Pandemic Disease: A Past and Future Challenge to Governance in the United States

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Abstract

Throughout history, pandemics have posed significant challenges to governments. Examination of the ways that governments have responded to pandemics can contribute to the U.S. government's ability to react in the future. We utilize past cases of Severe Acute Respiratory Syndrome (SARS) and multiple forms of influenza to identify specific challenges governments have faced. Based on that knowledge, we discuss the major issues that the United States will have to address in the event of a future pandemic.

KEY WORDS: disease, influenza, pandemic, quarantine, response, SARS

Introduction

The threat of pandemic disease, whether naturally occurring or terrorist inflicted, is real. In today's world of rapid global transportation, any location on Earth can be reached in less than 36 hours—a time frame shorter than the incubation period of many diseases, which may take days or even weeks to manifest symptoms. The significance of this is that persons infected with truly terrible afflictions could travel around the world before they even had a sniffle. This may make it more difficult for the health care community to recognize that there is a problem as infected individuals may be spread around the world. A 2005 report by the RAND Corporation indicated that the required public health response will not be proportional to the actual number of people infected or dead because of the need for increased disease surveillance and the number of healthy people that will seek attention because they fear the disease (Stoto et al., 2005, pp. xii–xiii). Furthermore, there are over 5,000 viruses and more than 300,000 species of bacteria that impact humans (Brower & Chalk, 2003). This means that identifying exactly what is causing the illnesses may be difficult. Because an outbreak of disease can occur before anyone is aware of it, governments must become better prepared to address the societal, political, and economic impacts of pandemic disease.

Recent viruses have increased awareness of the potential threat posed by a major pandemic. The spread of severe acute respiratory syndrome (SARS) in 2002 and 2003 and of avian flu in 2005 and 2006 have raised concerns about governments' abilities to stop the spread of disease and to treat those exposed effectively. Both viruses have also increased awareness of the potential economic losses that a country could incur based on the spread of disease. Recent studies indicate that a severe influenza pandemic could cause a decline in U.S. gross domestic product (GDP) as high as 5 percent and a milder epidemic could reduce GDP by about 1.5 percent (Congressional Budget Office, 2006). While estimates of potential economic losses are always contentious, they are useful in demonstrating that there is a potential for

significant impact. Furthermore, in the post-9/11 world, more attention is being paid to the challenges governments will face in the event of a major bioterrorism incident. In fact, spending on biodefense has increased from \$576 million in fiscal year 2001 to a proposed \$5.4 billion in 2008 (Franco & Deitch, 2007).

A major epidemic could potentially challenge governments in many different ways beyond the economic impact. Several studies and exercises have indicated that hospitals lack the capacity to handle a major influx of infected individuals (Brower & Chalk, 2003; Heinrich, 2004; Stoto et al., 2005). Gaining treatment for large numbers of patients may be a logistical nightmare, if it can be done at all. Other studies indicate that the United States would be likely to experience shortages of the required vaccines or treatments for a large number of ill. Beyond the medical issues, the government may confront civil rights and civil liberties challenges as they attempt to stop the spread of the disease (see also Cohen, Cook, & Louscher, 2004). Travel restrictions may need to be imposed and quarantine or isolation (defined as the confinement of an exposed individual for the incubation period of the disease or of someone with the disease for its duration, respectively) measures may also be necessary (Cohen & Cook, 2006). Either of these measures may be perceived as a violation of the civil liberties of American citizens.

We utilize past epidemics to identify strengths and weaknesses displayed by governments as they have struggled to respond to the spread of certain diseases. While we include the response activities of many different countries, we focus on preparedness challenges for the United States, particularly with respect to airborne diseases that are readily spread and that are naturally occurring cases.

We examine the unique characteristics and histories of diseases that have spread broadly from person to person, or threaten to do so. The case studies included will pay special attention to pandemic influenza (both the 1918 flu and avian influenza) and SARS. We then highlight U.S. government activities that are under way to improve preparedness for a future epidemic. Following that, we address challenges to U.S. policy makers in this area such as the need to integrate response between the public and private sector, the challenge of providing medicines and vaccines to the public in an epidemic, and the need to impose quarantines and isolation to stop the spread of the disease. We conclude by summarizing the findings about U.S. preparations to respond to a global pandemic and provide recommendations for areas in most need of improvement.

Past Response Activities

American history contains many examples of epidemics that have killed and sickened hundreds of thousands. The 1918 Spanish influenza killed half a million Americans—four times the number of American soldiers killed in World War I. The Asian flu of 1957 killed 70,000 Americans—15,000 more American soldiers than were killed in the Korean War. The Hong Kong flu of 1968 killed an additional 34,000 Americans (statistics from the U.S. Government Accountability Office [GAO], 2005a). Besides influenza, federal, state, and local governments must prepare for numerous naturally occurring diseases that are potential threats to the American populace, including hantavirus, West Nile virus, whooping cough,

hepatitis, meningitis, encephalitis, and AIDS. This is not to mention the threat of bioterrorism, which may or may not make use of common diseases that have been weaponized.

Many observers fear that a strain of avian influenza that is communicable between people or a pandemic flu similar to that of the 1918 strain will occur in the near future and indeed pose a grave threat to Americans. In November 2005, President George W. Bush announced a national strategy for combating avian flu. In his speech to the National Institutes of Health (NIH), the president commented that

scientists and doctors cannot tell us where or when the next pandemic will strike, or how severe it will be, but most agree: at some point, we are likely to face another pandemic. And the scientific community is increasingly concerned by a new influenza virus known as H5N1—or avian flu—that is now spreading through bird populations across Asia, and has recently reached Europe . . . While avian flu has not yet acquired the ability to spread easily from human to human, there is still cause for vigilance. The virus has developed some characteristics needed to cause a pandemic: It has demonstrated the ability to infect human beings, and it has produced a fatal illness in humans. If the virus were to develop the capacity for sustained human-to-human transmission, it could spread quickly across the globe. Our country has been given fair warning of this danger to our homeland—and time to prepare. It's my responsibility as President to take measures now to protect the American people from the possibility that human-to-human transmission may occur. (The White House, 2005b)

This section provides two case studies about the governmental response to pandemics in order to illustrate the types of challenges faced when disease is spreading rapidly. The cases presented are SARS and a variety of cases of influenza.

Pandemic Influenza

Influenza takes a variety of forms, each with its own characteristics. While some spread relatively easily from person to person, others are less contagious. Certain flu viruses seem to be relatively limited to animal hosts, with little concern about them passing to humans. Therefore, some influenza is extremely dangerous while others pose little threat to society. The most deadly incident of pandemic influenza was the outbreak in 1918. The impact of the 1918 flu on America was so profound that life expectancy within the country decreased by ten years (Billings, 2005). This 1918 flu virus was unique in that it spread very easily from person to person and—unlike most flus, which kill the very young, the elderly, and the infirm—killed healthy adults in the prime of their lives. The United States struggled, along with other countries and the international community, to bring an end to this deadly epidemic.

Many of the activities undertaken by governments were focused on the need to separate infected individuals from those that had not been exposed. Governments banned public gatherings and closed schools. Most recreational activities were curtailed because they would bring people together. This extended so far as to result in a ban of public funerals, which were deemed unnecessary gatherings of people (Kolata, 1999). People wore cloth masks—sometimes distributed by public health agencies and required of citizens—in public, and stayed in their homes to a

large extent (Billings, 2005). However, containment was complicated by World War I. Soldiers were coming together across America and the world. They lived and fought in cramped quarters and the disease consequently spread quickly among the troops (Barry, 2004).

Quarantines and isolation orders were enacted as the most restrictive of the measures to control the spread of the disease. This challenged hospitals to keep the infected individuals under isolation. Because the number of cases quickly outstripped public health capacity, many were merely told to stay in their homes. Others were quarantined in military installations. Hospitals were also terribly short-staffed. They were compelled to deal with soldiers with varying injuries returning from the war, the large numbers of people infected with the flu, the need to disperse their personnel around cities to care for those on home quarantine, and the loss of staff members that contracted the flu virus (Billings, 2005).

Recent studies by the NIH demonstrate that cities implementing containment measures (such as isolation, quarantine, and public separation) rapidly in response to the first cases of disease significantly reduced the spread of the disease as well as the number of casualties. According to Anthony Fauci, MD, NIH, "a primary lesson of the 1918 influenza pandemic is that it is critical to intervene early" (Morens & Fauci, 2007). A second study found that the timing of lifting the quarantine measures was also an important factor in preventing the disease from being reintroduced into society (Morens & Fauci, 2007).

The swine flu scare of 1976 raised the specter of another deadly flu pandemic. Swine flu began at Fort Dix in New Jersey, where a young recruit informed a drill instructor that he felt ill and was dead within 24 hours. Four of his friends also were stricken with the disease and another 200 soldiers caught swine flu without becoming sick. (Garrett, 1995; Kolata, 1999; Krause, 2006). This incident spawned a massive government and public health movement to inoculate Americans from the disease in the hopes of avoiding another 1918-magnitude epidemic. The fear of the return of a 1918-type influenza was sparked by the similarity of the two viruses. Stockpiling of a swine flu vaccine in case of an outbreak was initially considered, but many worried that waiting for the epidemic to begin would result in broader spread of the disease. Forty-five million people, nearly 25 percent of the U.S. population at the time, were vaccinated through the National Influenza Immunization Program by October 1976 (Krause, 2006). In the end, the epidemic did not occur and more people got sick from Guillain-Barré Syndrome, a side effect of the vaccine, than contracted swine flu (Kolata, 1999).

As was the case with swine flu, avian influenza (the H5N1 virus) is of great concern to today's national and international public health community because of the striking similarities between the virus and the one responsible for the 1918 flu pandemic. Another reason governments are worried about avian flu is that the disease is carried by migratory birds, allowing it to spread along migration paths throughout the world (World Health Organization [WHO], 2006). "Were a strain of influenza much the same as that which caused the 1918–20 pandemic to emerge . . . , we estimate that it could kill 51–81 million individuals" (Murray et al., 2006, p. 2215). To date, the WHO has recorded 288 cases of avian flu in humans, with 170 of those resulting in death (WHO, 2007). Although there have been a few reported cases of human-to-human infection, experts fear that muta-

tions of the H5N1 virus could make it much more transmissible in the future. Most of the human cases to date have been contracted through contact with infected birds or infected surfaces (Centers for Disease Control and Prevention [CDC], 2006).

The United States has responded to the threat of avian flu by banning the importation of birds from H5N1 countries. Avian influenza was also added to the official U.S. list of quarantinable communicable diseases when President Bush amended Executive Order 12395 on April 1, 2005 (Bush, 2005). The CDC is working with the WHO and other international agencies to track the spread of the disease. However, because the disease is not readily transmissible between humans, the CDC has not recommended the wearing of masks or other restrictive measures in response to the disease (CDC, 2007b). Avian flu also sparked the creation of the National Strategy for Pandemic Influenza and the U.S. Department of Health and Human Services Influenza Plan in 2005, and the National Strategy for Pandemic Influenza Implementation Plan in 2006 (all discussed in greater detail further in the text). These were focused on improving domestic preparedness for a major disease outbreak. The U.S. State Department has also become involved in the International Partnership on Avian and Pandemic Influenza, which seeks to enhance public health and surveillance through international diplomacy (Salaam-Blyther, 2006, pp. 5–6).

SARS

As the world prepares to respond and recover from the next great pandemic disease, it is instructive to examine the SARS crisis of 2002–03. SARS was discovered in November 2002 in the Guangdong province of China and was contained through the efforts of individual governments and of the world medical community. President Bush acknowledged the relevance of SARS to future potential pandemics when he stated:

Three years ago, the world had a preview of the disruption an influenza pandemic can cause, when a previously unknown virus called SARS appeared in rural China. When an infected doctor carried the virus out of China, it spread to Vietnam and Singapore and Canada within a month. Before long, the SARS virus had spread to nearly 30 countries on six continents. It infected more than 8,000 people and killed nearly 800. One elderly woman brought the virus from Hong Kong to Toronto, where it quickly spread to her son and then to others. Eventually, four others arrived with the virus and hundreds of Canadians fell ill with SARS, and dozens died. By one estimate, the SARS outbreak cost the Asian-Pacific region about \$40 billion. The airline industry was hit particularly hard, with air travel to Asia dropping 45 percent in the year after the outbreak. All this was caused by a limited outbreak of a virus that infected thousands and lasted about six months. A global influenza pandemic that infects millions and lasts from one to three years could be far worse. (White House, 2005b)

The characteristics of SARS contributed to the challenges of addressing the outbreak. It is a communicable disease that has a two- to seven-day incubation period with infected individuals initially exhibiting flu-like symptoms and a high fever (World Health Organization, 2005). Symptoms that followed included: headache, body ache, dry cough, and eventually pneumonia. The disease was spread

through close personal contact, usually by sneezing and/or coughing.¹ Some individuals (dubbed super spreaders) produced an abundance of the virus and were highly contagious (e.g., Lemonick & Park, 2003; McKenna, 2003). Most people contracting the disease, however, were only moderately contagious and seemed to infect only those with whom they have had close contact, including the medical community.

Although the CDC initially published a mortality rate for the disease of 5.9 percent, by May 8, 2003, the World Health Organization established a 15 percent mortality rate for SARS—particularly frightening when compared with the 1918–19 Spanish influenza outbreak that killed more than 20 million people in 18 months with a mortality rate of 3 percent.² The 2002–03 SARS outbreak resulted in 8,098 confirmed cases and 774 fatalities. China and Hong Kong were hit hardest by SARS: China had 5,327 reported cases and 349 deaths; Hong Kong had 1,755 cases and 299 deaths (U.S. GAO, 2004a).

Economic Impact—The economic impact of SARS, especially in hard-hit Asian countries, was significant and provides insight into the effects of a major disease on national economies. The economic impact of the disease was seen in airlines, hotels, trade, and retail markets (Rahman & Sanchanta, 2003; Struck, 2003). The GAO estimated that the economic costs to Asian countries at between \$11 billion and \$18 billion with a net drop in GDP for selected Asian countries at between .5 and 2 percent (U.S. GAO, 2004a).

Countries impacted by the disease suffered in a variety of ways ranging from loss of tourism to government bailouts of failing companies. Restaurants, karaoke bars, and other gathering places in Hong Kong lost money as people stayed home to avoid infection. Hong Kong's Liberal Party announced during the crisis that it had reached an agreement with property developers to reduce rents from 10–40% for tenants over a three-month period to help some stay in business ("Small Businesses in Hong Kong Hammered by SARS," 2003). In Canada, conferences, concerts, sporting events, and other activities were canceled in response to the outbreak (e.g., Vlessing, 2003). In addition to the costs borne by private industry, governments in countries most impacted by the disease incurred significant costs, not only in terms of response to the outbreak but also in large economic stimulus packages aimed at increasing GDP (U.S. GAO, 2004a).

Fear was the primary driver for these economic impacts (e.g., Rahman & Sanchanta, 2003; Struck, 2003). As stated by the GAO, "while the number of cases and associated medical costs for the SARS outbreak were relatively low . . . , the economic costs of SARS were significant because they derived primarily from fears about the disease and precautions to avoid the disease, rather than the disease itself" (U.S. GAO, 2004a). People were afraid to visit countries in which the disease was spreading, leading to a large drop in tourism and business travel. Firms stopped corporate travel to these areas for fear of disrupting business as a result of the potential illness of large numbers of employees. According to one report, as many as 58 percent of U.S. corporations banned travel to specific Asian countries as a result of fears of SARS ("SARS Epidemic 'Grounding Business Travel,'" n.d.). About the only economic sectors in the affected Asian countries that were experiencing growth were the health and surgical mask markets.

U.S. Response Activities—The impact of the disease in the United States was relatively limited, with only 27 reported cases, most of whom traveled to Asia or cared for someone with SARS (CDC, 2003; WHO, 2003a). No American died of SARS during the outbreak; however, President Bush signaled the seriousness of the disease's spread when he signed an executive order that revised the U.S. list of quarantinable diseases to include SARS (Bush, 2003). This was the first time that the list had been expanded since the addition of Ebola in 1983 (McKenna & Wahlberg, 2003; Stein, 2003).

The CDC assumed an important role in helping Asian governments cope with the disease, particularly by providing resources in the area of disease surveillance. The CDC was instrumental in disseminating information to international travelers and identifying passengers who were particularly at risk of being exposed to SARS. However, CDC efforts were hindered to a great extent because of a lack of cooperation from airlines that were reluctant to release passenger information to the U.S. government (U.S. GAO, 2004a).

The U.S. State Department also was instrumental in preventing the spread of the disease within the continental United States. Among other actions, State pressured other governments to share disease-specific information with the U.S. government and to increase transparency. State also took the lead in distributing information and coordinating medical evacuations of U.S. government employees and citizens afflicted with SARS (U.S. GAO, 2004a).

Some states took an aggressive response to the issue of quarantine even in advance of the SARS epidemic. In December 2002, Washington state passed regulations that allowed for mandatory quarantine for those who were exposed to infectious diseases or mandatory isolation for those who were symptomatic. In such cases, police were required to support public health officials and required no court order to do so. The regulations actually served to address civil liberties concerns about the existing state laws, which some believed violated the due process rights of individuals (Ostrom, 2003).

Because the impact on the United States was relatively minimal, it is insightful to provide a summary of the steps taken by Asian countries and Canada. While these are countries with different forms of government and cultures, the challenges they faced provide valuable insights into those likely to be encountered by the United States in a pandemic.

Response in Asia—China was criticized for concealing the spread of SARS and the extent of its impact on that country from November 2002 through April 2003 (U.S. GAO, 2004a). In fact, reports of the extreme lengths to which the Chinese government went to hide the extent of the SARS problem are numerous (e.g., Ratnesar, Beech, & Frank, 2003). For example, according to one account, James Salisbury, a 52-year-old English teacher, appeared to have already been dead when he was transported to Hong Kong. It is believed that the Chinese government covered up his death in order to avoid the embarrassment of another foreign casualty from SARS in mainland China (Luk, 2003).

Quarantine in China was not discussed extensively until the end of April 2003, when it was announced that 4,000 people living in Beijing were ordered to quarantine themselves. That action caused incidents of hoarding among those who felt

that the government was preparing to initiate martial law in China (Pomfret, 2003). By May 1, the quarantine figure had risen to 11,000 individuals, including workers and patients at 128 medical facilities around Beijing (Armitage & Korporeal, 2003; "More than 11,000 Quarantined in Capital," 2003).

Like China, Hong Kong suffered a terrible toll from SARS. In late March 2003, government officials ordered the quarantine of 1,080 people who were believed to have had close contact with infected individuals. People were told to stay in their homes and were informed that failure to do so could bring a fine of approximately \$650 and six months' imprisonment (Yau & Ng, 2003). Members of the Amoy Gardens apartment complex's Block E, where the disease had produced an inordinate number of patients, were moved to government-owned resorts under armed guard (Lee & Yau, 2003). Those placed in quarantine were required to stay at home and report in at regular intervals about their health. Those quarantined complained that their needs were not sufficiently met by the government (Ng, 2003).

Of the known actions to try to control the spread of the disease, those taken by Singapore would likely be the most objectionable to American notions of civil liberties. Quarantine in Singapore began as voluntary. Once an individual violated that quarantine order, Singapore's efforts to control the spread of disease became more invasive. Internet-linked cameras were issued to those under quarantine and they were expected to turn on the camera at specific intervals and report their health status to monitors. Violators were charged \$2,840 for the first offense and \$5,663 for the second (Soh Wong Sher Maine, 2003; "Singapore Puts 740 in Home Quarantine," 2003). Electronic bracelets normally used to monitor individuals who were under house arrest were forced upon those who do not comply with the orders. Singapore officials eventually announced that jail time could be ordered for repeat offenders who would be placed in prison isolation wards for the duration of the quarantine period (Henson, 2003b). Finally, thermal-imaging scanners were being used at all major entry points to detect the presence of fever in individuals (Paddock, 2003).

In addition to civil liberties issues, the potential for civil rights violations in times of pandemic are highlighted by the Singapore case. Doctors, nurses, family members of the ill, pilots, and flight attendants all reported cases of discrimination. Members of the health community were advised to change out of their uniforms before heading for home, both to avoid the spread of the disease but also to avoid being shunned if they took public transportation (Bradsher, 2003; Henson, 2003a).

Response in Canada—Canada experienced more incidences of SARS than any other area outside of Asia. By April 20, 2003, Canada had quarantined 10,000 and placed 1,500 Toronto residents into home isolation. One of the unique methods employed by the Canadians was barring visitors to hospitals. Only those visiting critically ill patients or parents visiting children were permitted to enter hospitals for visitation (Green, 2003).

Canada took an extraordinary step in the case of a public health official who had come into contact with an infected individual and failed to comply with the quarantine order. The Ontario Superior Court of Justice issued what is known as a Section 35 order authorizing police to escort the individual forcibly to quarantine in a secure hospital. The order also carried a fine of \$5,000 for each day the individual

remained at large (Friscolanti & Vallis, 2003). By April 17, more than 15 people in Toronto had been placed in forced quarantine. Toronto officials had also considered using electronic monitoring devices for those who broke quarantine (Branswell, 2003; Niedowski, 2003). Public health officials placed at least one person under police guard in the hospital and hired private security firms to check on those in isolation. Ontario's Health Minister, Tony Clement, was quoted as saying, "This is a time when the needs of a community outweigh those of a single person" (Altman, 2003a).

The SARS outbreak died a quiet death in 2003. With little fanfare, and despite the late start as a result of initial intransigence and cover up by China, the world community successfully stopped SARS before it became an invisible killing machine impossible to stop. We turn now to the subject of U.S. response planning—a critical link in the pandemic preparedness chain.

Pandemic Response Planning in the United States

"Although the timing, nature, and severity of the next pandemic cannot be predicted with any certainty, preparedness planning is imperative to lessen the impact of a pandemic" (U.S. Department of Health & Human Services [HHS], 2005). Perhaps nothing is more difficult to respond to, however, than a silent killer seen only through a microscope. A pandemic disease outbreak generates unique challenges for first responders. Because each disease has an incubation period, it may take days or weeks before an outbreak is discovered and steps are taken to contain it. Unlike most natural disasters or terrorist incidents, a pandemic disease is managed mostly by hospitals and health care professionals. Typical characteristics of emergency response to a major incident, such as leadership from the fire and police departments and establishment of the incident command system, are irrelevant. A pandemic disease response requires far more preparedness and surveillance on the part of health care professionals and federal health care agencies to minimize the devastation caused by a contagious disease outbreak. Fire departments, police, military personnel, and other governmental agencies may be called upon to help with security, quarantine, and containment. This supporting role is unusual for these agencies.

Because the initial response will be dominated by medical personnel and facilities, their preparations are crucial. In the United States these are largely private-sector entities. While they are clearly conscious of the threat and are preparing for response, government influence over these activities is less than if they were public sector organizations such as police or fire departments. All aspects of the response, from disease surveillance to containment, will rely on the coordination and cooperation of these facilities.

The health care system will not be able to contain a pandemic alone. Agencies at the local, state, and federal levels will all be called upon to address issues beyond the control of the medical community. This might include police or military enforcement of quarantine, reliance on federal agencies to identify trends nationwide, and utilization of the Strategic National Stockpile (SNS) of medicines, vaccines, and medical supplies. Finally, in a pandemic situation there would be involvement of international organizations such as the WHO and involvement among governments of the world.

Hospital Planning and Preparations

As mentioned earlier, health care professionals and hospitals become the first responders in a pandemic disease outbreak. According to the GAO, while most urban hospitals across the country report participating in basic planning and coordination activities for bioterrorism response (which shares many characteristics with a naturally occurring pandemic), they do not have the medical equipment to handle the number of patients that would be likely to result from a bioterrorist incident (U.S. GAO, 2003c). Four out of five hospitals reported having a written emergency response plan addressing bioterrorism, but many plans omitted some key contacts, such as laboratories—a crucial component in the response to a pandemic disease outbreak (U.S. GAO, 2003b). Almost all hospitals reported participating in a local, state, or regional interagency disaster preparedness committee, and have undergone training of their personnel on identification and diagnosis of disease caused by biological agents considered likely to be used in a bioterrorist attack, such as anthrax or botulism. However, fewer than half of the hospitals have conducted exercises simulating the hospital's response to a bioterrorist incident. Hospitals have reported repeatedly that they lack the medical equipment necessary for a large influx of patients, whether from a bioterror incident or a naturally occurring pandemic. In general, larger hospitals reported more planning and training activities than smaller hospitals (U.S. GAO, 2003c).

As concerns about bioterrorism and talk of a pandemic disease outbreak have intensified in this post-9/11 world, hospitals across the country have been working to increase their preparedness for responding to such events. The staff, medicines, supplies, and equipment that hospitals would require to respond to a bioterrorist attack with mass casualties are far greater than what are needed for everyday performance. Hospital administrators are faced with the choice of increasing funding for unique pandemic response requirements that they may never use, or of utilizing those funds for the known daily needs of patients and the community. Because the characteristics of every possible disease outbreak or incident are so case specific, administrators would also have to decide for which types of diseases they should be preparing.

Hospital officials are aware that their facilities are an essential component of U.S. health care preparedness and strive to create a balance between the unknown future and the daily routines of community care. Most hospitals, however, still lack equipment, medical stockpiles, and quarantine and isolation facilities for even a small-scale response. Grant funding has been provided under the National Bioterrorism Hospital Preparedness Program (NBHPP) to help hospitals address these issues (U.S. GAO, 2003c). The NBHPP was created by the HHS's Health Resources and Services Administration to enable hospitals and health care systems better preparation and response to bioterrorism and public health emergencies (HHS, 2007).

First Responders: Planning for Police and Fire

The Pandemic Influenza Plan (discussed in greater detail further in the text) released by the HHS details the role of law enforcement in a postoutbreak event (Colwell, 2006). This role would likely be consistent in any major pandemic of a highly contagious disease. In a time when a contagion is spreading, controversial

tactics may be necessary to contain the disease. Law enforcement has a key role in many aspects of a pandemic. The most important aspect of this may be the need for local law enforcement to be prepared to help control diseases at the community level and manage the risk of disease transmission through the enforcement of travel restrictions (CDC, 2004). Law enforcement agencies require preparations with local leaders and their communities for the implementation of pandemic containment measures in the event that an outbreak occurs. Disease control measures range from voluntary individual containment to community-based containment or quarantine (Colwell, 2006).

An involuntary individual level of containment requires law enforcement officers to contain the spread of an infection by enforcing the isolation of an individual patient and by managing individuals who may have come into contact with sources of infection. Containment or isolation can be enforced at health care facilities, individual homes, or an alternative location. Local law enforcement may need to provide guards and to isolate patients with a highly infectious disease at multiple facilities in their communities while maintaining the daily duties required of the agency by the community (Colwell, 2006). An excellent and controversial example of this began in July 2006. At that time, an individual infected with extremely drug resistant tuberculosis (XDR-TB) was placed in a prison containment cell. He had not been charged with a crime. The individual contracted the disease and then refused to follow orders that he wear a mask in public to protect from infecting others. XDR-TB is among the frightening diseases that are virtually untreatable and easily transmissible ("Man Jailed for Having Deadly TB," 2007). South Africa is reportedly also considering forcible isolation for patients infected with the disease. ("Call for Deadly TB Isolation Move," 2007).

Community-level containment may include voluntary and involuntary snow days, the closure of office buildings, shopping malls, schools, and public transportation, and widespread community quarantine (CDC, 2004). Local law enforcement will be charged with enforcing the closures of office buildings, public facilities, and public transportation, as well as with providing secure transport for supplies, patients, and public health personnel (Colwell, 2006). Community quarantine will undoubtedly need to be enforced by police or military officials.

Emergency responders (both fire and police) are likely to experience an increase in the number of emergency calls during a pandemic, which will require additional units for transportation beyond those regularly used for daily calls. Staffing shortages will be exacerbated by the fact that some members of the first responder community will likely be stricken with the disease. According to one estimate, as much as one-third of the department staff could be lost as a result of illness and quarantine. Emergency responders are at a higher risk for infection because they are likely to come into direct contact with those infected with the virus or disease in the course of their job duties. Also, fire departments will likely experience a shortage of both medical supplies and protective gear that may hinder responses and treatments ("Pandemic Influenza FAQs," 2006).

Generally, fire departments will have fewer responsibilities in a pandemic disease outbreak than in most other disasters. Fire department personnel may be used to aid in the enforcement of quarantines, assistance in decontamination activities, distribution of medical supplies, and providing assistance to those placed on

in-home quarantine. Planning and preparedness among all emergency responders, local leadership and members of the community is critical in advance of a pandemic disease outbreak. If emergency responders become infected, the consequences could be devastating.

Federal Response Planning Activities

NRF, NIMS, and the Stafford Act

National all-hazards emergency response activities are coordinated through the National Response Framework (NRF). This document provides guidance for federal agencies as they prepare to provide support to state and local response activities. It recognizes that response is a local activity, but that no one locality or agency will be able to respond adequately in a catastrophic disaster. Therefore, the NRF follows the Stafford Act conceptualization that participation in response activities will begin at the local level and then move up the layers of federalism as the disaster outstrips the capacity at the lower levels (U.S. Department of Homeland Security, 2008).

Utilization of the National Response Framework to guide pandemic response also brings the operational paradigm of the National Incident Management System (NIMS) into play. NIMS is a set of doctrine, concepts, and processes intended to assist in the management of complex disasters. One of the major contributions of NIMS is its focus on creating a common lexicon for the management of disasters so that communications are more effective across disciplines and levels of government. It also provides the Incident Command System (ICS), which is a scalable and modular organizational scheme intended to facilitate command in response activities (Federal Emergency Management Agency, 2007).

The NRF contains incident-specific annexes that provide special guidance for uniquely challenging events. One of those annexes is the Biological Incident Annex. It assigns HHS as the coordinating agency for federal-level response to either a bioterror attack or a naturally occurring pandemic. It lists most other agencies of the federal government and the American Red Cross as cooperating agencies in the response. The actions that are to be taken by the federal government can be mobilized with or without a presidential declaration of disaster, but may only be implemented for incidents of national significance (U.S. Department of Homeland Security, 2004).

The annex requires the federal agencies to be active in a response to a pandemic in many different aspects, including: disease surveillance; identification of at-risk populations; controlling the disease spread; augmenting public health and medical capacities at the state and local levels; decontamination where appropriate; coordination of the U.S. response with international activities; containment of the infected population and control of the epidemic; provision of public information; identification of the disease and its means of transmission; development and distribution of appropriate vaccines, medicines, or treatments; and assistance in the law enforcement aspects of the outbreak. Generally, this means that the state- and local-level agencies will begin the response and will continue to be active throughout its duration, but the federal government will provide support and assistance in a variety of different ways. For instance, if a contagious disease were beginning to

spread in the United States, the governors of affected states would be required to implement isolation or quarantine orders, but then the federal authorities could assist in the enforcement of that quarantine (U.S. Department of Homeland Security, 2004).

These federal activities largely fall under Emergency Support Function #8 in the National Response Framework. This area of the framework is devoted to the Public Health and Medical Services aspects of response to any disaster with a medical or health component. It provides “supplemental assistance” to all levels of government. It tasks the Federal government with the initial actions of: assessment of public health/medical needs, health surveillance, provision of medical care personnel (which may come from the Department of Defense, Veterans Affairs, or federally coordinate volunteers), provision of equipment and supplies, patient evacuation (where appropriate), patient care, assurance of the safety and security of supplies, provision of public information, mass fatality management, and many other tasks (U.S. Department of Homeland Security, 2008, ESF #8-3-ESF #8-8).

The NRF provides for the fairly comprehensive assistance and coordination of a pandemic response through the federal government. On paper, this seems to provide the statutory authority for the federal government to provide assistance, as well as prearranged mechanisms to do so. However, the NRF and its predecessors are relatively untested in the area of pandemic response and it is therefore uncertain how well the federal government would do in these tasks.

National Strategy for Pandemic Influenza and Its Implementation Plan

These companion planning documents came out of the fear of pandemic influenza arising out of the spread of avian influenza in 2003–05. The document recognizes the unique nature of pandemic disease and the challenges that it would pose. It specifies that the threat of pandemic influenza “necessitat[es] a strategy that extends well beyond health and medical boundaries, to include the sustainment of critical infrastructure, private-sector activities, the movement of goods and services across the nation and the globe, and economic and security considerations” (Homeland Security Council, 2005, p. 2). It assigns the roles and responsibilities for a response to pandemic influenza to the federal, state, and local governments.

The federal government is tasked with addressing the international implications of the disease, supporting the establishment of countermeasure capacities, ensuring that federal departments have developed and exercised preparedness plans, facilitating state and local activities with funding and guidance, and guiding the private sector on public preparedness. State and local governments are tasked with ensuring that reasonable measures are taken to contain the spread of the disease, establishing preparedness and response plans, integrating nonhealth entities into pandemic planning, establishing community-based stockpiles, and providing public information and education campaigns (Homeland Security Council, 2005).

The Implementation Plan for the National Strategy for Pandemic Influenza provides operational detail for the Strategy. It emphasizes that the distributed nature of a pandemic will place significant burden on state and local governments, as the federal government attempts to support the actions of many state and local entities. It states explicitly that “[the distributed nature of pandemics] means that it

is essential for communities, tribes, States, and regions to have plan in place to support the full spectrum of their needs over the course of weeks or months, and for the Federal Government to provide clear guidance on the manner in which these needs can be met” (Homeland Security Council, 2006, p. 2). The Implementation Plan emphasizes that the federal government participation in pandemic response will be guided by the National Response Plan (which has been replaced by the National Response Framework discussed earlier) (Homeland Security Council, 2006).

The Implementation Plan is a multilevel activity. It addresses the need for the federal government to work to increase surveillance in countries that are at risk and to work to help contain disease spread in foreign countries, before it even reaches U.S. shores. It also provides guidance for federal activities to provide support to state and local governments if the disease were spreading domestically. Furthermore, the Implementation Plan directs the federal government to increase U.S. capacity for the production of vaccines and antiviral medications and the development of prioritized distribution lists for their distribution (Homeland Security Council, 2006).

Department of Health and Human Services—Centers for Disease Control and Prevention

The HHS is charged with the responsibility of preparedness for all public health agencies across the country. Health care facilities and professionals require basic standards to be met in the event of a pandemic outbreak or a bioterror attack. The GAO found that HHS has not developed an adequate public health infrastructure that will also allow coordination between responsible entities (U.S. GAO, 2003a). This was highlighted by the failures during the 2001 anthrax response wherein there were many breakdowns at the local, state, and federal levels. At the federal level, the CDC (a department of HHS) suffered from inadequate managing of information and communications resources. Vaccines and drugs were in short supply and training deficiencies were identified for health care workers. Furthermore, it was found that there was no plan for how to prioritize vaccinations and treatment distribution to the public (U.S. Homeland Security Council, 2005). Since 2001, a great deal of government activity (as evidenced by the discussion herein) has taken place with the goal of improving response to disease. However, a major pandemic could still overwhelm government’s capacity to respond.

The CDC is instrumental in planning and preparation efforts for a pandemic disease outbreak. It is charged with increasing communication among public and private hospitals as a means to identify the onset of a pandemic outbreak and provide the status of the outbreak in the most efficient and timely manner. In addition to assisting the state, local, territorial, and tribal health authorities, the CDC is positioned to aid in the confinement of pandemic diseases prior to their reaching the United States. The CDC has taken many steps to accomplish this critical task.

In response to the anthrax incidents, the CDC created the Office of Terrorism Preparedness and Emergency Response. States have improved their disease surveillance systems, laboratory capacity, communication systems, and training for

health care professionals. The CDC has also created new vaccine distribution patterns to aid high-risk patients first (Homeland Security Council, 2007).

In preparation for a pandemic disease outbreak, the CDC defined certain responsibilities and declared specific assumptions. First, the CDC recognized that response to a pandemic will be the responsibility of state and local governing entities in the initial phases, leading to gaps in public services and safety. For this reason, the CDC has established a phased approach to responding to a major disease outbreak. These range from activating itself in alert mode to reducing normal CDC functions to allow for a surge in the organization's commitment to the pandemic.

The Strategic National Stockpile and Provision of Supplies

The CDC's phased response includes management, distribution, and deployment of the SNS as well as the allocation of other medical supplies such as personal protective equipment (Gerberding, 2006). The SNS consists of medicines and medical supplies the U.S. government and health practitioners believe will be helpful in the event of a major public health emergency. It is designed to provide support to state and local public health entities and could reportedly be delivered anywhere in the United States in under twelve hours (CDC, 2005).

In addition to the SNS, the government has planned for future pandemics by arranging for the availability of necessary vaccines and medicines. Given the current fears of avian flu, the United States has taken extra efforts to prepare for the need to vaccinate large sectors of society for influenza. Lessons learned from federal, state, and local responses to the 2004–05 influenza vaccine shortage have been aggressively targeted by HHS and the CDC (U.S. GAO, 2005b). As part of that effort, the CDC has recently created a pandemic severity index to help guide response. It provides categories from 1 to 5, with 1 indicating a mild flu outbreak with fewer than 90,000 deaths and 5 being comparable to the 1918 flu (CDC Issues Flu Pandemic Guidelines, 2007). Government activities increase as the categories progress from 1 to 5. Category 1 provisions instruct public health workers to ask infected individuals to stay away from others, increase hand washing, and utilize antiviral treatments. In contrast, Category 5 requires quarantine, closing of schools, decreased social gatherings and work, and encourages teleconferencing and working from home (CDC, 2007a). While this strategy is focused on responding to the flu, it is likely that a similar strategy would be helpful in preparing for other diseases.

Disease Surveillance

Another effort underway by all levels of American government involves surveillance of disease patterns in the United States. The goal of surveillance is to allow for the identification of potential epidemics at their early stages. The problem with identifying an epidemic is that patients may go to many different facilities to seek treatment. If those facilities do not communicate with one another, the disease could be widely spread before anyone even realizes it is a potential problem. Surveillance programs are designed to expedite the recognition that there is a problem (U.S. GAO, 2004b). It involves hospitals, physicians, and other public health workers at

the local and perhaps state levels notifying the CDC of any cases of diseases of major concern are identified. There are currently more than 60 diseases on the Nationally Notifiable Infectious Diseases list, including food-borne diseases such as botulism and salmonella, and diseases such as anthrax, smallpox, cholera, and hantavirus (CDC, 2008). There are also state-specific notification lists that may vary based on the local conditions.

Surveillance systems look for variances in the frequency of reporting of the diseases. Systems are in place in each state, at the CDC, at the Food and Drug Administration, at the U.S. Department of Agriculture, and within the Department of Defense. Information flows from states up to federal entities, and then trend information is passed back down from the top. Among the problems that have been identified with current surveillance systems is that they are costly to maintain, that communications are lacking, that the information technology in some areas is insufficient, and there are 60–100 different systems for reporting being used among the states (U.S. GAO, 2004b).

The Challenge of Quarantine

As highlighted in the earlier discussion of past response activities, quarantine is a major aspect of controlling disease spread. However, imposition and maintenance of quarantines and isolation orders will be contentious as they require the perceived denial of civil liberties to infected or exposed individuals. The authority of the U.S. government to impose quarantine on citizens and/or forcibly vaccinate them, even against their will, was established with the 1905 U.S. Supreme Court case of *Jacobson v Massachusetts*.³ The official list of quarantinable diseases for the United States is presented in Table 1. Three major problems that can be anticipated in the event of the need for imposition of quarantine will be a lack of availability of facilities for containment, failure of citizens to comply with the quarantine orders, and determining appropriate measures government can use to enforce the quarantine.

The lack of facilities that can be devoted to quarantine has historically resulted in the imposition of home isolation for those infected or exposed. Home containment creates verification challenges. Government must create means to assure that individuals are complying with the quarantine. As mentioned in the SARS case, some methods for verification might include Internet cameras and corrections-

Table 1. U.S. List of Quarantinable Communicable Diseases

Cholera
Diphtheria
Infectious tuberculosis
Plague
Smallpox
Yellow fever
Viral hemorrhagic fevers (to include Lassa, Marburg, Ebola, Crimean-Congo, South American, and others not yet isolated or named)
SARS
Influenza caused by novel or reemergent influenza viruses that are causing, or have the potential to cause, a pandemic

Sources. George W. Bush, *Executive Order: Revised List of Quarantinable Communicable Diseases*, April 4, 2003, and George W. Bush, *Executive Order: Amendment to E.O. 13295 Relating to Certain Influenza Viruses and Quarantinable Communicable Diseases*, April 1, 2005.

monitoring ankle bracelets. Additional difficulties will be encountered in providing for the daily needs of those sequestered in their homes. This will include distribution of food and household goods, as well as medicines and vaccines among those under quarantine. Another method of imposing quarantine could be to isolate an entire city impacted by the disease.

Regardless of the nature of the quarantine, enforcement will pose major civil liberties debates. This is anticipated in spite of the recognition of the statutory authority government has to enact such measures. People will question whether government has the right to deny them their freedom without a trial, what methods of quarantine or isolation are acceptable, what obligations the government has to people under separation orders, and so forth. Incarceration of violators would expose prisoners and members of the corrections industry to the disease. What measures would be acceptable to Americans if the country needed to enforce isolation? In the infamous emergency response exercise, *Dark Winter* (2001), the scenario hypothesized that smallpox was spreading in Oklahoma. By the end of the exercise, officials playing the role of Texas state government ordered National Guard troops to shoot on sight any person trying to cross over their border with Oklahoma (Memorial Institute for the Prevention of Terrorism, n.d.). While this response may seem extreme, the panic caused by fear of a contagion could generate public and governmental support for what would normally be unacceptable measures. It is possible that people will voluntarily comply with quarantine and isolation orders in the interest of public health and safety. However, the government must plan for the potential that some people will behave differently. President George W. Bush has stated that the military will likely be called to assist in enforcement of curfews and quarantine efforts during a U.S. pandemic disease outbreak:

If we had an outbreak somewhere in the United States, do we not then quarantine that part of the country, and how do you then enforce a quarantine? When—it's one thing to shut down airplanes; it's another thing to prevent people from coming in to get exposed to the avian flu. And who best to be able to effect a quarantine? One option is the use of a military that's able to plan and move. (White House, 2005a)

This has become a controversial issue regarding the constitutionality of the use of military of order and control of U.S. citizens. The military has taken preparedness measures to ensure the safety and security of Americans while containing and thus lessening the effects of an outbreak.

In a 2004 table-top exercise in San Diego, California, officials simulated the need to implement quarantine. The exercise was designed to help San Diego develop its future quarantine plan. Civilian and military officials in the exercise were able to work together for public affairs and providing information to the public. However, they were less effective in coordinating the delivery of public health and mental services. Military commanders pledged cooperation with the response and imposition of quarantine but in the end were unable to commit resources because of their desire to sustain operational readiness. Law enforcement officials expressed concerns about having to carry out their role of enforcing the quarantine. Concerns among those quarantined centered on the loss of wages and the desire to keep their jobs, which interfered with their willingness to comply with voluntary quarantines (DiGiovanni et al., 2005).

Conclusion

The earlier discussion of past pandemic response would indicate that the following, at a minimum, will be required to respond to future pandemic diseases:

- Early detection of unusual patterns of disease spread;
- Recognition of the potential for a pandemic based on the nature of the disease;
- Rapid mobilization of response at all levels of government;
- Distribution of medicines and other supplies to impacted areas;
- Development and administration of vaccines (where relevant);
- Separation of the ill and exposed from the healthy through isolation and quarantine;
- Enforcement of public separation measures;
- Provision of required supplies and care for those under quarantine;
- Effective decision making about when the pandemic has ended and cessation of the response measures.

However, the cases would also indicate that policy makers need to be careful to avoid decision making based on personal fears and public panic. Examination of U.S. activities to improve response reveals that they are consistent with achieving these goals. However, the unique characteristics of each disease possible and divergent requirements for treatment and response may undermine even the best laid plans.

There are several major challenges that government is likely to face regardless of its preparations. Coordinating and communicating across the levels of government will have to be effective in order to be successful in the response. This is true both for sharing information about disease spread from localities to the federal government as well as in the other direction. Another complicating factor will be present as the pandemic spreads across the country. As discussed earlier, states and localities will have to be relied on as the first responders to a pandemic. They, in turn, will have to rely upon federal assets and assistance in order to respond more effectively. Widespread cases of the disease may dilute federal support such as the SNS and personnel. This may reduce the assistance federal agencies can give to each impacted community.

Controlling fears will also be an important aspect of government's response. Several important conclusions relevant to a global pandemic or bioterrorist attack can be drawn from this analysis. First, SARS is illustrative of the potential impact that fear of a spreading disease may have on a society (e.g., Holloway et al., 1997). In fact, the fear of a global pandemic may have a worse impact on the country than the disease itself. SARS was frightening because it was a new disease to humankind that, because of modern transportation, rapidly traveled around the globe. Avian influenza, pandemic flu, or agents of bioterror such as weaponized smallpox, or any viral hemorrhagic fever, would be comparably fearsome. The impact of SARS was relatively limited in terms of actual medical casualties and geography; endemic

diseases such as the seasonal flu, which kills about 36,000 globally each year, and malaria, which kills approximately 3,000 African children daily, have a much greater relative impact in human terms than SARS, which killed less than 800 (World Health Organization, 2003b). However, the psychological impact of the disease on the international economy and on individuals' perceptions of their safety is undeniable, and it foreshadows the calamity which would ensue in the wake of a more serious pandemic.

It is likely that the vast majority of individuals will voluntarily comply with quarantine and isolation orders. As one man in Singapore stated during the SARS epidemic, "It is no longer a matter of privacy. It is a matter of national security" (Marican, 2003). Only a very small proportion of those under quarantine failed to comply with the order. When that has happened, it was usually based on economic need (e.g., they felt the need to continue working) or health concerns. For the majority of the quarantine breakers, the economic motive was predominant.

The institution of quarantine, whether voluntary or forced, necessarily infringes on the liberties of the individual. Isolation of individuals who are obviously ill or showing symptoms is rarely problematic. However, placing people under quarantine merely because they have been exposed to someone who has the disease or someone who was around someone with the disease just in case they caught it is far more problematic (Annas, 2002; Barbera et al., 2001). For instance, during the SARS epidemic, a flight attendant in Singapore was berated by a neighbor who thought she should put herself under quarantine because she sometimes flew to Hong Kong. The flight attendant declared, "She has no right to demand that I be quarantined as I'm not sick. I have a job to do and a rice bowl to keep. If SARS goes on for the next six months and I stop work because of it, how do I feed my children?" (Tan, 2003). Such reactions may be common during a pandemic. It is difficult to convince someone that they should disrupt their lives, not go to work, and cut themselves off from society just in case they have contracted the disease. For this reason, government may need to be prepared to intervene with more forcible options than voluntary quarantine.

These are just some of the challenges faced by the government in the United States, at all levels, and by governments across the globe. The next pandemic could be years away or right around the corner—an event that will test the planning and preparedness activities of government in the interim. Dr. Rajeev Venkayya, Special Assistant to President George W. Bush for Biodefense, summed it up best when discussing avian influenza:

We don't know what's going to happen with this particular influenza virus, but if it's not H5N1, we can be certain that some other influenza virus at some point in the future will lead to a pandemic. More importantly, if it's not an influenza pandemic in the next 10 years, we know—we can almost be certain that some other biological threat will come upon us and we will need to be prepared for that. (White House, 2007)

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Notes

- 1 According to the CDC, "close contact" is defined as "cared for or lived with someone with SARS or having direct contact with respiratory secretions or body fluids of a patient with SARS." Examples of such activities would include sharing drinking glasses or utensils, kissing, or hugging. U.S. CDC, "Fact Sheet: Basic Information about SARS." Available at: <http://www.cdc.gov/ncidod/sars/factsheet.htm>. Accessed on March 23, 2007.
- 2 The 15 percent mortality rate includes a 50 percent or greater chance of death in persons age 65 and older. The calculation of the overall mortality rate is an average of the average rates across groups. CDC, "Frequently Asked Questions." Available at <http://www.cdc.gov/ncidod/sars/faq.htm>. Viewed April 24, 2003. See also Altman (2003b) and Stein and Connolly (2003).
- 3 Justice Harlan noted in the case that:

There is, of course, a sphere within which the individual may assert the supremacy of his own will and rightfully dispute the authority of any human government, especially of any free government existing under a written constitution, to interfere with the exercise of that will. But it is equally true that in every well-ordered society charged with the duty of conserving the safety of its members the rights of the individual in respect of his liberty may at times, under the pressure of great dangers, be subjected to such restraint, to be enforced by reasonable regulations, as the safety of the general public may demand.

Jacobson v. Massachusetts (1905), 197 U.S. 11 (See also Cohen et al., 2004)

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