

Anthrax 2001: Observations on the Medical and Public Health Response

ELIN GURSKY, THOMAS V. INGLESBY, and TARA O'TOOLE

INTRODUCTION

THIS ARTICLE DESCRIBES ASPECTS of the medical and public health response to the 2001 anthrax attacks based on interviews with individuals who were directly involved in the response. It has been more than 18 months since *B. anthracis* spores were discovered in letters sent through the U.S. postal system. The specific purpose and perpetrator(s) of these attacks remain unknown. A total of 22 people developed anthrax as a result of the mailings, 11 suffered from the inhalational form of the disease, and 5 of these people died. Thousands of workers—including health care, public health, environmental, and law enforcement professionals—participated in the response to the attacks. Thousands more were directly affected, including individuals working in facilities contaminated by the attacks and their families. The immediate and continuing medical and public health response to the anthrax attacks of 2001 represents a singular episode in the history of public health.

After-action assessments of the response to the anthrax attacks could offer invaluable opportunities to better understand and remedy the systemic vulnerabilities revealed by America's only experience with an anthrax attack. Yet there still has been no comprehensive published analysis of the response to these events. In December 2001, the Center for Strategic International Studies convened a meeting, which included high-level government officials directly involved in managing the crisis, to discuss the response and review lessons learned. The report describing this meeting has been withheld from public distribution by the Department of Defense, which supported the meeting, on the grounds that the document contains sensitive information.¹

The "response" to the anthrax attacks was extremely complex, and any analysis that purports to assess the re-

sponse must account for this complexity. The unprecedented nature of the attacks and the context in which the response occurred are also crucial to understanding what happened and why. The long-standing neglect of federal, state, and local public health agencies, and the highly stressed condition of U.S. medical facilities, which routinely work at the limits of their capacity, are acknowledged by virtually all informed observers. That the medical and public health institutions involved in the response functioned as well as they did is a tribute to the extraordinary efforts of the individuals involved.

Despite the commitment and hard work of the individuals in these professional communities, what was revealed by the anthrax attacks was an unacceptable level of fragility in systems now properly recognized as vital to national defense. Too many citizens, elected leaders, and national security officials still have limited understanding of the degree to which 22 cases of anthrax rocked the public health agencies and hospitals involved in the response to this small bioterrorist attack. Most of the vulnerabilities in the medical and public health systems revealed by the response remain unaddressed. It is not the purpose of this article to praise or criticize individuals who responded to the 2001 anthrax attack. The emphasis here is on how to improve response *systems*. The article seeks to identify the strategic and organizational successes and shortcomings of the health response to the anthrax attacks so that medical and public health communities as well as elected officials can learn from this crisis.

The recent international spread of Severe Acute Respiratory Syndrome (SARS) is illustrating once more the importance of effective public health response systems. Initial impressions of the Centers for Disease Control and Prevention's response to SARS indicate that the agency has improved several aspects of epidemic response that were problematic in the aftermath of the 2001 anthrax at-

Elin Gursky, ScD, is Senior Fellow for Biodefense and Public Health at the ANSER Institute for Homeland Security, Arlington, Virginia. Thomas V. Inglesby, MD, is Deputy Director, and Tara O'Toole, MD, MPH, is Director, the Johns Hopkins Center for Civilian Biodefense Strategies, Baltimore, Maryland.

¹Personal communication, David Heymann, Center for Strategic International Studies, Feb. 7, 2003.

tacks. Fortunately, because the numbers of SARS cases remain low, the state public health agencies' capacities to deal with a major epidemic have not been severely tested by SARS. It is hoped that other countries' experiences with SARS will offer useful lessons for outbreak response and bioterrorism preparedness.

This article provides a small window into the medical and public health response that followed the anthrax attacks of 2001. The authors recognize that since that time a number of actions have been taken by federal, state, and local public health agencies to improve bioterrorism preparedness. It is the authors' hope that the perspectives presented in this article will stimulate more comprehensive examinations of public health biopreparedness and help guide future bioterrorism planning efforts.

METHODOLOGY

The authors interviewed clinicians, public health professionals, government officials, journalists, union representatives, and others who were directly involved in the five geographic areas where anthrax attacks took place: Boca Raton, Florida; New York City; Washington, DC; Hamilton, New Jersey; and Oxford, Connecticut. A total of 37 individuals were interviewed from the period late 2001 through spring 2002. Study participants represented the following sectors: clinicians working in hospital settings or in private practice, including physicians who cared for victims of the attacks ($n = 6$); public health professionals working in local public health agencies ($n = 9$); public health professionals working in state health departments ($n = 5$); officials from public health laboratories ($n = 2$); public health professionals working at the Centers for Disease Control and Prevention ($n = 3$); other officials of the federal government ($n = 2$); media professionals in the private and public sector ($n = 4$); postal service managers and representatives of the postal workers' union ($n = 3$); and directors of not-for-profit health organizations ($n = 3$).

Participation was voluntary and nonremunerated. Interviews were confidential. All study participants were assured that their responses would not be attributed to them in ways that could identify interviewees. A small number of the interviews were conducted in person, but most interviews were conducted in prearranged telephone calls. Prepared interview questions were intended to bring to light specific challenges and successful strategies that interviewees had observed or identified during the response to the anthrax attacks. Participants were encouraged to offer additional comments and to suggest the names of other individuals whose involvement and insights might benefit the goals of this study.

Comments from interviewees were analyzed by the au-

thors. Themes and findings that were common in the responses of multiple interviewees are reported below under "Important Issues and Challenges." Quotes from the interviews are included when they illustrate these issues.

There are limitations to the methods employed here. The authors are mindful of the responsibility to distinguish between anecdote and analysis, and we have included only those issues or themes that were raised or commented on by several interviewees. This article does

²Centers for Disease Control and Prevention. Notice to Readers: Ongoing Investigation of Anthrax—Florida, October 2001, *Morbidity and Mortality Weekly Report* 10/12/01, 50(40):877.

³Centers for Disease Control and Prevention. Update: Investigation of Anthrax Associated with Intentional Exposure and Interim Public Health Guidelines, October 2001, *Morbidity and Mortality Weekly Report* 10/19/01, 50(41):889–893.

⁴Ibid.

⁵Ibid

⁶Ibid.

⁷Ibid

⁸Ibid.

⁹Centers for Disease Control and Prevention. Update: Investigation of Bioterrorism-Related Anthrax and Interim Guidelines for Clinical Evaluation of Persons with Possible Anthrax, *Morbidity and Mortality Weekly Report* 11/02/01, 50(43):941–948.

¹⁰Jernigan DB, Raghunathan PL, Bell BP, et al. Investigation of Bioterrorism-Related Anthrax, United States 2001: Epidemiologic Findings, *Emerging Infectious Diseases* October 2002, 8:1019–1028.

¹¹New Jersey Department of Health and Senior Services. Anthrax Investigation Update in New Jersey. *News Release* November 5, 2001.

¹²Op cit., note 9.

¹³Op cit., note 2.

¹⁴Centers for Disease Control and Prevention. Update: Investigation of Bioterrorism-Related Anthrax and Interim Guidelines for Exposure Management and Antimicrobial Therapy, October 2001, *Morbidity and Mortality Weekly Report* 2001;50(42):909–919.

¹⁵Centers for Disease Control and Prevention. CDC Statement Regarding the Washington DC Processing and Distribution Center, and Postal and Mailroom Facilities Who Directly Receive and Distribute Mail from this Center, *Health Advisory* October 24, 2001.

¹⁶Centers for Disease Control and Prevention. CDC Statement regarding postal and other mailroom facilities in the Metropolitan DC area, *Health Alert* October 27, 2001.

¹⁷Op cit., note 8.

¹⁸Mina B, Dym JP, Kuepper F et al. Fatal Inhalational Anthrax With Unknown Source of Exposure in a 61-Year Old Woman in New York City, *Journal American Medical Association* February 2002;287:858–862.

¹⁹Centers for Disease Control and Prevention. Update: Investigation of Bioterrorism-Related Inhalational Anthrax—Connecticut, 2001, *Morbidity and Mortality Weekly Report* 11/30/01: 50(47):1049–1054.

CHRONOLOGY OF KEY EVENTS FOLLOWING THE ATTACKS

The following brief timeline of events following the anthrax attacks is synthesized from reports from public health agencies, news summaries and from statements of those interviewed in this study. It is not intended as an exhaustive account of events, but only as a synopsis of key developments that would enable readers of this article to place events and observations in some context.

October 2, 2001—An infectious disease physician recognized a possible case of inhalational anthrax in a man hospitalized in Palm Beach County, Florida. This physician contacted the local health officer in Palm Beach County, who immediately began a public health investigation. By October 2, there were already 7 persons with cutaneous anthrax in the northeastern U.S., but none had yet been diagnosed.

October 4—The microbiologic diagnosis of *B. anthracis* was confirmed by the Florida Department of Health (FDH) and the Centers for Disease Control and Prevention (CDC), and the diagnosis was made public.^{2,3} Epidemiologic and environmental investigations were launched to determine the source of the patient's anthrax exposure. Evidence of contamination with *B. anthracis* was found at American Media Inc. (AMI) in Boca Raton, Florida, where this first victim worked as a photo editor.⁴

October 5—The first victim of the anthrax attacks died. A second AMI employee, who had been hospitalized for pneumonia on September 30, was diagnosed with inhalational anthrax. He was an employee in the AMI mailroom.

October 6—The Palm Beach County Health Department began to obtain nasal swabs from those who had been in the AMI building in an attempt to define exposure groups.⁵ Because nasal swab testing was known to be an insensitive diagnostic test, the health department also recommended prophylactic antibiotics for all those people who had been in the AMI building for at least one hour since August 1 regardless of the results of their nasal swab tests.⁶ Environmental samples taken from the mailroom showed evidence of *B. anthracis*.

October 7—A nasal swab was positive on another employee. A swab from the first victim's computer screen was positive. The AMI building was closed.

October 9—The New York City Department of Health notified CDC of a woman with a skin lesion consistent with cutaneous anthrax. The woman, an assistant to NBC anchor Tom Brokaw, had handled a powder-containing letter postmarked September 18 at her workplace.⁷

October 13—Another cutaneous case of anthrax was recognized in a 7-month-old infant who had visited his mother's workplace, the ABC office building on West 66th Street in Manhattan, on September 28.⁸

October 13—Symptoms of cutaneous and inhalational anthrax in New Jersey postal workers began to be observed and reported by physicians to the New York City Health Department. Diagnoses of anthrax are confirmed by the CDC on October 18 and 19.⁹⁻¹¹

October 15—A staff member in the office of Senator Daschle in the Hart Senate Office Building opened a letter (postmarked October 9) which contained a powder and a note identifying the powder as anthrax. The powder tested positive for *B. anthracis* on October 16. Nasal swab testing of anthrax spores was performed on 340 Senate staff members and visitors to the building who potentially were exposed and to approximately 5,000 other people who self-referred for testing. This testing indicated exposure in 28 persons. Antimicrobial prophylaxis was administered on a broader scale and environmental testing was initiated.¹²

October 19—CDC linked the four confirmed cases of anthrax to "intentional delivery of *B. anthracis* spores through mailed letters or packages."¹³

October 19-22—Four postal workers at the Brentwood Mail Processing and Distribution Center in the District of Columbia were hospitalized with inhalational anthrax. The Brentwood facility was closed on October 21. On October 22 two of these four postal workers died.¹⁴

October 24—CDC sent an advisory to state health officials via the Health Alert Network recommending antibiotic prophylaxis to prevent anthrax for all people who had been in the non-public mail operations area at the U.S. Postal Service's Brentwood Road Postal Distribution Center or who had worked in the non-public mail operations areas at postal facilities that had received mail directly from the Brentwood facility since October 11.¹⁵

October 27—A CDC alert recommended antibiotic prophylaxis for workers in the mail facilities that supplied the CIA, the House office buildings, the Supreme Court, Walter Reed Army Institute of Research, the White House, and the Southwest Postal Station after preliminary environmental sampling revealed *B. anthracis* contamination in these mailrooms.¹⁶

October 31—A 61-year-old female hospital stockroom worker in New York City died from inhalational anthrax after she had become ill with malaise and myalgias on October 25. The source of her exposure remains unknown despite extensive epidemiologic investigation.^{17,18}

November 16—A 94-year-old woman residing in Oxford, Connecticut, was hospitalized with fever, cough, and weakness. She died on November 19. Her diagnosis was confirmed as *B. anthracis* on November 20 by the Connecticut Department of Public Health Laboratory. Subsequent environmental and epidemiological testing indicated exposure from cross-contaminated letters.¹⁹

not focus on the actions taken by individual hospitals, though many hospitals had key roles in the response and published accounts of such institutional experiences would be of great value. Nor does this article offer an analysis of the decisions, processes, and actions occurring within the Centers for Disease Control and Prevention (CDC), the Department of Health and Human Services (DHHS), the Federal Bureau of Investigation (FBI), or other federal agencies engaged in the response to the anthrax attacks. Such analyses could provide very useful information and should remain a priority.

Much time and effort is being invested in the development of bioterrorism exercises and drills at multiple levels of government and in the private sector. A comprehensive analysis of what actually happened after the anthrax attacks informed by more voices and the willing cooperation of involved institutions would be useful.

A brief timeline of events following the anthrax attacks, synthesized from reports from public health agencies, news summaries, and statements of those interviewed in this study, is provided on page 99. It is not intended as an exhaustive account of events, but only as a synopsis of key developments to enable readers of this article to place events and observations in some context.

BACKGROUND: CONTEXT OF THE U.S. PUBLIC HEALTH SYSTEM

In the United States, public health functions are conducted by agencies at federal, state, and local (municipal, county, etc.) levels of government. These agencies vary in scope and capacity and are only loosely connected. The legal responsibility for many public health functions is vested in state governments. The level of state operational authority over local health departments varies across the country, but most state health departments provide disease control assistance when more than one local jurisdiction is involved or when local resources are insufficient.

There are approximately 3,000 local (i.e., municipal, county, city) health departments that routinely conduct restaurant inspections, environmental testing, and disease outbreak investigation and control.²⁰ Many of these agencies also deliver a broad spectrum of clinical services such as the provision of immunization, treatment of tuberculosis and sexually transmitted diseases, hypertension screening, and prenatal care. The median number of full-time staff in local health departments is 13 persons. Two-thirds of these local public health agencies are responsible for populations of fewer than 50,000 persons.²¹

The federal agency that deals with public health is the Centers for Disease Control and Prevention within the Department of Health and Human Services. Initially or-

ganized in 1946 to lead malaria control efforts, CDC now employs 8,500 people.²² CDC serves as a source of scientific guidance and funding for many state and local public health programs. Traditionally, states formally request and receive assistance from CDC when a disease outbreak exceeds local skills and resources, or when an unusual health threat is involved which requires specialized expertise. CDC has limited formal authority within states or local jurisdictions unless public health problems arise that cross state borders.²³

IMPORTANT ISSUES AND CHALLENGES IDENTIFIED BY INTERVIEWEES

Public health decision-making processes

The 2001 anthrax attacks challenged traditional decision-making processes of federal, state, and local public health authorities. Historically, most outbreaks of naturally occurring disease are first recognized in a limited geographic region; laboratory and clinical methods for accurately diagnosing and treating cases of an unfamiliar illness (e.g., HIV/AIDS, Hanta virus, Legionnaire's Disease) often evolve over a period of months or even years. Data pertaining to the outbreak and the causes of the illness are collected and analyzed by scientists at CDC and other public health agencies and medical institutions, and these analyses are discussed in the academic public health and medical communities at conferences and in medical journals. With time, a consensus view usually emerges about the causes of the disease, who is at risk, and how the illness can best be diagnosed, treated, and prevented. These scientifically based guidelines often are published by CDC and/or professional medical societies and serve as the basis for state and local public health practice.

In October 2001, at the time of the initial discovery of a person with anthrax infection in Florida, public health officials worked closely with clinicians in Palm Beach County to rapidly confirm the medical diagnosis of anthrax and to initiate the epidemiologic investigation that followed. For many of the decisions and actions that would follow, traditional public health decision-making processes were not adequate to cope with the extent, pace, and complexities of events surrounding the attacks.

This was the first time that CDC had been called on to respond to outbreaks of illness occurring nearly simultaneously in five geographic epicenters. Because sending

²⁰National Association of City and County Health Officials. Local Public Health Agency Infrastructure: A Chartbook, October 2001. www.naccho.org/general428.cfm

²¹Ibid.

²²www.cdc.gov/aboutcdc.htm

²³42 CFR §70, 70.2.

B. anthracis spores through the mail was clearly an act of terrorism, the FBI was involved, substantially increasing the number of people and organizations that needed to receive and interpret information pertinent to the disease investigation and remain “in the loop.” In addition, because anthrax is virtually unknown in current medical practice, few local or federal public health officials had ever seen or been involved in evaluating a single case of *B. anthracis* infection, let alone a bioterrorist attack resulting in a series of cases.

Many public health policies—for example, whether to offer needle exchange programs to stem the spread of HIV/AIDS, or the nature and extent of prenatal care programs—routinely differ quite extensively from state to state and reflect variations in resources, expertise, and judgments about local priorities and needs. In the context of the anthrax attacks, however, policies and recommendations that differed between states, and between states and CDC, caused confusion. In some cases, inconsistencies in the response were interpreted as evidence of incompetence or inequitable treatment, rather than as nuanced reactions to local situations or principled disagreement about what was the best course of action.

Throughout the crisis, huge volumes of information related to the anthrax attacks arrived at federal and state public health agencies via email, phone, fax, and news media reports. The information came from disparate sources that included local and state health departments, postal distribution sites, unions, physicians, hospitals, clinics, and laboratories. At the same time these agencies were gathering and trying to make sense of available data, they faced enormous demands to rapidly produce clear and accurate information and guidance for both public and professional use. Those interviewed for this study acknowledged these daunting challenges. One public health official echoed the sentiments of many: “CDC was in a classic double bind. They have to be exactly right. And they have to be exactly right very quickly.”

In some instances, state and local public health officials were reluctant to initiate public health actions, such as recommending prophylactic antibiotics, without benefit of specific CDC guidance. Other health departments made decisions prior to receiving CDC guidance, in some instances deciding to act in ways that conflicted with CDC recommendations. Such variations in states’ decisions were especially notable in the context of determining who was at risk for exposure to *B. anthracis* spores and who should receive prophylactic antibiotics.

Confusion and contention surrounded both CDC’s authority to mandate specific public health actions and state public health officials’ responsibility to act on their own best judgments. Noted one state public health official, “We relied on CDC as a consultant. They gave us guidance and knowledge, but we used our own instincts. [We

concluded that], if the environment had one spore, you are exposed.” A local public health official expressed the view that although CDC’s scientific expertise was valuable, CDC was “a research-based organization, far removed from how public health is delivered,” and hence was not well placed to make operational decisions on the local level.

Some interviewees described disagreements that occurred between state public health officials and CDC. For example, New Jersey public health officials learned that three New Jersey postal workers had sought medical care for cutaneous anthrax between October 13 and 19. By October 19, state public health officials recognized that these cases likely were the result of exposures to at least two unopened anthrax-contaminated letters postmarked at the Trenton post office. State public health officials wanted to provide prophylaxis to postal workers in the facilities where these three cases of cutaneous anthrax had been diagnosed, but officials from CDC did not concur. One health official recalled, “CDC still believed [at that time] that only the material in opened letters could aerosolize, and therefore closed letters posed no risk. They still thought of anthrax spores like fomites—a disease contracted through touching something contaminated. We were left with the option of recommending antibiotic prophylaxis for postal workers on our own, or waiting until CDC came to this conclusion later. We went against CDC’s advice.” New Jersey officials released a health alert on October 19 recommending that all postal workers at the two implicated post offices begin a course of antibiotics. Because CDC did not agree with state health officials’ decision, resources from the National Pharmaceutical Stockpile were not immediately released. State public health officials therefore instructed postal workers to obtain antibiotics from their private physicians.

On some occasions during the response to the anthrax attacks of 2001, confusion about who was at risk of developing anthrax and ambiguities about the extent of public health officials’ authority resulted in public health actions being influenced by political pressures. Several of those interviewed reported that in some locations elected officials had directed which groups of people should receive preventive antibiotics. In at least one case, differences among state health departments’ recommendations about who should receive antibiotic prophylaxis caused great concern among elected federal representatives. One public health official noted, “The media would compare our decisions to those made [elsewhere]. It was extremely uncomfortable. Elected officials came down on us regarding fairness. One elected official said, ‘The only fair thing was to give every postal worker [in the state] Cipro’ even though state public health officials believed that the information available warranted a more limited distribution of antibiotics.”

Coordination and sharing of information within and across health organizations

In a number of areas targeted by the anthrax attacks, several different adjacent or overlapping public health agencies were simultaneously responding. City, county, and state health officials within states and across state borders, in many instances, had difficulty acquiring and sharing information and harmonizing their recommendations.

Medical and public health professionals from the greater Washington, DC, area reported many obstacles to reaching consensus decisions and to working collaboratively across the region. The Washington, DC, metropolitan area encompasses a complicated network of government jurisdictions. Many people who work in DC live in Maryland or Virginia.^{24,25} Three different health departments (Maryland, Virginia, and DC) were involved in the 2001 anthrax investigation and response. Although each was responsible for actions in their respective jurisdictions, the people at risk and the issues at stake often crossed geopolitical boundaries. In some instances, local public health officials working in these different jurisdictions were receiving contradictory recommendations from different sources.

The District's recommendations regarding who needed prophylactic antibiotics and for how long were at odds with CDC's guidance, while Maryland and Virginia were following CDC guidance. One local public health official stated, "Since the majority of people who work in DC's federal buildings live outside of DC, there was a question of whose preventive treatment guidelines to follow: DC's, where people were exposed, or Virginia and Maryland's, where people lived. Things didn't get resolved until the three health secretaries sat down to review the situation." Steps to resolve cross-jurisdictional problems in the nation's capital region were subsequently taken in May and September 2002 when representatives of the governments of Maryland, Virginia, and the District of Columbia signed agreements to coordinate disease surveillance, alerts, evacuation, and other emergency preparedness efforts.²⁶

It also proved difficult to communicate environmental testing data across jurisdictions, so that public health officials could make informed decisions about who might have been exposed to anthrax and thus needed antibiotic prophylaxis. "We could not get enough information [about environmental exposure risk] to make clinical decisions on how to treat patients," noted a local public health official in Maryland. People would just show up at prophylaxis clinics and expect to be treated stating, 'My boss told me to come here.' " Another public health official noted that in many cases the agency was unable to verify that an individual was in an identified risk group, so antibiotic prophylaxis often was initiated

on the basis of the patient's judgment and wishes: "If they thought they were exposed, that person was treated."

There were also examples of great collaboration between different components of the public health and medical system. For example, in Palm Beach County, health department officials worked very closely with physicians, sending emails and faxes to all physicians in the county and inviting all infectious disease physicians to visit the health department.

In and around Washington, DC, members of the medical community initiated a process of coordinating clinical management of patients with suspected anthrax across the DC metropolitan jurisdictions. Morning conference calls were held by the DC Hospital Association, greatly facilitating information sharing among DC-area physicians. These conference calls proved to be a valuable tool during the crisis, allowing doctors who were treating anthrax victims to describe the clinical course of patients under care and to discuss medical management options. Information shared on these calls included epidemiologic data, such as what buildings and which floors showed evidence of contamination with anthrax spores. Participants exchanged information regarding diagnosis and treatment, such as the usefulness of chest CTs in detecting early signs of inhalational anthrax, the value of nasal swabs in making a diagnosis, the effectiveness of certain antibiotic regimens, and the numbers of days for which treatment should be prescribed. The calls also helped dispel rumors and contributed to the development of relationships within and outside of hospital systems. Even so, it was difficult to create a unified treatment plan. One physician noted, "There needed to be a consistent, city-wide and regional [clinical] response to minimize the anxiety for caregivers and patients and lessen the chaos. We had hoped a consistent protocol would have emerged from the public health community and the CDC. [Instead different] protocols came out of Kaiser, GW [George Washington University Hospital], and the Washington Hospital Center."

²⁴U.S. Department of Transportation, Federal Highway Administration. *Journey-To-Work Trends in the United States and its Major Metropolitan Areas, 1960–1990*. Washington, DC.

²⁵Metropolitan Washington Council of Governments. *COG Report: 2010 worker flows*. Washington, DC: George Mason University of Public Policy, "Characteristics of the Northern Virginia Workforce and Labor Market," December 2001. Available at <http://www.nvrp.org/whatnew/gmu-surveypdfs.html>

²⁶Hsu S. Emergency Plan for Region Unveiled; COG Proposal Includes D.C. Evacuation System. *Washington Post* September 12, 2002.

Risk communication in the context of scientific uncertainty

CDC is a world-renowned source of scientific expertise on a broad range of diseases and public health issues. As of October 2001, however, CDC did not have extensive experience in dealing with *B. anthracis* disease; CDC's staff included few anthrax experts. The anthrax attacks immediately confronted CDC and state and local public health agencies with an array of scientific uncertainties. As one CDC official reported, "We lacked scientific data to address issues. We could not inform public health decision-making regarding issues such as exposure, isolated cases, letters in transit, [and] cross-contamination. Identifying the population at risk was the greatest problem."

CDC's usual approach to investigating disease outbreaks—a careful, step-by-step gathering of evidence followed by deliberate scientific analysis—was not feasible in the context of a high-profile attack occurring in multiple epicenters that potentially placed thousands at risk and was causing massive disruption of government, business, and citizens' routines. The analytical challenges were compounded by the complexities of the investigation. For example, the FBI was in charge of studying the anthrax powder found in the identified envelopes—material that immediately became evidence in a criminal investigation. It is unclear how soon CDC became aware that the anthrax powder found in the letter to Senator Daschle had different physical properties from the anthrax powder in letters sent to ABC, which had been examined earlier. The Daschle material was more refined, "fluffier," and more likely to remain airborne, thus posing a greater threat of inhalation.

Over the course of the response to the anthrax attacks, some public health officials began to question the technical guidance they were receiving from CDC. One local public health practitioner noted, "Things kept changing. CDC kept changing things. Simple swabs [for environmental surface testing] versus dust wipes. Dry swabs versus wet swabs. Yes to nasal swabs. No to nasal swabs." Another local government official stated, "We would ask CDC a question [about antibiotic treatment] and they would tell us 'It's not warranted.' We would ask why and they would answer, 'Not sure.' There was a lack of trust of CDC's knowledge. CDC was making recommendations that they could not initially justify. Later their guidance was disproved. They could not clearly answer questions about the latency of infection or why Cipro versus Doxy."

In the days immediately following the discovery of the first case of inhalational anthrax in Florida, CDC scientists had judged that only opened envelopes posed a risk of spore exposure. The investigation to date had revealed

that no postal workers were ill in the Florida facility "upstream" of the contaminated letter that was believed to have been the source of the first victim's exposure. Concerned about the potential side-effects of preventive antibiotics, and lacking information about what risks anthrax spores in sealed letters might pose to people working in the U.S. postal system, CDC initially recommended that only those in close proximity to *opened* anthrax-laden letters receive antibiotic prophylaxis. As the risks posed by sealed *B. anthracis*-laden envelopes and cross-contamination of envelopes became evident, prophylaxis recommendations were expanded to include mail handlers and others working in contaminated sites. A CDC official noted, "The greatest challenge was developing and communicating a set of recommendations for the public. It was difficult because we had to get all the [state and local] jurisdictions to agree and because there were different recommendations [for different risk groups]."

One hospital-based infectious disease expert said, "The public had better sense than CDC. They saw their co-workers getting sick and came for treatment. We had this really sick guy. We could not prophylax him because he was not on the list. CDC would only let us prophylax people who worked in the Brentwood postal office [as postal workers], not people who cleaned the air handlers there or filled the Coca-Cola machines." Other study participants faulted CDC for failing to solicit technical information from the postal workers themselves. As one postal employee noted, "Right after the Daschle letter, postal employees were voicing their concerns, but there was no guidance from the CDC. The first thing CDC said was, 'There is no danger unless the mail is opened.'" But as this postal employee noted, it was widely recognized by postal workers that "stuff leaks out of envelopes all the time. One machine handles 17,000 envelopes per hour. There is lots of capacity for aerosolization."

Postal workers also questioned the reliability of some of the CDC guidance. A representative of the postal workers noted, "The information [from CDC] changed every day. Nobody knew what was going on. I started a web page, but I would put something out and it would change. They said you need 10,000 spores to be ill, but we asked, 'Can't some people get sick with less?' They said, 'No. You have a better chance of getting hit by a bicycle.' We had a party [to celebrate] the end of 60 days [of Cipro] and then they came back [a few weeks later] and said there were spores still living in us. They held a lot of meetings. I sat in on each one. Every doctor and every story was different. They said the stuff [vaccine] was safe but we would have to sign all these papers and maybe we could lose our rights under workers comp. Then they said the military people used to get six shots, but we were going to get less. Even that doctor said she had the six. If six was good for her, why not for us?"

The confusion caused by these scientific uncertainties was compounded by the poor communication among public health officials and the media and the public. As the investigation first evolved and CDC learned more about the nature of the anthrax powder, the risk posed by unopened envelopes working their way through post office sorting machines, and other technical issues that bore on who was at risk and the nature of the public health response, the public heard little from top federal health officials. The lack of a consistent, credible message emanating from CDC in the early days after the anthrax attacks has yet to be fully explained.

CDC thus faced daunting challenges. The world expected CDC to provide detailed, authoritative information about a disease with which it was not familiar, in the context of a deliberate attack during a criminal investigation, the scope of which was larger than anything CDC had ever handled. Key aspects of the investigation were not under CDC's control, and it is unclear to what extent CDC officials were free to speak to the public or the media.

Information dissemination to professional communities

Physicians interviewed for this study initially believed that they would be given rapid and specific instructions from public health officials regarding how to recognize and treat victims of the anthrax attacks. It quickly became clear that public health guidance was not being issued fast enough to guide many necessary clinical decisions. When no guidance was forthcoming, clinicians relied on their own medical judgment to make diagnoses and initiate treatment and, in some instances, published guidelines based on their experience. As one physician noted, "There were expectations of external support. We were told on October 20th that guidelines from CDC were forthcoming. They were [eventually] posted in the *Morbidity and Mortality Weekly Report* on the 26th. [Meanwhile] we wrote our own prophylaxis guidelines and created a milieu for clinical decision-making. We created what we needed to create."

Many of those interviewed from the medical and public health communities spoke of the difficulty getting information about the number and location of confirmed or possible anthrax cases, the risk factors associated with anthrax exposure, or the latest CDC recommendations on diagnosis and treatment. Physicians reported being unable to get through to local or federal public health officials by phone. According to one local public health official, "Our phone lines were clogged by people who were confused about their risk of exposure and the worried well." When authoritative guidance from health officials was provided, it was often, as one clinician noted, "too little, too late." Many study participants reported that the media was the most consistent and rapid source

of current information for physicians and public health practitioners.

A number of CDC's intended mechanisms for communicating with health care and public health professionals proved to be problematic vehicles for delivering information during the anthrax response. *Morbidity and Mortality Weekly Report (MMWR)* is a weekly bulletin that conveys important disease outbreak-related information to clinicians and public health officials. It is available by subscription through the mail and on CDC's website, and excerpts are printed in the weekly *Journal of the American Medical Association*.²⁷ But the *MMWR* weekly schedule was not designed to deliver updates of information that changed several times a day, and only a minority of physicians are regular readers. Those interviewed did not report that *MMWR* was a source of rapid clinical information during this crisis.

Epi-X, an encrypted electronic web-based communication, was launched in December 2000 to relay sensitive and urgent disease outbreak information to state and local public health departments. Most clinicians do not have access to Epi-X.²⁸ The utility of Epi-X for public health officials following the anthrax attacks was unclear; those interviewed in this study did not cite it as a source of information during the response.

In 1999, CDC initiated the Health Alert Network (HAN).²⁹ The HAN is envisioned as an electronic system linking CDC with state and local health departments, allowing electronic distribution of CDC health alerts and disease prevention guidelines. The HAN also would make it possible for state and local health officials to electronically report laboratory findings and disease surveillance data and to participate in distance learning modules. During the anthrax attacks of 2001, in most areas of the country the HAN was accessible only to public health agencies; the medical and hospital communities were not part of the HAN and could not receive its reports. Some local health departments passed HAN alerts on by fax or shared HAN information through phone calls, but this was not a widespread practice.

Public health officials interviewed for this study indicated that even within the public health community, the HAN's usefulness during the anthrax attacks was limited. Constraints included limited access to the necessary technology, confusion about how information conveyed by the HAN should be used, and delays in moving the HAN information down the chain from CDC through state health agencies to local public health officials.

At the time of the 2001 anthrax attacks, only 60% of local health departments had the type of Internet access necessary to receive HAN alerts. In the first several

²⁷www.cdc.gov/mmwr/about.html

²⁸www.cdc.gov/programs/research5.htm

²⁹www.phppo.cdc.gov/han

weeks after the initial anthrax attacks, HAN alerts often were stopped or delayed at the state level before being distributed to local public health departments. Public health authorities at the federal and state levels were at times uncertain about how much information to send over the HAN. As one public health expert noted, “The HAN could have been the most reliable source of information for state and local public health officials during the anthrax outbreaks, but there were technical and philosophical problems. There were concerns about sharing HAN information. Should it be shared with local health officials? All physicians? What if the press got hold of HAN information?” When it became clear that information was not reaching many local health departments, CDC began distributing anthrax alerts and updates directly to all state and local health departments that had Internet access and were a part of the HAN.

CDC maintains a public website where much useful information that was pertinent to the anthrax attacks was posted. It crashed and went off-line twice during the anthrax response, in part because of heavy use and partly because it lacked redundancy.

Strategies for responding to the media

Many public health agencies were not prepared to meet media demands. A number of public health officials interviewed for this study found the media demands during the anthrax crisis extremely time-consuming and difficult to satisfy. Many public health officials did not consider media requests for information to be a priority. Most public health departments lacked prepared materials or detailed public communication plans. In many cases, educational fact sheets stating basic facts about anthrax were crafted in the midst of the crisis.

Public health practitioners spoke of the “tension” among elected officials and health officials trying to reach consensus about how much information should be released to the press. There were disputes about who should be responsible for releasing information: the local health department, the state health department, CDC, elected officials, or other government agencies. A number of public health professionals noted that they lacked the skills to prepare press statements or speak to the media. Some health officials were afraid to say anything in the midst of an unfolding investigation during which the facts changed so quickly. Several within the public health community stated that there were restraints placed on them regarding what information could be released. One local public health official stated, “My mayor told me what I could say and what I could not say to the media.”

Some public health officials criticized their own colleagues for spending too much time with the press, saying that time spent with the media meant attention was being diverted from the anthrax investigation. Other pub-

lic health officials disagreed with these sentiments and asserted the critical importance of speaking to the press. One of these officials said, “The community, country, and world needed a point of central knowledge. If you don’t do interviews, the reporters will get information elsewhere and the source may not be as good.”

Some health departments were clear leaders in their ability to develop information and summaries for public and professional community dissemination more quickly, and they were able to share this information broadly with other health departments. For example, New York City Department of Health officials placed a high priority on communication with the press. They issued timely alerts and updates to clinicians and public health officials in New York City, and these were regularly passed on to others across the country. The department also held regular briefings for the press. They judged that these press briefings were an important way to transmit current information and avoid misinformation. These officials knew they had the authority to speak to the press, because the authority had come from the top. Said one NYC public health official, “The mayor had a strong belief that you have to get information out and not keep things from the public.”

The difficulties that public health agencies had communicating with the public were particularly serious in the Washington, DC, area, where communication failures led some to speculate that there were racial disparities in the treatment recommendations. When a letter containing anthrax spores was delivered to the office of Senator Daschle, the Capitol physician arranged for Capitol workers to receive nasal swab testing and instituted a course of ciprofloxacin antibiotic prophylaxis. One week later, when it became evident that Brentwood postal workers had been exposed to anthrax, CDC decided not to recommend nasal swabs because they had determined that this test was an unproven and possibly misleading measure of anthrax exposure. CDC had also begun to recommend doxycycline as an alternative antibiotic prophylaxis choice to ciprofloxacin (“Cipro”), because they judged it to be equally efficacious and more readily available. These recommendations led some to believe there was a double standard emerging. As one infectious disease physician in the DC area noted, “There was no printed guidance and a lot of what we did was fly by the seat of our pants. We attempted to be consistent, but CDC’s recommendations and the Capitol physician’s recommendations were different.”

Ultimately, CDC did not succeed in convincing many of the Brentwood employees that the changing guidelines reflected public health officials’ best judgments regarding prophylaxis and treatment. The variations in practice were perceived by many as evidence of a lack of equity. As one government official noted, “The Capitol physician’s course was different from CDC. So people in DC

felt they were getting less good care. It became an issue of poor black folks versus rich white folks.”

Media lacked access to reliable information. The media reported great difficulty getting reliable information from public health authorities. Members of the media interviewed for this study reported that public health officials frequently ignored or did not return phone calls from the press. One newspaper journalist stated, “Finding out what was being done was incredibly difficult. Finding out what was happening at the national level was next to impossible. We couldn’t get through, or no calls were returned. This went on for weeks. CDC was a disaster until one month later when they started daily telephone press briefings. [In addition], the top state officials were not accessible and they could not figure out how to do the press.”

Journalists faced the challenge of reporting on a subject with which most public health experts had a limited scientific understanding and no firsthand experience. Reporters spoke of the frustration in dealing with changing recommendations and with the uncertainties of who would deliver the next installment of authoritative information and when. “Once we reached people, the quality [of information] varied, and every day we got different and conflicting information. The health department press offices didn’t know the disease. I can’t think of any other public health event like this.”

Faced with either poor access to public health officials or inadequate information, reporters scanned websites, downloaded articles, and attempted to identify experts. Without information from public health authorities, one journalist noted that they had to assemble pieces of the anthrax puzzle from a variety of what they hoped would be credible sources. One reporter noted, “It was extremely difficult to get information out [of public health]. If I did not have a several-year relationship with officials, it would have been impossible. I have been in the business 25 years, but this was the fastest unfolding story. There was information, rumors, powders, and people on edge. It would have been useful to have a single person, point of contact, or continually updated website. Everyone was having meetings and things were hush-hush. They didn’t know what was safe to say. The press relied on back channel contacts. We wanted to make sure we did not embellish. This took effort. The job of good reporting is a function of the reliability of data. There were many agencies involved that had conflicting information. You don’t want reporters making scientific judgments.”

Insufficient personnel, resources, and operational systems

The anthrax attacks of 2001 placed heavy and novel demands on a public health system that long has been

recognized to lack resources commensurate with its responsibilities. Although some public health officials reported that experience with previous communicable disease outbreaks had helped to prepare them to respond to the anthrax attacks, most believed that the demands placed on public health authorities by the anthrax crisis made this different from past public health events. One state public health official noted, “Public health planning for West Nile Virus, Y2K and even 9/11 facilitated the development of systems and strategies, but we were unprepared for the surge in demand [caused by the anthrax attacks].” A number of concerns were common across affected communities.

Communications technology was inadequate. Equipment widely requested on an emergency basis by public health officials during the attacks included computers, software applications, conference call capability, wireless email, broadcast fax, and cell phones. One Virginia public health official noted that cell phones were ordered when the anthrax attacks were discovered in the DC region, but the phones were delivered to fire departments and not public health agencies. Another study participant noted that cell phones finally arrived at the local public health department, but came with a service agreement that did not cover the health department’s location.

Systems for emergency procurement of critical resources were lacking. Few public health departments had emergency procurement systems. Interviewees repeatedly noted the lengthy and cumbersome administrative processes they had to navigate to procure tools and equipment to manage the anthrax response. One public health laboratory director noted that he had adequate funds in his budget to purchase the additional safety cabinets needed to analyze suspect anthrax samples, but he was told that it would take the state’s office of general services two months to process the request. A public health physician reported using a personal credit card to purchase plastic bags to package preventive medication doses for patients.

Public health laboratories were stretched. State public health laboratories across the country were highly stressed by the quantity of potentially contaminated items brought in for testing. CDC laboratorians worked around the clock, sometimes sleeping in the lab, to analyze clinical samples. One state public health laboratory director noted, “We handled over 2,000 [suspect] anthrax samples in two months.” This lab previously had performed one anthrax test per year. “We worked 7 AM to midnight, seven days a week. Sometimes we worked until 2 or 4 in the morning. We eventually trained ten people, but then we did not have enough safety cabinets to work in.”

Many public health officials noted there was a lack of space to store samples and inadequate procedures to receive them. A state laboratory director noted, "We had no teams to assess the risks of samples, so nothing got rejected. We got drum-sized things, large bags of mail, stuff that we could not get into safety cabinets. [Additionally] stuff just got walked in through the department lobby by Hazmat workers in their protective and contaminated garments. It was a risk for the laboratories."

Personnel limitations affected local public health surge capacity. Public health officials needed to perform a wide array of functions, including investigating all suspected cases; answering inquiries from other public health officials, clinicians, the public, and the media; coordinating clinical information from hospitals; conducting and tracking down environmental test results; and administering antibiotic prophylaxis clinics. States typically did not have the capacity to emergently credential health professionals from adjoining states. A public health physician noted, "Lots of people wanted to help. . . . We needed lots of people but we couldn't teach them while we were so involved." Most senior local and state public health officials noted that there were no systems in place to compensate their staff for the tremendous number of overtime hours worked.

There were not enough personnel to continue routine public health functions, so non-anthrax-related public health investigations and other laboratory studies were put aside. A senior local public health official noted, "If we had another simultaneous health problem we would have been in trouble." Five months after handling the anthrax investigation, a public health official at another site noted, "If there were a recurrence today we would be less able to respond. People are tired. They have been working seven days a week since October. We're in big trouble. We pulled out all the stops. If this were just the tiniest bit bigger, we would have been in trouble."

Organizational and personnel fatigue was further exacerbated in locales where public health personnel had participated in the response to the events of 9/11. And other public health emergencies required attention even as the anthrax response continued. For example, Florida health officials, in addition to investigating scores of "suspect powder" incidents, were also responding to the contamination of 500 pounds of grouper with ciguatera toxin, hurricane Michelle, and many other outbreak investigations.

Over the course of the anthrax response, CDC dispatched more than 350 employees to the five anthrax epicenters, but even this substantial deployment could not address all of the personnel shortages experienced by state and local health departments. Of the CDC staff deployed to states, 136 were Epidemiologic Intelligence Service (EIS) officers, representing 93% of the nation's

active EIS.³⁰ Many public health officials interviewed were appreciative of CDC direction and support, acknowledging a lack of local expertise and inadequate numbers of human resources needed to respond to the attacks, but some noted that CDC personnel did not always match local needs. Some state and local health officials noted difficulty integrating CDC staff into local response efforts. One state health official noted, "I don't expect CDC to do community-based work. I just expect technical guidance."

CONCLUSIONS

These interviews with several dozen individuals directly involved in responding to or reporting on the 2001 anthrax attacks document the intense and sustained pace and pressures associated with the crisis response. These accounts reveal several themes that might usefully be considered by those responsible for bioterrorism preparedness and planning.

Expectations about federal, state, and local public health responsibilities require clarification

Public health officials from state and local health departments appear to have differing, and sometimes contradictory, views about the type and extent of assistance that can or should be expected from CDC in the wake of a bioterrorist attack. Some were disappointed that CDC was unable to deliver more robust operational support on the ground. Others believed that CDC's resources and capabilities were more appropriate to the role of scientific advisor. Still others believed that CDC did not possess the medical expertise to guide clinical efforts or to adequately interface with the health care delivery community. It would be useful to have a national discussion regarding the expected role of CDC during large-scale public health crises.

If CDC is to serve as the authoritative source of scientific analysis, the agency's ability to quickly gather and make sense of information from many sources, including the medical community, will need to be greatly improved. It needs to be recognized that CDC's resources are insufficient to serve during a crisis simultaneously as the nation's scientific advisor in public health matters, as a provider of extensive operational assistance to state and local health departments, and as an authoritative source of clinical practice recommendations.

³⁰Centers for Disease Control and Prevention. Update: Largest-Ever Deployment of CDC Epidemic Intelligence Service Officers. *Press Release* January 25, 2002.

Dr. Julie Gerberding, who was appointed CDC Director in the summer of 2002, has noted that the agency has revised its emergency response strategy in an effort to improve CDC's ability to respond to future attacks in a more coordinated manner. Nonetheless, absent extensive investments in CDC staff and infrastructure, it is unrealistic to expect CDC to play a prominent operational role during a response to a bioterrorist attack, given limitations on the agency's resources and the potentially huge scope of bioterrorist attacks.

The type and extent of assistance that local health care institutions and public health agencies can expect from CDC and other federal agencies, as well as realistic timetables for delivering such aid need to be clarified. The Federal Response Plan and most other bioterrorism response templates acknowledge that responsibility for responding to terrorist acts resides with local authorities. It appears, however, that many in the responder community—particularly health care professionals—expected the federal government to provide immediate, scientifically accurate guidance in a bioterrorism emergency. Prudence requires that bioterrorism preparedness plans *assume* that state and local public health authorities will have to make judgments based on uncertain knowledge and without the guidance of federal authorities, at least initially. Provisions for gathering critical information, including input from relevant local experts, and for reaching coherent decisions and making the basis of these decisions known should be part of all local and state plans.

Medical preparedness requires better communications among physicians and between medical and public health communities

The 2001 anthrax response highlighted the challenges associated with managing the medical and public health aspects of bioterrorist attacks. Should future attacks occur, clinicians likely would be called on to exercise professional judgment in the face of unfamiliar illness and uncertain risk factors. The time pressures associated with caring for acutely ill patients will likely make it impossible for CDC or local health authorities to supply physicians with rapid, authoritative, and scientifically validated assessments of the nature of the attack and with the most current medical diagnostic and management recommendations, at least in the initial stages of response.

Near real-time communication networks that enable clinicians involved in direct care of bioterrorism victims to communicate among themselves and with other clinicians around the country could be extremely helpful in establishing effective diagnostic and treatment protocols. Procedures to establish a coherent network of medical experts to offer advice and monitor clinical issues throughout the response also could prove useful. Such an expert clinical network might be facilitated by CDC but need

not be—and arguably should not be—a CDC responsibility. CDC's essential mission is, literally, "disease control." There exists no agency or institution other than CDC that could conceivably take over the essential public health tasks involved in managing epidemic response. Deepening CDC's professional staff and administrative, technological, laboratory, and financial resources in this critical realm of public health response would probably be a more effective investment than expecting CDC to provide near-real-time clinical guidance in the midst of a bioterrorist attack. The vast majority of the country's clinical experts practice medicine in hospitals and medical centers outside CDC, and mechanisms should be developed that make that expertise more available to the broader clinical community during crisis. During a fast-moving epidemic, it makes more sense to allow CDC to focus its resources on epidemic management.

Public and media must recognize that response to bioterror attacks will evolve

Epidemics move at a pace that is unlike that of other crises and catastrophes. The full extent of future bioterrorist attacks will not be immediately apparent at the start of such crises; identifying the at-risk population and formulating effective recommendations for unfamiliar diseases occurring in never-before-seen contexts will take time, and initial impressions may be revised or rejected.

It is apparent that responders, the media, and the public were frustrated and confused by the evolving understanding of the risks posed by anthrax-laden letters and by shifting recommendations about who might be at risk for becoming sick and how such people should be treated. Some of this confusion is the result of inadequate public education regarding the nature of bioterrorism and of epidemics generally.

It is likely that recognition of the nature of and appropriate response to future bioterrorist attacks also will unfold over time. This is a difficult lesson in an age of 24/7 media coverage and expectations of instant answers. The media and the public must understand that the need for rapid decisions may be at odds with the desire for complete answers. As has been seen with the international outbreak of Severe Acute Respiratory Syndrome (SARS), it may be difficult to quickly answer even seemingly straightforward questions such as whether the number of victims is increasing or leveling off.

It is critical that leaders familiarize the public and the media with the likelihood that reliable answers to questions arising in future attacks will take time to assemble and validate. Government spokespeople must take great care to highlight uncertainties and to be explicit about what is known and what is not known or fully understood. If public health and medical recommendations that evolve or are revised are interpreted as revealing incom-

petence or as evidence that information is being withheld or that different populations are getting preferential treatment, the public may be unwilling to follow authorities' recommendations in times of crisis.

Health officials must prepare to handle the media storm

Most study participants acknowledged that the public health community, with some notable exceptions, did a poor job of meeting the media's demand for information, although study participants believed many of the reasons for this inadequate performance were beyond their personal control. The intention to provide accurate and comprehensive information (and in so doing, necessitating the time required to be accurate and comprehensive) was at odds with the media's—and the public's—desire to be informed about the attacks as soon as information became available.

Most public health agencies lacked sufficient numbers of technically credible, media-savvy professionals who could work constructively with the media. There was no evident media strategy within the federal government for several weeks into the crisis. The irregular and at times confused interactions between the federal government and the press during the crisis resulted in a loss of government credibility and an increasingly aggressive media feeding frenzy.

Past public health emergencies, notably those involving environmental crises, have yielded many well-tested lessons about how health risk information can reliably be communicated. The essence of these lessons is that authorities should tell the truth as they know it, when they know it; they should be forthright about what is not known; and they should explain what is being done to improve understanding of the situation and manage the problem. If the government does not find a way to embody these fundamental lessons, the public's willingness to accept the government's recommendations in future crises will be compromised.

Dr. Gerberding has noted that she intends to change CDC's traditional "evidence-based" style of communicating to an "adaptive style" more suited for fast-moving emergencies. "We'll tell you what we know today, and acknowledge that it may change by tomorrow," Dr. Gerberding is quoted as saying in a recent publication.³¹

Public health resources are barely adequate for a small-scale bioterror attack

The failure to create a detailed, after-action assessment of the public health and medical response to the 2001 anthrax attacks is a lost opportunity to illuminate, concretely and specifically, the fragile state of bioterrorism preparedness. The capacities of CDC and involved health

departments and hospitals were highly stressed by the bioterror attacks of 2001, which resulted in 22 cases and involved one of the few bioagents for which there exist effective drugs and vaccine. The adequacy of the response was due in large part to the laudable efforts of individual clinicians and public health professionals who worked relentlessly for months to manage the response. This level of effort would not be sustainable over the long term (e.g., for the span of the 1918 flu epidemic). An attack involving more victims, or multiple attacks in different locations, likely would have overwhelmed the frail network of response capabilities.

The Bush Administration has significantly increased the federal resources available to state health departments for bioterrorism preparedness. By late fall 2002, HHS had dispersed the bulk of almost \$1 billion in new funding to state governments, intending that state and local health departments spend this money to meet 17 "benchmark" criteria judged essential to epidemic response.³²⁻³⁴ Many states and cities have hired bioterrorism coordinators and have undertaken drills and exercises to improve responsiveness. Hospital response has received less attention and much less money, but HHS officials have asserted that this is a high priority for future spending. Federal funding for research and development of drugs, vaccines, and biomedical research important to biodefense also has been appropriated.³⁵ Sufficient quantities of smallpox vaccine to immunize all Americans are being manufactured, and mass pre-event and event-related smallpox vaccination strategies are being developed.

These are welcome and appropriate steps. It must be remembered, however, that these federal funding streams are flowing into states whose own revenues are severely limited.³⁶ The smallpox immunization plan announced by the Administration in December 2002 has added great stress to public health agencies around the country. Many have reported that they will not be able to move forward in that effort without interruption of routine immuniza-

³¹Boschert S. Most Clinical Labs Have Bioterror Detection Plan, but Gaps Remain, *Internal Medicine News* January 15, 2003;36(2):38.

³²United States Department of Health and Human Services. Bioterrorism Preparedness Grants, *Press Release* June 6, 2002. www.hhs.gov/news/press/2002pres/20020606b.html

³³United States Department of Health and Human Services. 17 Critical Benchmarks for Bioterrorism Preparedness Planning, *Press Release* June 6, 2002 <http://www.hhs.gov/new/press/2002pres/20020606a.html>

³⁴*Washington Fax*. Gerberding plans strategically for CDC's future while preparing for emergencies now, February 24, 2003.

³⁵*Ibid.*

³⁶Elliott VS. Public health funding: Feds Giveth but the States Taketh Away *amednews.com* October 28, 2002. www.ama-assn.org/sci-pubs/amnews/pick_02/h1121028.htm

tion or other public health prevention programs. More than 40 states are in recession, and most of these have placed a freeze on hiring. As history, and the current state of public health, has shown, public health preparedness is not necessarily a priority of governors and mayors. The Executive Director of the American Public Health Association, who was the Maryland Health Commissioner in 2001, has noted that overall funding for public health in the 50 states has declined, in spite of federal support for bioterrorism preparedness.³⁷

It will take considerable vision and leadership—and sustained funding—to build the medical and public health systems needed to appreciably improve the nation's capacity to mitigate the consequences of bioterrorist attacks. The anthrax attacks of 2001 demonstrated the feasibility of the use of biological weapons upon civilian populations. The SARS outbreak has again demonstrated the great responsibilities and challenges that the medical and public health systems bear in confronting disease epidemics, even when the overall number of cases remains relatively modest. Assessments of the response to the 2001 anthrax attacks and to other disease outbreaks such as SARS are critical to making wise decisions and strategic investments at the local, state, and federal levels concerning bioterrorism preparedness and response. Es-

tablishing the policy priorities, resources, and institutional capabilities to practice public health at a level of sophistication consistent with 21st century science and technology and commensurate with the threat posed by catastrophic bioterrorism is the task before us.

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Address reprint requests to:

Elin Gursky
2900 South Quincy St., Suite 800
Arlington, VA 22206

E-mail: Elin.Gursky@anser.org

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³⁷Mulcahy N. Bioterror Prep Funds Don't Cover States' Cuts, *Internal Medicine News* January 15, 2003;36(2):38.