (e.g., in terms of lost productivity) total $750 billion per year.[11] Chronic diseases must be addressed with the same vigor with which we address bioterrorism or emerging infectious diseases. However, the United States does not currently have a method of tracking chronic diseases similar to that used to track the occurrence of infectious diseases. Nor do we have sufficient mechanisms to evaluate the strength of the connection between the environment and chronic illness.

AN INTEGRATED RESPONSE: THE NEED FOR ENVIRONMENTAL HEALTH TRACKING

So what is the solution that can assist us in comprehensively understanding the linkages between health and environmental exposures and help us prepare our nation for handling public health emergencies? The Nationwide Environmental Health Tracking Network is part of the potential solution. This network, based on an original concept proposed by the Pew Environmental Health Commission in September 2000, is designed to link the tracking of environmental exposures, biomonitoring of the presence of chemicals in humans, and data on chronic diseases to improve the nation's prevention efforts. When this network is fully operational, it will comprise 5 key components[9]:

- national baseline tracking of certain diseases and exposures, through the use and enhancement of existing systems as well as the development of new ones as necessary
- a nationwide early warning system for acute environmental health threats, including heavy metal (e.g., lead) and pesticide poisonings

• state pilot tracking programs designed to test diseases, exposures, and approaches for national tracking that match state and local needs and concerns
• enhanced federal investigative response capability in terms of increased personnel available to respond to urgent needs as well as increased training of these personnel in the area of chronic diseases
• links to affected communities that can use the information to effect change and expanded research programs that will elucidate connections between environment and human health

Both the case of Libby, Mont, and the anthrax events highlight real-world health crises that could have been better understood or more quickly recognized had a system been in place to track and monitor levels of disease and search for unusual patterns and anomalies. The Nationwide Environmental Health Tracking Network received its initial year of funding in fiscal year 2002 through CDC. When the network is fully operational (at an estimated cost of $275 million annually, only a small fraction of the cost associated with chronic diseases in the United States), it will build the capacity of federal, state, and local public health personnel to investigate and intervene in the growing problem of chronic diseases, focusing specifically on the role of the external environment. Funds were allocated in September 2002 to establish pilot projects in 17 states and 3 large cities and to develop centers of excellence at 3 leading schools of public health. With this comprehensive network in place, the public health system will be able to identify populations at risk and respond to outbreaks, clusters, and emerging threats, whether accidental or intentional; establish or refute relationships between environmental hazards and disease; guide intervention strategies, including lifestyle improvements; and track progress toward achieving a healthier nation.[9]

DUAL-FUNCTION SYSTEMS

As the public, policymakers, and the medical and public health communities prepare to invest the additional resources appropriated to combat bioterrorism, it is critical that public health systems are developed and enhanced to be dual-function systems. Dual-function systems recognize that the same resources and skill sets are necessary whether the focus of investigation is an emerging or reemerging infectious disease, a terrorist attack, or a community cluster of chronic diseases. Although bioterrorism is currently one of the country's most pressing concerns, we hope that it will not always be an imminent threat. Eventually the urgency will fade, and the public health system will be left to cope with its continued, everyday problems.

Efforts are under way in the both the Senate and the House of Representatives to enhance federal, state, and local public health systems, and the voice of the public health community is essential to ensuring the success of such efforts. Congress made progress in this area in fiscal year 2002, increasing funding for public health infrastructure and passing the Nationwide Health Tracking Act (HR 4061, §2054); however, there is still a long way to go. Significant deficiencies continue to exist in terms of technological resources, training of personnel, laboratory sophistication and upkeep, and the overall resources necessary to perform essential public health functions.

Now that there is a critical opportunity to rebuild the public health infrastructure, the challenge is to allocate the resources in such a way that systems are both flexible and sustainable. Systems must be flexible so that they collect and compile health data of all types. It is important that investments made now to strengthen the infrastructure are sustainable. While emergency and bioterrorism preparedness are important and noble causes, it is absolutely critical not to lose sight of the overall function and focus of public health to prevent disease and disability in as many people as possible.

There are numerous lessons that the public health community can learn from the events of 2001. Our vulnerability as a nation demands that we place public health at "center stage" and build the capacity to address not only emergency preparedness but also the long-term health of the American people by tackling chronic disease. Now is the time for us, the public health voices of America, to support and bring to fruition a strong and effective environmental health tracking network. We must ask ourselves: What are the steps that we can take today to improve the health of both the present generation and future generations? ■

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