

# Issue Paper

RAND

## Are Local Health Responders Ready for Biological and Chemical Terrorism?

*Lois M. Davis and Janice C. Blanchard*

The public health and medical communities have long sought to address the threat of biological, chemical, or other weapons of mass destruction (WMD) and their potential effects on the health and safety of U.S. citizens. The United States has made some key advances in the past five years or so toward increasing the capacity of the public health system to conduct disease surveillance, establishing pharmaceutical stockpiles, and improving the training of medical and public health personnel to detect and treat exposed victims.<sup>1,2</sup>

However, despite these important strides, another key challenge remains: Are local public health agencies and our nation's hospitals (both public and private) prepared to deal with biological or chemical terrorism? These local health responders represent the front line for ensuring the public's health against such emerging threats, especially in the aftermath of the September 11, 2001, attacks on the World Trade Center and the Pentagon and the anthrax attacks that followed in the fall of 2001. Yet these events have called into question how prepared our public health system and hospitals actually are to respond effectively to such incidents.

In addition, a key concern has been whether the public health and medical communities are well integrated with the preparedness activities of other local emergency responders to address bioterrorism or other acts of terrorism inside our borders. Indeed, the lack of integration of health care facilities with WMD preparedness and planning of the overall community response has been characterized by some as a serious flaw of U.S. national strategy.<sup>3</sup>

In fact, the challenge of improving integration between the public health and medical communities and the first-responder community was recently noted in the after-action review of the June 2001 *Dark Winter* tabletop exercise held at Andrews Air Force Base, Maryland, to simulate the intentional release of smallpox in three U.S. cities. Within the two-week period of the simulated game, 1,000 people were projected to have died and 15,000 to be infected, with the disease spreading to 25 states and 15 other countries.<sup>4</sup> In her testimony on July 23, 2001, at hearings before the U.S. House of Representatives Subcommittee on National Security, Veteran Affairs, and International Relations, Margaret Hamburg, M.D., the former Assistant Secretary for Planning and Evaluation, Department of Health and Human Services (DHHS-ASPE), noted that:

*Dark Winter* further demonstrated how poorly current organizational structures and capabilities fit with the management needs and operational requirements of an effective bioterrorism response. Responding to a bioterrorist attack will require new levels of partnership between public health and medicine, law enforcement and intelligence. However, these communities have little past experience working together and vast differences in their professional cultures, missions and needs.<sup>5</sup>

The scenario posed by *Dark Winter* was a severe scenario for any community. Perhaps a more realistic question is how local health responders would deal with more-moderate acts of terrorism<sup>6</sup> involving the use of biological or chemical weapons inside our borders.

## WMD Scenarios

The following scenarios were provided to respondents in the RAND survey. They were designed to measure respondents' objective and self-assessed preparedness for a variety of WMD terrorist incident scenarios. The specificity in each narrative assured—to the extent possible in a mail survey—that all respondents shared a common notion of the scale and nature of what was meant by “WMD terrorist incident.” The scenarios helped to fix ideas and establish a baseline against which respondents' claims of preparedness could be interpreted and compared.

### Biological Incident

During a three-day period in July, 20 individuals present to a local hospital's emergency room complaining of fever, night sweats, headaches, coughing, and joint pains. Initially, an untimely flu epidemic is suspected. However, after the third day, concern grows more acute: Additional patients are admitted with more severe symptoms; and laboratory personnel who analyzed patient blood samples begin reporting similar symptoms.

Several days later, ERs and physicians have seen enough cases to alert local and state public health authorities, who immediately undertake large-scale surveillance and dispatch an investigation team. The state health department also notifies the CDC [Centers for Disease Control and Prevention], at which point other federal agencies are alerted. It is quickly determined that all patients had visited a regional airport in the last 10 days. The governor orders the airport closed and quarantined. Fire and HAZMAT [hazardous materials] teams report to the scene to investigate and determine if there is a continuing threat. The National Guard is called to assist police with airport closure and crowd control.

Days later, seven of those affected die. All victims' blood specimens test positive for brucellosis.<sup>a</sup>

A statewide and international alert is activated urging anyone who passed through the airport to contact their local health department. News agencies report that brucellosis can be fatal, creating panic. Local ERs are crowded with patients complaining of flu-like symptoms.

### Chemical Incident

An explosion in a building with 200 people inside results in numerous injuries and some fatalities, but minimal structural damage. As first responders arrive on the scene, they observe the following: Twenty-five individuals have been killed by the blast; there are more casualties than would be expected for an explosion alone; and unlikely symptoms among the survivors include sweating, disorientation, muscle tremors, convulsions, and eye pain exhibited by 145 individuals.

Soon, some of the responders also start to experience similar symptoms. A highly toxic and persistent chemical agent is suspected of having been released by the explosion. Both state and federal emergency management officials are notified. Cross-contamination becomes a major concern, as victims find their way to local hospitals and responders operate in an area potentially covered with an active chemical agent. As the media pick up the story, panic begins to spread among the large crowd that has formed outside the building and in the nearby vicinity.

<sup>a</sup>Brucellosis, also known as “undulant fever” or “Bang's Disease,” is a systemic infection caused by several different strains of bacteria that can infect both humans and animals. Symptoms include fever, night sweats, undue fatigue, anorexia, weight loss, headache, and arthralgia (see *CDC Fact Sheet on Brucellosis*, March 13, 1998).

Just prior to the September 11 attacks, RAND completed a nationwide survey of state and local response organizations.<sup>7</sup> In this issue paper, we discuss some of the results for city and county (“local”) public health departments and general acute care hospitals (both public and private). Respondents were asked a series of questions about their organization's preparedness for emergency response in general and specifically for WMD-type<sup>8</sup> incidents. In addition, they were also given a series of scenarios—more moderate than those used in *Dark Winter*—addressing hypothetical threats and were asked to assess their own organization's level of preparedness and ability to respond to such incidents. (See the sidebar describing the WMD scenarios.) Here, we focus specifically on the survey's findings on preparedness in relation to local planning activities.<sup>9</sup>

In particular, we examine the answers to four general questions:

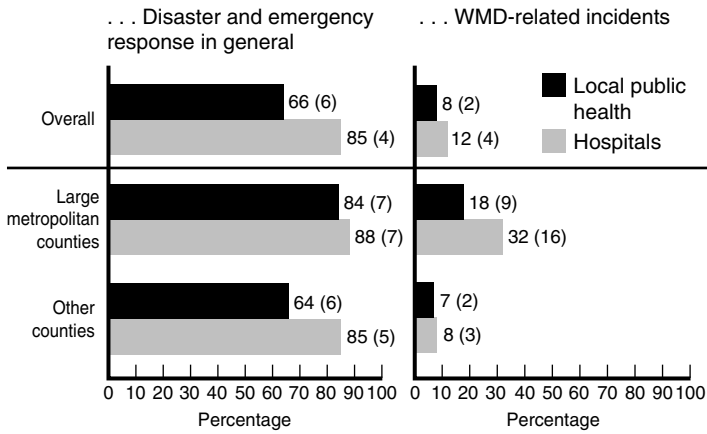
- Do local health responders have plans to address terrorism involving the use of biological or chemical weapons?
- How well-integrated are local health responders with the preparedness activities of other emergency responders?
- Do plans exist at the local level for disseminating public health information following a bioterrorist attack?
- What is the overall state of planning at the local level for dealing with bioterrorist attacks?

## DO LOCAL HEALTH RESPONDERS HAVE PLANS TO ADDRESS TERRORISM INVOLVING THE USE OF BIOLOGICAL OR CHEMICAL WEAPONS?

One tool for ensuring an effective response is whether public health departments and general acute care hospitals—both public and private—at the local level have mutual aid agreements that address sharing of resources and personnel in the event of a WMD-related incident. As shown on the top left bar chart in Figure 1 (above the line), two-thirds of local public health departments and 85 percent of hospitals have informal or formal mutual aid agreements with other city, county, state, or regional organizations for disasters and emergency response in general.

However, as shown on the top right side of the figure, only one out of ten local health departments and hospitals have mutual aid agreements that specifically address incidents involving WMD. Whether these mutual aid agreements address WMD specifically may be of less import than the fact that, in general, most health organizations have such mechanisms in place to address the sharing of resources and personnel in the event of a disaster or an emergency. As shown in the bottom right of the figure, public health departments and hospitals in large metropolitan counties<sup>10</sup> were more than twice as likely as

**Have informal or formal mutual aid agreements for . . .**



NOTES: The standard error for each point estimate is shown in parentheses. Weighted results presented are based on the sample size of n = 147 local public health departments and n = 105 hospitals. Approximately one-quarter of local public health departments (n = 35) and of hospitals (n = 27) were located in large metropolitan counties; 112 local public health departments and 78 hospitals were located in other-sized counties.

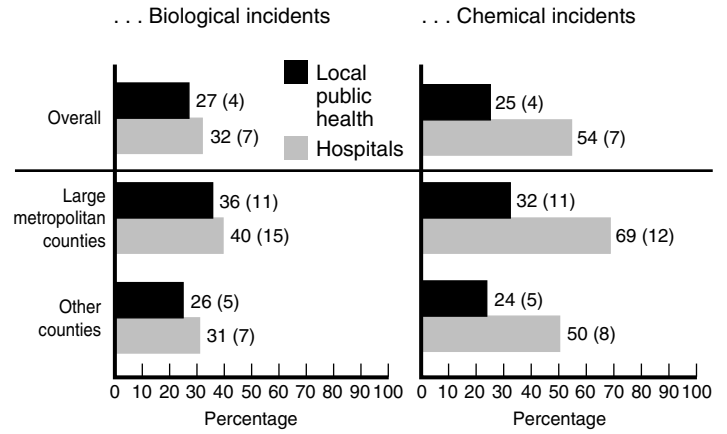
*Figure 1. Percentage of Local Public Health Departments and Hospitals with Informal or Formal Mutual Aid Agreements*

other counties to have mutual aid agreements that address WMD-related incidents.

A more specific measure of preparedness for dealing with terrorist threats inside our borders is whether a health department or hospital has plans or standard operating procedures (SOPs) in place that specifically address response to a biological or chemical incident. As noted above (and as shown in the WMD scenarios sidebar), we presented survey respondents with several different scenarios involving the use of a biological or of a chemical weapon. For each scenario, we asked survey respondents to assess their organization’s level of preparedness along several different dimensions. These included whether the organization had response plans that addressed a similar scenario, what aspects of the organization’s response the plans addressed, and how recently those response plans had been exercised. The scenarios were developed using information from a variety of sources, including the Department of Justice’s Office for State and Local Domestic Preparedness Support (OSLDPS)—recently redesignated the Office of Domestic Preparedness (ODP)—and the Federal Emergency Management Administration’s (FEMA’s) Emergency Management Institute. The scenarios, reviewed by subject-matter experts, were scaled to moderate size: sufficient to test the preparedness of an organization to respond but not large enough to be expected to overwhelm the capabilities of most organizations.

As shown on the top left of Figure 2, only about one-third of local public health departments and hospitals reported having plans or SOPs in place for response to a moderate-sized biological scenario. Furthermore, public health departments and hospitals in large metropolitan counties were only somewhat more likely than other counties to have such response plans.<sup>11</sup> These findings are con-

**Have response plans or SOPs for . . .**



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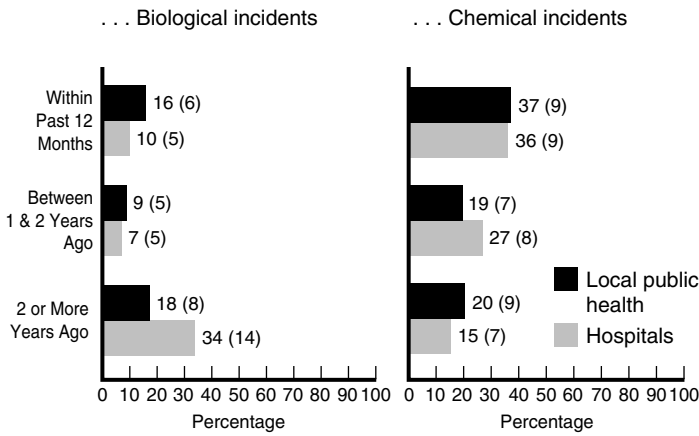
*Figure 2. Percentage of Local Public Health Departments and Hospitals with Response Plans or SOPs*

sistent with results from a recent survey by the National Association of City and County Health Officials (NACCHO) to assess local preparedness for bioterrorism, which was conducted shortly after the September 11 attacks. In that survey, only 20 percent of local public health agencies (LPHAs) reported having a comprehensive response plan for biodefense.<sup>12</sup> Similarly, a 1998 survey of hospital emergency departments in four northwestern states found that fewer than 20 percent of respondent hospitals had plans for biological or chemical weapons incidents.<sup>13</sup> A more recent survey of hospital emergency departments in FEMA Region III states<sup>14</sup> showed that only 27 percent of departments had incorporated WMD preparedness into hospital disaster plans.<sup>15</sup>

For incidents involving chemical weapons, the survey findings (shown on the right of the figure) suggest that the preparedness of the public health system for chemical incidents is similar to that for biological incidents. However, hospitals appear to be somewhat better prepared than the public health agencies, with more than 50 percent having response plans or SOPs for a moderate-sized chemical incident. Overall, large metropolitan counties appear to be better prepared than other counties: One-third of public health departments and two-thirds of hospitals have response plans for this type of incident.

A third component of preparedness is how recently response plans or SOPs have been exercised. In general, as shown in Figure 3, response plans for a chemical incident were more likely to have been exercised within the past year than response plans for a biological incident; one out of three public health departments and hospitals had exercised their chemical incident plans within the past year.<sup>16</sup> Of those local public health departments and hospitals with response plans or SOPs for a biological incident, only

**Response plans or SOPs last exercised for . . .**



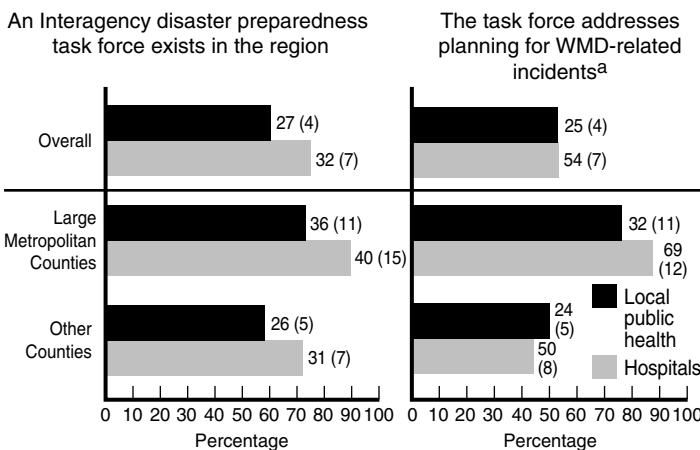
NOTES: The standard error for each point estimate is shown in parentheses. Weighted results presented are based on the sample sizes: 53/147 local public health departments and 33/105 hospitals had response plans that addressed biological incidents; 47/147 local public health departments and 62/105 hospitals had response plans that addressed chemical incidents.

**Figure 3. When Response Plans or SOPs Were Last Exercised**

one out of six public health departments and one out of ten hospitals had exercised their response plans within the past year.

**HOW WELL-INTEGRATED ARE LOCAL PUBLIC HEALTH DEPARTMENTS AND HOSPITALS WITH THE PREPAREDNESS ACTIVITIES OF OTHER EMERGENCY RESPONDERS?**

As the *Dark Winter* exercise made clear, integration between the public health and medical communities and that of other local emergency responders is a key concern. Our survey results (as shown in Figure 4) suggest that the degree of integration between public health and hospitals with the planning activities of other emergency responders



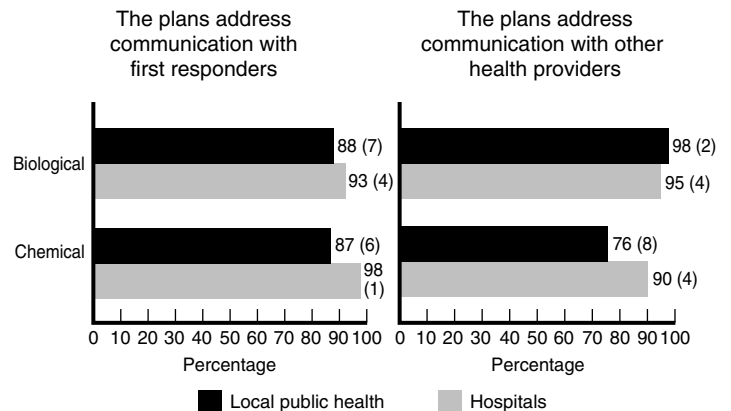
NOTES: The standard error for each point estimate is shown in parentheses. Weighted results presented are based on a sample size of n = 147 local public health departments and n = 105 hospitals.

<sup>a</sup>Responses conditional on "yes" answer about whether task force exists: 104/147 local public health departments and 75/105 hospitals indicated an inter-agency task force existed in their region; of these organizations, approximately one-third of the local public health departments and hospitals were located in large metropolitan counties.

**Figure 4. Presence of Interagency Disaster Preparedness Committee or Task Force**

is greater for disaster and emergency response in general than for incidents involving the use of biological or chemical weapons. For example, many counties reported they had interagency task forces or committees that address disaster and emergency preparedness in general. As shown on the top left side of the figure, two-thirds of local public health departments and just over three-quarters of hospitals indicated such task forces existed in their region. Most organizations belonged to these interagency task forces if they had been established locally. However, only a little more than one-half of these interagency task forces specifically address planning for WMD-related incidents. Large metropolitan counties were more likely to have inter-agency disaster preparedness task forces that addressed planning for these types of incidents.

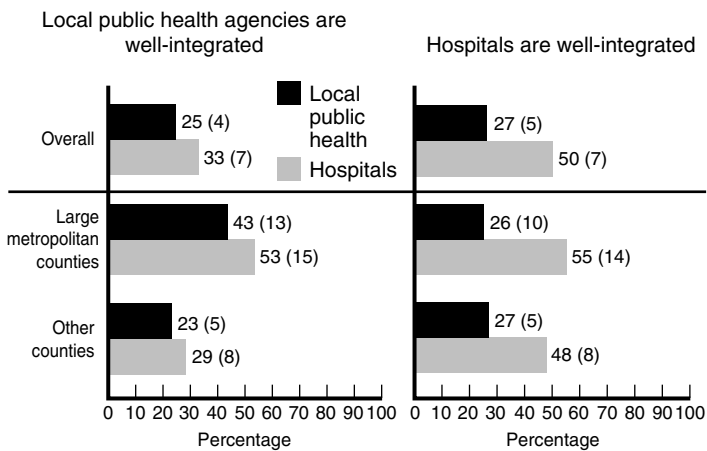
Another measure of integration is whether response plans address communication with other emergency responders or other health facilities in the event of an emergency involving biological or chemical weapons. Of the local public health departments and hospitals with response plans for incidents specifically involving biological or chemical weapons, the majority (as shown in Figure 5) indicated that their plans or SOPs addressed communications with first responders and other health organizations within their area.<sup>17</sup>



NOTES: The standard error for each point estimate is shown in parentheses. Weighted results presented are based on the sample sizes: 53/147 local public health departments and 33/105 hospitals had response plans that addressed biological incidents; 47/147 local public health departments and 62/105 hospitals had response plans that addressed chemical incidents.

**Figure 5. Response Plans Address First Responders and Other Health Providers**

However, when survey respondents were asked their opinions about whether hospitals and public health agencies overall are well-integrated with the bioterrorism planning and preparedness activities of other emergency response organizations within their communities, both hospitals and public health agencies felt that public health agencies in general were not well-integrated, as shown in Figure 6. Organizations in large metropolitan counties were more likely than other counties to consider public health agencies to be well-integrated. However, respondents differed in their opinions about how well-integrated



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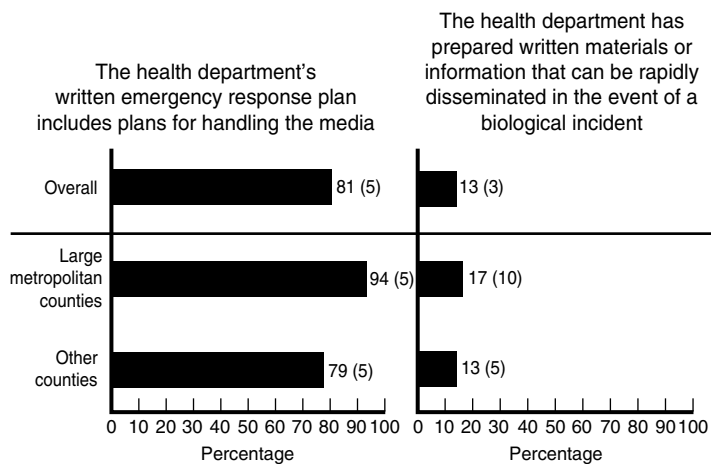
Figure 6. Level of Integration of Health Response with Preparedness Activities of Other Emergency Responders in Community

hospitals in their communities were with respect to local bioterrorism planning and preparedness activities. Hospitals (50 percent) were more likely than public health departments (27 percent) to assess local hospitals as being well-integrated with the planning and preparedness of other emergency responders.<sup>18</sup>

### DO PLANS EXIST AT THE LOCAL LEVEL FOR DISSEMINATING PUBLIC HEALTH INFORMATION FOLLOWING A BIOTERRORIST ATTACK?

The mailings of anthrax-laced letters in 2001 have underscored the critical importance of timely and effective communication by public health authorities to the media, the public, and other health providers and emergency responders about dealing with such bioterrorist incidents. The initial communication gaps and delays by federal health authorities in responding to requests for information left many local public agencies wondering how prepared their own departments might be to handle such information requests. More generally, since September 11, local public health agencies have reported receiving numerous requests from the community for information, including (among other topics) questions about vaccination and medication availability, level of local preparedness, and the existence of local emergency response plans for biodefense.<sup>19</sup>

As shown in Figure 7, our survey found that of those local public health departments with a written emergency response plan (or whose organization is included as part of the local OEM's emergency response plan), most (81 percent) have plans that generally address communications with the media for disasters or emergencies. Although not shown in the figure, of the one-third of public health departments with a response plan or SOP for a biological



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Figure 7. Plans for Disseminating Public Health Information

incident, two out of three of these plans addressed procedures for rapidly notifying and disseminating emergency information and diagnostic results to other health care providers, health and safety personnel, or emergency responders. Half of the plans also addressed procedures for rapidly notifying and disseminating emergency health information in the event of a chemical incident.

However, as shown on the right side of the figure, only one out of ten local public health departments said they had written materials or information that could be rapidly distributed to medical or public health professionals and to emergency responders to inform them about how to handle a biological incident. Large metropolitan counties were only somewhat more likely (17 percent) to have such written materials. This is a noteworthy finding in the aftermath of the recent anthrax incidents, where public health departments in New York City and Washington, D.C., have played a highly visible role. To help address this problem, the Centers for Disease Control and Prevention (CDC) have recently made available web bioterrorism resources for public health professionals to reference when providing information to the public.

### WHAT IS THE OVERALL STATE OF PLANNING AT THE LOCAL LEVEL FOR DEALING WITH BIOTERRORIST ATTACKS?

The after-action review of the *Dark Winter* exercise found the United States unprepared for bioterrorist attacks. The simulation underscored the importance of strengthening the public health response at the local, state, and federal levels. Compared to the *Dark Winter* simulation, the biological scenario presented in RAND's nationwide survey was more modest in magnitude. Yet only a third of local public health departments and hospitals in the United States reported having plans or SOPs in place to

address response to even a moderate-sized biological scenario.

Overall, large metropolitan counties with a population of one million or more appear to be better prepared for biological or chemical terrorism than other counties, in that they were more likely to have

- an interagency task force or committee that addressed planning for these types of incidents
- plans or SOPs in place that address response to moderate-sized biological or chemical incidents, including communication with other emergency and health care responders
- recently exercised response plans for a biological or chemical incident
- plans for disseminating public health information to other emergency and health response organizations.

One might argue that since large metropolitan counties are more likely to be targets of terrorist attacks, they should be better prepared. However, as the survey findings suggest, there is significant room and reason for improvement in planning for biological and chemical terrorist attacks even within our larger counties. For instance, because these findings are based on self-reported data, one might expect an upward bias in the reporting of organizational preparedness. Further, these findings are relevant not just to response preparedness for biological or chemical terrorist incidents, but to any acts of terrorism inside the United States involving the use of radiological or nuclear weapons or even conventional explosives.

Our analyses focused on two types of terrorist incidents—chemical and biological attacks—where public health agencies and hospitals clearly will play an important role in the response. Based on the survey findings, local planning for chemical incidents—whose effects will be manifested immediately—appears to be somewhat further along than planning for biological attacks. In terms of the investigation of, and response to, a biological terrorist attack, there is special cause for concern. Biological attacks evolve in fundamentally different ways than other emergencies. The release of a biological weapon may take days or even weeks to be detected. Law enforcement and other local authorities may be unfamiliar with the evolving nature of a bioterrorist attack and uncertain of the role local public health agencies and medical care providers may play in the investigation and detection of such an attack. Public health has traditionally been peripheral to emergency planning in general; many hospitals and public health agencies are unfamiliar with the incident command system used by other emergency responders. In various tabletop exercises and analyses of disaster response, confusion continues to exist between health and medical professionals and other emergency responders over who has what authority and who is in charge of the response. The

anthrax attacks in fall 2001 were another example of how differences between law enforcement and public health and medical officials in their investigative approach and objectives resulted in delays, duplication of effort, and communication breakdowns.<sup>20</sup>

In our view, insufficient attention has been paid to improving planning at the local level and to the integration of hospital and public health planning activities with the preparedness activities of other emergency responders. The lack of specific response plans for chemical or biological incidents alone suggests that the health and medical response to terrorism at the local level has been inadequately addressed. Our findings suggest that many local public health agencies and hospitals are unaware of what type of capabilities or surge capacity may be required; do not have plans for communicating with other health providers, emergency responders, or the public; and do not fully understand what role other responders such as law enforcement may play in the response to or the investigation of such incidents.

#### **MEETING THE CHALLENGE OF IMPROVING PLANNING AT THE LOCAL LEVEL**

Given these concerns, how can planning be improved at the local level? Currently, a number of efforts at the local, state, and federal levels are being undertaken to address the contribution of public health and medicine in ensuring U.S. preparedness for chemical and biological terrorism. However, most of the focus to date has been on capacity-building of our nation's public health system: improving federal, state, and local surveillance capabilities; establishing pharmaceutical stockpiles; and improving laboratory capabilities to detect and prevent the use of biological and chemical agents as weapons of mass destruction. Various efforts are also now under way to educate health and medical care professionals. For example, the American College of Emergency Physicians recently convened a task force of health care professionals to develop a sustainable training strategy for EMS personnel, emergency physicians, and nurses. Various rapid-response teams have also been established, although their utility has been questioned by some experts.<sup>21</sup>

The CDC recently reiterated the importance of local communities in developing coordinated response plans that include medical and public health, in addition to the more traditional "first responder" organizations—law enforcement, fire services, and EMS.<sup>22</sup> The lack of integration of public health and medical facilities and the professionals who run them with terrorism preparedness activities at the local level has partially been attributed to the fact that federal funds have tended to be directed to traditional first responders. Some feel that lack of federal funds has made hospital administrators, under increasingly severe fiscal constraints, reluctant to involve their institu-

tions in terrorism preparedness.<sup>23</sup> Further, health insurers do not pay for planning and other preparedness activities,<sup>24</sup> and there are important differences between the public and private health care sectors in their willingness to invest resources in this area. Preparedness for chemical and biological terrorism has also had to compete with other priorities at the local and state levels. For some counties, the probability of any terrorist attack may be assessed as being so low that policymakers and administrators do not invest resources in preparing for such an event.

In the wake of the 2001 terrorist attacks, federal funding has been forthcoming, representing a critical opportunity to improve planning at the local level. In January 2002, President Bush signed into law a \$2.9 billion supplemental bioterrorism appropriation that includes more than \$1 billion for states to help prepare their public health infrastructures for biological attacks. On January 25, 2002, DHHS Secretary Tommy Thompson announced the release of the first installment of \$240 million to be used to create regional hospital response plans for a bioterrorist attack; expand the Metropolitan Medical Response System to 25 new cities; support the CDC's Health Alert Network; develop emergency plans for the distribution of stockpiles of emergency medical supplies; and increase federal, state, and local laboratory capacities to assess exposure to biological and chemical weapons. The remaining 80 percent of the \$1 billion will be awarded to each state following the receipt and validation of state plans for responding to bioterrorist incidents and other outbreaks of infectious disease and for strengthening core public health capacities.<sup>25</sup> Under this arrangement, states will have wide leeway in determining how best to improve their public health capacity and response preparedness.

NACCHO has expressed similar concerns about where the recent budget requests for combating bioterrorism are being directed:

Much of the administration's proposal is for efforts that will occur after the detection and initial containment efforts associated with a bioterrorist attack: vaccine, prophylaxis, and national response teams. First, or at least concurrently, we need to support the fundamental activities necessary to enhance the preparedness of our nation's communities. We must be able to conduct active syndromic surveillance for disease, to do immediate, on-the-scene epidemiologic investigation, to develop and test local preparedness plans, to coordinate community responses . . . . What we need are local plans and systems in place that make the best use of local assets.<sup>26</sup>

In summarizing the lessons learned from the recent *Dark Winter* tabletop exercise, Governor Frank Keating of Oklahoma noted:

Public health is now a major national security issue . . . . Train and equip your first responders, for they are

the front line in meeting the terror threat. Search for ways to support teamwork *before* an incident, and emphasize that teamwork after.<sup>27</sup>

To have an effective public health and medical response to a terrorist attack, more-effective planning is needed at the local level. The focus to date has been primarily on capacity-building and on educational activities. There is a need to go beyond these efforts. Only through integrated planning and exercises and improved communications between health responders and other emergency responders will local communities be able to respond effectively to these emerging threats.

## RAND Survey

The RAND survey was sponsored by the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, also known as the Gilmore Commission, after its Chair, Governor James Gilmore of Virginia. The panel was created by Congress in 1999 to assess federal WMD preparedness programs and recommend strategies for effective coordination of preparedness and response efforts between federal, state, and local government and response organizations.

The survey was completed by a nationwide sample of state and local organizations from 200 randomly selected counties throughout the United States. The organizations surveyed included local and state public health departments, general acute care hospitals, local and state emergency medical services organizations, local law enforcement agencies, fire departments, and local and state offices of emergency management. In addition to the random sample of counties, 10 counties were handpicked for inclusion based on past experience with WMD-related terrorist incidents or upcoming events that might have heightened their sensitivity to domestic terrorism. The most prominent of each type of response organization within each of these counties was then also surveyed. In all, 1,080 organizations were surveyed, including 117 at the state level (including Washington D.C.) and 963 at the local and regional levels.

The final sample of survey respondents is representative of local and state responders, both geographically and across the different emergency response and health disciplines. Surveys were received from every state in the union and the District of Columbia. All estimates reported in this issue paper have been statistically adjusted to be representative of all local public health departments or general acute care hospitals throughout the entire United States. Detailed information about the survey and the results are provided in the *Third Annual Report to the President and the Congress of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction*, December 15, 2001, [www.rand.org/nsrd/terpanel/](http://www.rand.org/nsrd/terpanel/).

*We would like to acknowledge the contributions of the research team members involved in this study, of which only a subset of the results are presented here. In particular, we would like to thank Ronald D. Fricker, Jr., who provided statistical guidance and comments on this paper. Also, we would like to acknowledge the contributions of Jerry Jacobson, Sarah Cotton, and Jennifer Pace, who helped develop the survey instruments and who assisted with the analysis. We also wish to thank Susan Everingham, Jeffrey Wasserman, Michael Stoto, and Michael Wermuth, who reviewed this paper.*

## ENDNOTES

- 1 "Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response: Recommendations of the CDC Strategic Planning Workgroup," *Morbidity and Mortality Weekly Report (MMWR)*, Vol. 49, 2000, pp. 1-14.
- 2 A. G. Macintyre et al., "Weapons of Mass Destruction Events with Contaminated Casualties: Effective Planning for Health Care Facilities," *Journal of the American Medical Association*, Vol. 282, 2000, pp. 242-249.
- 3 Joseph F. Waeckerle, M.D., "Domestic Preparedness for Events Involving Weapons of Mass Destruction," editorial, *Journal of the American Medical Association*, Vol. 283, No. 2, January 12, 2000.
- 4 *Dark Winter*, Arlington, Va.: The ANSER Institute for Homeland Security, 2001.
- 5 Testimony of Margaret A. Hamburg, M.D., for the Subcommittee on National Security, Veterans Affairs and International Relations Committee on Government Reform's hearing on *Combating Terrorism: Federal Response to a Biological Weapons Attack*, July 23, 2001.
- 6 As defined here, "Terrorism is violence, or the threat of violence, calculated to create an atmosphere of fear and alarm, through acts designed to coerce others into actions they otherwise would not undertake or into refraining from actions that they desired to take. All terrorist acts are crime. Many would also be violations of the rules of war, if a state of war existed. This violence or threat of violence is generally directed against civilian targets. The motives of all terrorists are political, and terrorist actions are generally carried out in a way that will achieve maximum publicity." For the complete definition, see *Second Annual Report of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction: II. Toward a National Strategy for Combating Terrorism*, December 15, 2000.
- 7 The RAND survey was distributed to a nationwide sample of organizations at the state level in all the states and U.S. territories and at the local level in 200 randomly selected counties throughout the United States. At the local level, a two-stage sampling design was used. In the first stage, 200 counties were randomly selected. In the second stage, we randomly sampled within each county a general acute care hospital and a local public health department that served the county. For those counties (mostly rural) without a general acute care hospital, we identified the nearest general hospital that served the county and included it in our sample. We used a similar approach for counties without local public health departments. The few states without local health departments but only a state health department were excluded from this analysis. The survey response rate for local public health departments was 74 percent (n = 147); for hospitals, it was 52 percent (n = 105). Estimates were statistically adjusted to be representative of all local public health departments and general acute care hospitals throughout the United States. See the survey sidebar for further details.
- 8 As defined in the survey, WMD are "any devices capable of producing large-scale physical destruction, widespread disruption and/or mass casualties." As such, WMD may be chemical, biological, radiological, or nuclear devices or weapons. They could also entail the use of conventional explosive devices or involve the attack of an industrial facility resulting in the release of a toxic substance into the surrounding community.
- 9 As compared to other types of preparedness activities (e.g., equipping and education).
- 10 Large metropolitan counties are defined as central counties of metropolitan areas of one million population or more; the definition is based on the Office of Research and Planning, Bureau of Health Professions, *Area Resource File*, 2000.
- 11 In contrast, we found that other local responder organizations (fire departments, law enforcement, and emergency medical services) were less likely than hospitals or local public health departments to report having such plans in place. See Ronald D. Fricker, Jr., Jerry O. Jacobson, and Lois M. Davis, *Measuring and Evaluating Preparedness for a Chemical or Biological Terrorist Attack*, Santa Monica, Calif.: RAND, IP-217-OSD, 2002.
- 12 *Assessment of Local Bioterrorism and Emergency Preparedness*, Washington, D.C.: National Association of City and County Health Officials, Research Brief Number 5, October 2001.
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- 14 Delaware, Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia.
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- 16 No clear pattern emerged when survey results for large metropolitan counties were compared with those of other counties. Public health departments in large metropolitan counties were more likely than health departments in other counties to have exercised their biological response plans within the past year, whereas hospitals in large metropolitan counties were less likely than hospitals in other counties to have exercised their biological response plans within the past year. For a chemical incident, we found a reverse pattern for public health departments and hospitals.
- 17 First responders include law enforcement, fire service, offices of emergency management (OEMs), and emergency medical services (EMS); other health organizations include public health agencies, hospitals, clinics, health care providers, and laboratories.
- 18 In comparison, of the first responder organizations in our survey, fire departments and local EMS organizations were similar to public health agencies in their assessment of how well-integrated hospitals and public health agencies are with respect to local bioterrorism planning and preparedness activities. Nevertheless, law enforcement tended to have a more optimistic view, being more likely than any other responder group to assess the level of integration of local public health agencies and hospitals as being relatively high. The RAND survey also included fire departments (n = 300); local law enforcement agencies (n = 148); and local EMS organizations (n = 120). See survey sidebar for more details.
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201 North Craig Street, Suite 102, Pittsburgh, Pennsylvania 15213-1516 • Telephone 412-683-2300 • FAX 412-683-2800

IP-221-OSD (2002)