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Bioterrorism with Zoonotic Disease: Public Health Preparedness Lessons from a Multiagency Exercise

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Responding to agricultural bioterrorism with pathogenic agents that are communicable from animals to humans (zoonotic diseases) requires effective coordination of many organizations, both inside and outside of government. Action must be simultaneously taken to address public health concerns, respond to the agricultural dimensions of the event, and carry out the necessary law enforcement investigation. As part of a project focused on examining public health preparedness in Georgia, an exercise was carried out in July 2005 examining the intentional introduction of avian influenza (H5N1) in commercial poultry operations. The attack scenario, which was written to occur during an already severe human influenza season, enabled exploration of a range of issues associated with public health preparedness for major disease outbreaks including pandemic influenza, coordination of a multiagency response operation at multiple levels of government, and effective management of interdisciplinary response activities. The exercise is described and broader policy lessons regarding preparedness planning are discussed.

NATIONAL POLICY PRIORITIES and current events have focused attention on the capabilities of the U.S. public health infrastructure to respond in times of crisis, both to bioterrorism and naturally occurring events such as an influenza pandemic. Regardless of whether the event is naturally occurring or manmade, an effective public health response requires a coordinated effort involving groups with diverse responsibilities, as well as coordination at different levels of government and governments in multiple jurisdictions.

Many public health preparedness concerns come together in anticipating the response to agricultural bioterrorism (agroterrorism) and in considering disease agents that could result in substantial morbidity or mortality in both animals and humans.¹⁻⁴ Such an event would require a public health response to both the human and animal health threats, necessitating action by both public health and government agriculture agencies. Private sector organizations, ranging from very large to small businesses, may experience direct economic effects, potential

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health consequences for customers, and occupational health threats to employees. An avian influenza outbreak, whether confined to poultry or evolving to human-to-human spread, would similarly require considerable cross-sector response.

As part of a larger exercise program that focused on examining public health emergency preparedness in Georgia, RAND researchers, in collaboration with the staff at the Georgia Division of Public Health and the Rollins School of Public Health of Emory University, conducted a public health preparedness exercise. The goal of the exercise was to examine public health and intersectoral response to the intentional introduction of avian influenza (H5N1) in commercial poultry operations. The exercise was funded by the Nuclear Threat Initiative and the Robert W. Woodruff Foundation and was conducted in July 2005. In this article we describe the exercise design and process and the lessons learned.

EXERCISE DESIGN

The exercise tested multilevel responses to an escalating scenario of a highly pathogenic H5N1 avian influenza (AI) outbreak affecting commercial poultry flocks in the setting of a severe annual influenza season and influenzalike illness among some poultry industry workers.* This enabled participants to address both bioterrorism and pandemic preparedness in a single exercise. A central goal of the exercise was to efficiently explore the interaction and coordination among public health and other organizations at both the local health district and the state levels.

The exercise was conducted over two consecutive days. The first day consisted of a half-day tabletop exercise held in a single public health district; it examined the public health response to an unexplained outbreak of influenzalike illness in poultry workers, who in turn reported that poultry at their place of work were ill.

The exercise was continued the next day, as local public health and response officials joined state officials in a daylong exercise simulating an escalation of events that required increased state involvement and coordination. Conceptually, the public health or agricultural response

actions—carrying out disease surveillance, investigation, implementation of control measures, and so on—may differ very little whether the disease is naturally occurring or terrorist induced. Operationally, however, the latter requires collaboration with law enforcement agencies and consideration of legal implications of specimen and information collection. Making the AI introduction a terrorist event forced participants to consider both the human and agricultural public health responses as well as the interactions required in the event of terrorism.

At key points in the unfolding scenario, participants stopped for moderated discussions related to the exercise objectives, which were grounded in a set of preparedness indicators developed by the Georgia Division of Public Health and the Rollins School of Public Health at Emory University. The areas covered by the indicators are listed in Figure 1. Facilitators guided the discussions using a list of questions or draft agendas and decision-making documents. Both the local- and state-level components ended with a series of identified priorities for policy action.

Exercise Participants

Participants in the district-level exercise included representatives from the district health department (the district health officer, chief administrative officer, public information officer, epidemiologist, chief nurse, emergency coordinator, healthcare liaison), local law enforcement, the Georgia Department of Agriculture, county emergency management and response organizations, local medical care organizations, and the poultry industry. Observers from the state health department served as resource contacts for the district exercise and participated in the state-level exercise the following day.

Participants in the state-level exercise included local health district representatives, leadership and corresponding specialist representatives from the Georgia Division of Public Health as well as the state's public health laboratory, the Department of Agriculture, the Office of Homeland Security, the Georgia Emergency Management Agency (GEMA), state and local law enforcement organizations, fire and emergency medical services, the Georgia National Guard and Georgia Department of Defense, the Georgia Hospital Association, the Department of Emergency Medicine of the School of Medicine and the Rollins School of Public Health of Emory University, poultry industry organizations, and representatives of the United States Department of Agriculture and the Centers for Disease Control and Prevention assigned to stations in Georgia. By design, representatives from federal agencies were invited observers in order to maintain a focus on intrastate functions. However, state participants were expected to discuss their anticipated interactions with federal authorities.

*In addition to creating the need for interagency coordination in response, AI introduction in the poultry industry also tested other elements of public health response that were of major interest. Areas of the state have large immigrant communities, where language and other barriers can complicate effectively serving the population's public health needs. Because many immigrants work in the poultry industry, this scenario made addressing these issues a key element of successfully completing the exercise.

FIGURE 1. GEORGIA PUBLIC HEALTH PREPAREDNESS INDICATORS AND PREPAREDNESS DOMAINS

Command, Control, and Communications
 Surveillance and Epidemiology
 Laboratory
 Immunization and Postexposure Prophylaxis
 Patient Care and Transportation
 Legal Authorities
 Risk Communication
 Pharmacy, Logistics, and Materials
 Workforce Development*
 Occupational Health
 Administration and Financing*

*Because of the nature of the Georgia scenario, examination of these two domains was not a major focus of the exercise.

LESSONS LEARNED

We first summarize the most relevant lessons learned related to the exercise design and then describe implications for multiagency preparedness more broadly. To begin with, carrying a local-level exercise through to the state level on the subsequent day proved to be an important device. It enabled local participants to learn what decision-making processes occur after they “hand off” responsibility to a higher level of government. Similarly, it enabled state officials to gain an appreciation of how local-level officials address issues before they come to a state level. It also helped clarify the issues of who is responsible for what and when appropriate hand-offs should occur.

The experience supported our belief that successful multiagency exercises require broad participation in exercise design. Although exercise development was spearheaded by the Division of Public Health, representatives from other agencies, the poultry industry, and different levels of government were included in the planning process via early exercise tests and personal and formal interagency contacts. This inclusive involvement contributed to the success of the exercise. For example, involvement of the poultry industry ensured the realism of scenario elements related to poultry facilities, industry practices, and economic consequences. Furthermore, the exercise development process itself helped to strengthen relationships that would be needed in the event of a disease outbreak and to sustain preparedness, a key goal of the exercise.

Yet, despite all of the planning, efforts to include a broad array of participants were not always successful. For example, an effort was made to include participation

from an organization representing the area’s Hispanic immigrant community. Promising discussions to enlist the group’s participation were not completed in time for the exercise, perhaps reflecting the need to strengthen links between the local health district and community organizations.

Success in a multiagency response operation requires that all relevant agencies be involved in the response and that effective structures are in place to coordinate them. Appropriately designed exercises can help expose interagency incident management and coordination problems. At a basic level, preparedness exercises are a good vehicle to determine whether all needed organizations have been included in planning. For example, the state-level exercise identified the need for greater coordination among agencies responsible for monitoring and managing wild and domestic birds because of the potential for AI to spread to wild bird populations. The Department of Natural Resources (DNR) should have been significantly involved in response actions, but this was not evident during the exercise design process. Rather, the issue came to light as a result of DNR’s participation in the exercise itself.

Beyond determining if everyone who should be involved is at the table, appropriately designed multiagency exercises can identify whether appropriate structures are in place to coordinate operations. This exercise scenario emphasized the importance of leaders’ capabilities to bridge boundaries at the organizational, disciplinary, and government levels, and it uncovered unresolved issues during the exercise about the most appropriate way to choose an incident commander for a large multiagency response operation, identifying this as an area that should be addressed in subsequent planning efforts. These issues echoed results of previous RAND work on command and coordination during large-scale and complex response operations requiring integration of organizations with very different expertise and distinct responsibilities.⁵

The exercise also identified that different organizations within the state had different priorities and different assumptions about how operations in a large-scale event would be managed. In Georgia, public health, agriculture, and emergency management services are managed within regions or districts that each represent different aggregates of counties. Although this might not be a major problem during routine activities, where the organizations largely operate independently, exercise discussions showed that this could result in serious problems when responding to an incident that involved multiple disciplines. For example, participants indicated that this situation could create parallel command and control functions in public health districts, agricultural response sectors, and county emergency operations, resulting in duplication of information requests and management confusion.

Furthermore, the exercise also highlighted the differing needs of the human and animal public health sectors.

Coordination in response operations and among organizations has been a focus within agency planning and preparedness efforts. However, depending on how an incident evolves, different agencies implementing their own plans for cross-organizational coordination can result in separate and potentially conflicting multiagency management coordination structures, rather than addressing the requirement for effective multiagency incident management.

During the exercise, different expectations emerged about management for incident command systems centered in the Division of Public Health EOC and health districts, in the Department of Agriculture State Agriculture Response Teams (SARTs), or in local management systems in County Emergency Management Agencies reporting up to the state. At both the district-level and state-level components of the exercise, participants had difficulty establishing lead responsibility for declaring an emergency and invoking incident command procedures. In 2004, the governor of Georgia signed legislation mandating that all state emergency response agencies adopt incident command systems consistent with the National Incident Management System, which creates a unified approach to emergencies, including terrorism, so that responders can work together effectively across multiple agencies and multiple levels of government. The exercise demonstrated the challenges inherent in achieving this standard.

For action to be effective, information needs to flow readily among response organizations. Achieving unimpeded information flow among organizations in different response disciplines requires that data—in this case, epidemiologic and public health data—be presented in a way that is readily understandable to other responders. Although the exercise did not test procedures for displaying information, a suggested solution was to increase the use of geographic information systems, since almost all responder organizations are familiar with thinking about incident data in a geographic way. While the public health sector uses geographic information, it had never been a priority to organize or share data in this fashion.

In responding to a crisis, the involvement of multiple levels of government (e.g., both district-level and state-level public health organizations) presents its own challenges. Participants in the state-level component of the exercise pointed out that responding to an event like that in the exercise scenario requires more multilevel government coordination and integration than is routinely required or practiced. While interagency or local-state communication may occur informally in daily practice among colleagues, the circumstances of an emergency response demand that this communication be formalized and documented.

Most operational planning for a health crisis is focused at the local level, with the state primarily providing supplemental resources where needed. For a significantly large-scale event like that described in this exercise scenario, this “locally driven” action planning will likely be superseded, since effective response to such a crisis will require statewide coordination. Yet, actors at the state level may lack the information or perspective necessary to make use of the “locally driven” planning and resources. Understanding how this higher-level management is triggered and efficiently implemented in response to a crisis is critically important to preparedness planning and highlights the need for coordinated planning between state and local levels. This issue came to light in the state-level component of the exercise specifically because of the multi-level exercise design and involvement of local-level public health representatives.

During a multiagency, multilevel crisis, providing effective public information and risk communication will be a major challenge. The goal is to get the right information to the public so that people can effectively protect themselves, but without generating anxiety or panic that could impede responders from resolving the incident and minimizing damage.* Since most incidents will start locally, the tone and nature of risk communication efforts may already be partly set before state (or federal) government becomes involved. This was evident in the district-level component of the exercise. Once organizations from different response sectors and at different levels of government become involved in responding to a crisis, coordinated communication is critical to providing consistent and credible messages to the public. This exercise demonstrated that doing so will be difficult, especially since different response sectors have different concerns about the appropriateness of different types of communication. For example, public health may benefit from announcing a potentially large-scale outbreak even before all details about the disease are known. However, in the situation described in the exercise scenario, such an announcement would trigger trade and other economic consequences for the agriculture sector, an issue of only secondary concern for public health. Such conflicting needs for public information were observed in both the state- and local-level exercises, demonstrating the serious consequences that could occur in an actual crisis if coordinating communication activities is not part of prepared-

*Both the challenges of doing this well and the consequences of failing to do so are illustrated by the federal government's response to the 2001 anthrax attacks. See Thomas P. *The Anthrax Attacks*. Available at: http://www.tcf.org/Publications/HomelandSecurity/thomas_anthrax.pdf. Accessed November 19, 2005.

ness planning. In fact, participants in the state-level exercise viewed this issue as significant enough to warrant separate exercises to ensure that public information officers at all government levels and in all organizations understand how to work together.

Responding to protect life and health is the primary concern in a bioterrorist event, but addressing the requirements for law enforcement to identify and prosecute perpetrators is also necessary. The need for law enforcement to maintain chain of custody of samples from collection through laboratory analysis and diagnosis is well known, but less well understood is the degree to which this law enforcement need could significantly increase the burden on public health investigators and laboratories and reduce their ability to process the large volume of samples in a large-scale crisis. In this case, the exercise highlighted that planning should include prioritization schemes and “sample triage” approaches so that the needs of both law enforcement and health are met to the extent possible.

The exercise was designed to make participants look beyond the traditional sectors for additional response resources. It did this by including non-English-speaking and immigrant populations as examples of special needs groups who may be more difficult than others for government officials to reach successfully. During a crisis, such groups must be reached with risk communication messages, contacted during surveillance and epidemiologic investigations, and have their healthcare needs served.

Community organizations that represent specific populations are a potentially valuable resource for this role. So too are employers.⁶ For example, workers in the poultry industry may be reached more effectively through employers than by government organizations. The staffing challenges that major events will put on all responding organizations also emphasize the need to effectively use volunteers and volunteer organizations in response activities. Since a bioterrorist attack can have economic as well as health consequences, involving the private sector in preparedness is also critical. In perpetrating an agroterror attack, causing economic damage would likely be one of the terrorists’ primary goals. Acting to address public health needs while also trying to minimize the economic harms of a terrorist attack requires close cooperation and linkage with the private sector.

CONCLUSIONS

Preparedness exercises, such as the one described above, offer an effective way to identify strengths and gaps in local and state responses to public health emergencies, including terrorism, and address them before an actual crisis occurs. This exercise focused on a limited incident of

agricultural bioterrorism with a zoonotic disease occurring simultaneously with an unusually severe human influenza season. While this scenario was designed to be demanding and to require the involvement of many agencies in response activities, it was also designed to be realistic. Georgia has experience in preparing for and responding to natural disasters and large national-scale events, so its overall preparedness is strong. Still the lessons learned from this exercise demonstrated ways to strengthen coordination and management mechanisms across response sectors and across multiple levels of government.

The results of this exercise reinforced a variety of lessons that are already broadly appreciated, such as the need to address workforce and surge capacity issues in the public health and healthcare sectors, and the need to successfully reach non-English-speaking populations during response efforts. However, the exercise also revealed issues that are less widely considered, such as potential problems with incident management as events escalate, and the need for appropriate liaison and coordination with other responding organizations to address the veterinary, private sector, and law enforcement elements of the incident. This exercise discovered that the public health, agriculture, and emergency management agencies each had somewhat different assumptions about how and where multiagency coordination would occur during a complex event.

This exercise supports the observation that exercises where all agencies merely *attend* are not sufficient. Scenarios must be produced that require all agencies to *participate* in activities and decision making. It is only through such interaction that conflicts and trade-offs among response activities will be discovered. Until preparedness issues and problems have been identified, they cannot be solved. For national emergency and public health preparedness, it is far better to do this through an exercise and learning process than ad hoc in the high-pressure environment of actual response operations.

AFTERWORD

In August 2005, soon after completion of the exercise described in this article, Hurricane Katrina struck the Gulf Coast, creating one of the most significant disasters in recent U.S. history. While not directly affected by the storm itself, the state of Georgia hosted approximately 70,000 Katrina evacuees in the aftermath of the hurricane, most of whom were housed in the Atlanta area. Although the lessons from the exercise regarding multiagency coordination and response were not yet incorporated into revised preparedness plans, members of the Georgia Division of Public Health involved in managing the response activities indicated that the expe-

rience during the exercise helped to improve the programs put in place after Katrina in a variety of areas:

- *Communications.* The importance of building unified messages across government sectors during the exercise led to increased focus on doing so in the response to Katrina. State agencies worked together to coordinate unified and clear messages for the public information components of evacuee service operations.
- *Interoperability.* Building on the lesson from the exercise that geographic information (GIS) systems can make it easier to communicate data across responding agencies, GIS was used extensively in evacuee operations to track hotel resources that were housing evacuees and to use those efforts to focus public health and support efforts.
- *Defining Priority Groups for Public Health Services.* Just as the exercise scenario highlighted the need to prioritize the delivery of services to do the most good for the most people, focusing on hotels and shelters where public health efforts could be most beneficial helped to strengthen the response to Katrina.
- *Surge Capacity.* The exercise scenario explored a variety of surge capacity issues, ranging from the need for sufficient staffing for incident management to ways different response sectors can reinforce one another at large incidents. In the weeks after the exercise, the Georgia Division of Public Health reactivated its Health Emergency Alert and Response Team, a team drawn from agencies across the Georgia Department of Human Services. Reconstitution of this team provided a “deeper bench” to draw on for professionals to manage evacuee operations. This proved to be critical due to circumstances that made key staff members unavailable to participate in the Katrina response.
- *Use of Volunteers.* Discussions of volunteer credentialing and management in the exercise led to an early focus on effectively using volunteers to support evacuee service operations. Both early executive action (enabling medical professionals in other states to practice in Georgia), use of state public health information systems to catalogue medical professionals willing to volunteer, and matching evacuees needing attention with available doctors through a dedicated hotline made it possible to better meet the medical needs of evacuees.

The success in managing evacuee service operations in Georgia was certainly not a result of the exercise experience, reflecting instead the flexibility and hard work of the members of the government and nongovernment organizations involved. However, the fact that the exercise experience focused attention on key issues to address in response—and that its lessons could be readily applied to a disaster that struck soon after—highlight the value of

multiagency exercises for strengthening preparedness, even for events that differ significantly from the agents or incidents explicitly covered in the exercise scenario.

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